Bachelor of Engineering **Prospectus No. 121741**
III & IV Semester

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS

Prescribed for
Four Year Degree Course
Bachelor of Engineering

BRANCHES

1) Civil Engineering
2) Mechanical Engineering
3) Electrical Engineering (Electronics & Power)
4) Electrical and Electronics Engineering
5) Electrical Engineering (Electrical & Power)
6) Electrical Engineering
7) Electronics and Telecommunication Engineering
8) Electronics Engineering
9) Instrumentation Engineering
10) Computer Science and Engineering
11) Computer Engineering
12) Information Technology

III & IV Semester Examinations, 2011-2012

Semester Pattern

(CREDIT GRADE SYSTEM)

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SYLLABUS

PRESCRIBED FOR

BACHELOR OF ENGINEERING

CIVIL ENGINEERING EXAMS.

SEMESTER PATTERN (CREDIT GRADE SYSTEM)

THIRD SEMESTER

Inpalnt Training & Industrial Visit in the faculty of Engineering & Technology

1)
a) the inplant training shall not be compulsory,
b) the inplant training shall be taken by students strickly during Summer vacation. after IVth or VIth Semester examination and /or during Winter vacation after Vth or VIIth Semester examinations,
c) the inplant training shall not be part of examination system, however, student shall prepare and submit report after completion of training to the concerned Head of Department alongwith certificate issued by the industry,
d) the inplant training shall be of minimum two weeks duration,
e) there shall not be any liability whatsoever on the Institution with respect to implant training of the students,
f) students shall undertake inplant training on their own risk and cost. An undertaking in this regards signed by student and parents shall be submitted before proceding for training to the concerned Head of Department/ Head of Institution.
g) the students shall complete inplant training under the supervision of concerned person in the industry,
h) Institutes shall help students to organise inplant training by way of correspondance,

2) Industrial Visit : Industrial visit may be organised for the students. Students should prepare & submit the report on Industrial visit to the concerned Head of Department/Head of Institution.

3CE01 MATHEMATICS-III

SECTION - A

Unit I : Ordinary Differential Equations.

Complete solution, Operator D, rules for finding the complementry function, the inverse operator , Rules for finding particular integral. Method of variation of parameters, Cauchy's and Legendre's Linear Differential equations. Simultaneous linear differential equations with constant coefficients Applications to civil engineering.

Unit II: Laplace transforms :

Definition and elementry properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary and simultaneous differential equation using Laplace transform of periodic functions. Application to problems of beams.

Unit III Partial Differential Equations.

P.D.E. of first order and first degree of types i) f(p,q) = O ii) f(p,q,z)=0, iii) f(p,q,x,y)=O iv) f(p,q,x,y,z)=O i.e. (a) Lagrange's form Pp + Qq = R (b) Claivant's form z=px+qy+f(p,q) v) Equations reducible to above standard types linear Homogeneous P.D.E. of nth order with constant co-efficients.

SECTION-B

Unit IV Numerical Methods :-

(a) i) Solution of Algebraic and transcendal Equations by

Newton Raphson method and by method of False Position.

ii) Solution of system of linear equations by Grout's method, Gauss Seidal method and Relaxation Method.

(b) Numerical solution of differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method and Rungekutta forth order method.

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mapping, Elementary conformal mapping w=z+c, w=cz, w+ Bilinear transformation.

Unit VI Statistics :

Probability : Axioms, conditional probability, Baye's theorem, Mathematical Expectation and probability distributions (Binomial, Poisson and Normal) Curve fitting by method of least square only for line and parabola, Corelation regression.

Books Recommended :

1) Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
2) Advance Mathematics for Engineers by Chandrika Prasad.
3) Method of Applied mathematics by F.B.Hildebran.
4) Introductory methods of Numerical Analysis by S.S.Sasby.
5) Computer Oriented Numerical Method by Raja Raman.

3CE02 STRENGTH OF MATERIALS

SECTION-A

Unit-I
1. Mechanical properties : Concept of direct, bearing and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel and concrete, Generlized Hook's law, factor of safety.
2. Uniaxial stresses and strains : Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit-II
1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear force, bending moment and loading intensity.

Unit-III
1. Stresses in beams (Bending, Shear),
   i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.
   ii) Shear : Distribution of shear stresses on beam cross sections,
   iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

SECTION - B

Unit-IV
1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.
2. Thin cylinders subjected to internal pressures.

Unit -V :
1. Principal stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.
2. Combined direct & bending stresses : Combined direct and bending stresses, applications to short columns with eccentric loads, retaining walls with horizontal lateral force.

Unit-VI
1. Slope & deflection of beams : Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by a) Macauley's method b) Moment Area method c) Conjugate Beam method.
2. Theory of long columns, Euler, Rankine formula.

BOOKS RECOMMENDED:

1. E.P.Popov, Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young, Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, Strength of Materials, Harper and Row, New York
4. Shames, I. H., Introduction to solid mechanics, Prentice Hall of India, New Delhi
5. Natarajan, Mahadeoappa, Strength of materials
6. Junnarkar, S. B., Mechanics of materials
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pte. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.

3CE03 TRANSPORTATION ENGINEERING -I

SECTION-A

Unit-I
Highway : Development And Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material And Testing.
Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.

Unit-II
Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEVTheory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, superelevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.

Unit-III
Pavement Design : Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement,
Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil.

SECTION-B

Unit-IV Traffic Engineering : Traffic Characteristics, Traffic studies, road parking system, accident study, traffic control devices, marking, signs, signals, island its type, At grade intersections – clover leaf, diamond, rotary intersections & design elements, 3 E's of traffic, regulation for driving motor vehicle, motor vehicle Act & Rule.

Unit-V Bridge Engineering – Component, classification and identification, data collection, site selection, economic span, different structural form – culverts, causeways, major and minor bridges, types of foundation, abutments, piers and wing wall, bearing their types and choices, Erection of bridge superstructure.

Unit-VI Bridge Hydrology - Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board. Load, Forces, Stresses – Loads, forces, stresses acting on bridges.IRC Specification and code practices, critical combination. Rating And Maintenance – Methods and techniques of rating of existing bridges, repairs, maintenance, corrosion – causes and prevention, Strengthning of bridge superstructure.

BOOKS RECOMMENDED :-

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transporatation & Highway Engg.
3) Dr.Kadiyali L.R. : Traffic Engg. & Transport Planning.
4) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
5) Bindra S.P. : Principles & Practice of Bridge Engg.
6) Bindra S.P. : A Course in Highway Engg.
7) Duggal A.K. & Puri V.P. : Laboratory Mannual in Highway Engg.

3CE04 BUILDING CONSTRUCTION & MATERIALS

SECTION - A

Unit- I Introduction : Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages, load bearing walls and partition walls, HDPE Wall panel.

Foundation :- Definition and necessity, loads of foundation, Bearing Capacity soil, SBC values based on IS code, field methods of improving bearing capacity.

Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls &

columns, Raft foundations, Foundations in black cotton soils, under-reamed pile foundation, precautions to be taken. Causes of failure of foundations. Setting out for foundation, excavation for foundation.

Unit-II Stone Masonry – Technical terms, General principles to be observed during construction, random rubble masonry, coursed and un- coursed rubble masonry, Selection of stone for masonry.

Brick Masonry – Classification of bricks, manufacturing of clay bricks, tests on bricks, properties of burnt bricks, new trends in brick manufacturing such as use of fly ash, stabilized mud blocks.

Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Earthquake force, various features for making load bearing structure earthquake resistant.

Unit-III Floors – Types of Floors – Basement floor, ground floor and upper floors, Types of upper floors – R.C.C. slab floor, R.C.C. slab & beam floor, R.C.C. ribbed floor, R.C.C. Grid floor, R.C.C. flat slab floor, Floor finishes – Types of flooring material, Sahabad, Kotta, Granite, Ceramic tiles, plain tiles, mosaic tiles, glazed tiles, different types of floor finishes, their suitability, method of construction, criteria for selection.

Roofs – Flat & pitched roof, steel roof trusses – types and suitability, fixing details at supports, types of roof covering, AC & GI sheets, acrylic sheets, fixing details of roof covering.

Formwork – Different types, their relative merits & demerits, period for removal of formwork for different members.

SECTION - B

Unit-IV Doors & Windows – Different forms of commercial woods-plywood, particle-board, batten-board, block-board, novapan, sunmica, veneer sheets.

Doors : Purpose, criteria for location, size of door, door frames & its types, methods of fixing, T Types of door shutters and their suitability, HDPE door shutter.

Windows – Purpose, criteria for location, no. sizes & shapes of Windows, types of windows & their suitability.

Ventilators – Types and their suitability. Fixtures & fastening for doors & windows.

Glass – Types of glass & their suitability.

Arches & lintels – Types & their suitability, details of R.C.C.

lintels & chajja, precast lintels & arches.

Unit-V Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design.
Lifts, ramps & escalators – suitability.
Plastering & pointing- Necessity, types, processes of different types of plastering, defects in plastered work.
Painting & Colouring – Necessity, types, processes of painting & colouring to wall surfaces, wooden surface, iron & steel surfaces, types of paints and their uses.
Scaffolding – Purpose, types, suitability.

Unit-VI Special Aspects of Construction –
Damp proofing – causes of dampness, its effects, various methods of damp proofing, material used for damp proofing, details of cavity wall construction.
Fire proof construction – Points to be observed during planning & construction. Fire protection requirements for a multistoried building.
Sound proof Construction – Sound absorbants and their characteristic, factors affecting the acoustical design of an auditorium.
Joints – Expansion & construction joints necessity, details of expansion joint at foundation level & roof level of load bearing structure and framed structure. Provision of construction joints in slabs, beams & columns.

BOOKS RECOMMENDED :

1) Mackay W.B. : Building Construction, Vol. I, II, III, Longmans.
2) Sushilkumar : Building Construction, Standard Publishers Distributors.
3) Deshpande R.S. and Vartak C.V. : A Treatise on Building Construction.
4) Sharma S.K. Kaul B.K. : A. T.B. of Building Construction, S. Chand & Co.
5) Gurucharan Sing : Building Construction Engg., Standard Book House, Delhi-6
6) Sane L.S. : Construction Engg., Manak Talas, Mumbai.
7) Chudley R. : Construction Technology, Vol. I, II, III & IV, Longmans Group Ltd.
8) ISE National Building Code of India, 1970.
9) Punmia B.C. : Building Construction.
10) A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

3CE05 ENGINEERING GEOLOGY

Unit-I : Introdution - Different branches of Geology and importance of Geology in Civil Engineering.
Mineralogy - Study of common rock forming and ore minerals with reference to its physical properties.
Petrology - rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Unit II : Structural Geology - outcrop, dip strike, elementary ideas about folds, faults, joints and unconformity, effect of these structures in foundation.
Earthquake Engineering - earthquake waves, causes and effects, magnitude and intensity, earthquake zones of India, seismic coefficient.
Geological investigation - surface and sub-surface investigation, direct and indirect.

Unit-III : Rock as a material of construction. Study of engineering properties of rocks and soils. Geological studies related to site selection for dams and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields etc. Case histories of some major projects of tunnels, dams and reservoirs.

BOOKS RECOMMENDED :-

1) Singh Parbin : General & Engineering Geology.
2) Mukharjee : A Text Book of Geology.
3) Tuyrell G.W. : The Principle of Petrology.
4) Wadia D.N. : Geology of India.
5) Krishan M.S. : Geology of India.
6) Date S.Y. & Mukharjee D.M. : Geological Maps.
7) Deshmukh D.N. & Mukharjee D.M. : Engineering Geological Maps.
8) Gupte R.B. : Geology of Engineering.
9) Reddy Venkata : Engnieering Geology.

3CE06 STRENGTH OF MATERIALS -LAB

PRACTICALS:

Minimum seven out of following:

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.

7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3CE07 TRANSPORTATION ENGINEERING-I-LAB

PRACTICALS

Based on above syllabus, following practical are required to be performed and a laboratory report be submitted by every student. Practical examination will be viva based on above system.

List of Experiments (Any Eight)

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of perforation value of Bitumen
7. Determination of Viscosity of Bituminous material
8. Determination of softening point of bituminous material.
9. Determination of ductility of bitumen.
10. Determination of flash point and fire point of Bituminous material
11. Determination of marshal stability value

3CE08 BUILDING CONSTRUCTION & MATERIALS - LAB

PRACTICALS –

1. Drawing of following building elements on A-2 size sheet.
   a) Panelled door, flush door, glazed window.
   b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Fields visits to building under construction and its report writing including material of construction, construction processes, Human

recourses required, construction details.

6. Sketch book containing Free hand sketches of following
   i) Different types of foundations.
   ii) Bonds in brick masonry
   iii) Types of floors. [sections]
   iv) Types of stairs. [plans and side view]
   v) Line sketches of different types of steel roof trusses.
   vi) Details of expansion joints.
   vii) Details of damp proofing for basement.
   viii) Fixtures & fastenings of doors & windows.

3CE09 ENGINEERING GEOLOGY - LAB

LABORATORY WORK :-

1) Megascopic study of common rock forming and ore minerals.
2) Megascopic study of the common igneous, sedementary and metamorpic rocks.
3) Geological map reading and construction of sections from simple geological maps with engineering problems (about 8 maps)

A report/journal on above practical conducted shall be submitted by each student. Practical examination shall be based on practical and viva-voce conducted on the above syllabus.

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SEMESTER : FOURTH

4CE01 GEOTECHNICAL ENGINEERING – I

SECTION – A

Unit- I History of development of soil mechanics , formation of soil, its significance to the field problems.

Soil properties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Density of Soil, relative density, in-situ density, specific gravity of soil solids, soil solids index and simple soil properties, void ratio, porosity, degree of saturation and functional relationship. Grain size analysis, Mechanical and Sedimentation analysis, consistency limits and their determination, liquidity idea, activity, sensitivity etc. Criteria of classification of fine grained and coarse grained soil IS soil classification

Unit-II Concept of clay mineral, major soil minerals, Kaolonite, IIIite, Montmorillonite, its structural formation and properties. Mechanics of compaction, factors affecting compaction, standard and modificfed Proctor test, OMC, their field determination, zero air-void line, concept of wet of optimum and dry of optimum, different structures of soil, field method

of compactions and quality control. Mechanical stabilization and CBR test & its application.

Unit-III Absorbed water, surface tension, capillarity and its effect on soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection permeability, determination of oefficient of permeability laboratory and field methods. IS procedure for determination of coefficient of permeability for stratified deposits.

Drainage and dewatering of soil, various methods, deciding different drainage system.

SECTION – B

Unit-IV Laplace equation, its derivation in Cartesian co-ordainate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design of graded filter, Terzagghi's criteria, protection filter, requirement of ideal filter material, concept of piping and criteria of stability against piping.

Unit-V State of stress at a point, Mohrs stress circle, stress distribution in soil mass, Boussinesqs theory and its applications, point load, uniformly loaded rectangular and circular area New-marks chart, its preparation and use, equivalent point load to deleted.

Compression of laterally confined soil, e-p virgin compression curve, compression index, swelling index, coefficient compressibility, concept of consolidation spring analogy Terzaghi's theory of one imensional consolidation. Mathematical treatment). Consoledo meter-test, coefficient consolidation, time factor curve fitting methods, consolidation. Cassagrandes method for determination of pre-consolidation pressure.

Unit-VI A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criterial, Mohr-Coulambs theory and development of failure envelopes, Laboratory measurement of shear strength for different drainage, coditions by direct shear test, Unconfined compression test,Triaxial and vane sheartest, concept of pore pressure coefficients and their significance on strength of soil, overconsolidation ratio, shear characteristics of sand, NC

and OC clays and partially saturated soil: Influence of soil structure and strain rate on shear strength, Merits and demerits of various shear strength tests.

BOOKS RECOMMENDED :

1) Craig R.F. : Soil Mechanics, ELBS, 1983.
2) Lambe T.W. & Whiteman R.V. : Soil Mechanics, John Wiley and Sons, 1969.
3) Terzaghi K. & Peck R.B. : Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
4) Gulhati S.K. : Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
5) Singh A. : Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
6) Venkategramiah C. : Soil Mechanics and Foundation Engg.

4CE02 FLUID MECHANICS – I

SECTION - A

Unit I : Introduction: Definition of Fluid, physical properties of fluid mass density, unit weight, specific Gravity, dynamic viscosity, Kinematic Viscosity, Newton's law of viscosity, Rheological classification of fluids. Adhesion, Cohesion, surface tension, capillarity, pressure inside droplet & jet of liquid.

Fluid Statics I : Pressure at a point, Pascal's law, Equation of fluid static's & its integration, Measurement of pressure, absolute & gauge, types of manometers.

Unit II: Fluid Statics II : Forces on immersed areas – plane and curved, Buoyancy, equilibrium of floating bodies, metacenter, metacentric height, its determination by analytical method only. Kinematics : types of Flow – Eulerian approach of describing fluid motion, streamline, stream tube, streak line, Path line, substantive, local, convective acceleration, velocity potential, stream function, continuity equation of ID & 3D flow in Cartesian coordinates.

Unit III : Fluid Dynamics : Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, HGL, EGL, velocity distribution, Average velocity, Kinetic – Energy correction factor, momentum correction factor (Definition only) Momentum equation (Statement Only) Forces on pipe bends.

SECTION - B

Unit IV: Fluid Measurement –I : Venturimeter, Orificemeter, Pitot tube, Prandtl Pitot tube, circular orifices & mouthpieces, time of

emptying rectangular tanks by orifices at bottom & sides.

Fluid Measurement – II: Notches & weirs, Definition, Types rectangular, triangular, trapezoidal, cipolletti weir, end contractions, velocity of approach, Francis equation.

Unit V: Laminar flow through circular pipes, velocity distribution, Hayegen Puiseuille equation with Proof. Reynold's number, Boundary layer, definition, development along a flat plate, Nominal thickness, energy thickness, Momentum thickness, displacement thickness.

Unit VI : Flow around immersed bodies, drag, lift, different forms of drag, calculations of drag & lift on cylindrical bodies only. Pipe flow Darcy – Weisbach equation $h_f = flv^2/2gd$ (no proof) major & minor losses, pipes in series, pipes in parallel, equivalent pipe, pipe Network (Hardy – Cross method only)

Books Recommended :

1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition.
2) Dr. Jain A.K. : Fluid Mechanics.
3) Subramanya K. : Fluid Mechanics.
4) Streeter : Fluid Mechanics.
5) Garde & Mirajgaonkar : Fluid Mechanics.

4CE03 THEORY OF STRUCTURES – I

SECTION – A

Unit-I
1. Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.
2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II
1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.
2. Deflection in determinate trusses.

Unit-III
1. Influence line diagrams for reactions, bending moment and shear force for determinate beams.
2.. Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION B

Unit-IV
1. Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.
2. Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit-V Slope deflection method:
1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

Unit-VI Moment Distribution method:
1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Snalysis.

4CE04 SURVEYING – I

SECTION-A

Unit-I
1. Introduction Surveying – Necessity & purpose, Geodetic & plane surveying, classification of survey, principles of surveying.
2. Instruments for measurement of distance, linear measurements, corrections to field measurements, ranging out, direct and indirect ranging. Use of distomat.
3. Chain surveying: basic definition, principle, selection of survey stations, offsets for locating details, limiting length of offsets, degree of accuracy of offsets, use of cross staff, optical square, prism square, obstacles in chaining, plotting of chain survey work, cross staff survey.

UnitII
1. Instruments for measurement of angles: Prismatic compass, surveyor's compass, their use and adjustments. Vernier and microscopic theodolite, their temporary adjustment. Permanent adjustment of vernier theodolite. Introduction and uses of Total Station.
2. Traversing with chain and compass, Reference meridians, bearing and azimuths. Local attraction, magnetic declination and its variation. Open & closed traverses. Adjustment of closed traverse - Bowditch's Graphical method.

Unit-III
1. Instruments for measurement of elevation : Dumpy levels tilting and automatic levels. Details of their construction.
2. Temporary and permanent adjustments of Dumpy and tilting levels.

SECTION - B

Unit-IV: 1. Measurement. of Horizontal and Vertical angles with theodolite by different methods. Other uses of theodolite.
2. Theodolite traverse, latitude and departure, Gale's traverse table.

Unit-V 1. Leveling: Definition of terms, Principle, leveling methods, leveling staves, Booking and reduction of field notes, curvature and refraction.
2. Contouring: Definition, Characteristics and uses of contour maps, methods of contouring. Refraction, reciprocal leveling plotting of profiles. Errors in leveling.

Unit-VI: 1. Plane tabling : equipments, methods, two point and three point problems, Advantages & disadvantages of plane tabling, Lehman's rules.
2. Construction and use of minor instruments such as Abney level, Box sextant, Plan i meter, Tangent clinometer, Ghat Tracer.

BOOKS RECOMMENDED :

1. D.Clark : Plane and Geodetic Surveying, Vol. I & II Aisa Publication House.
2. P.B.Sahani : T.B. of Surveying, Vol. I & II, Oxford B.H.B.H.
3. T.P.Kanetkar & Kulkarni : Surveying and Leveling, Part I & II, Pune Vidharthi Griha Prakashan, Pune.
4. B.C.Punmia : Surveying I & II, Standard Book House Delhi.
5. R.C.Brinker and P.R.Wolf, Harper and Row : Elementary Surveying

4CE05 REINFORCED CEMENT CONCRETE – I

SECTION – A

Unit-I Cement: Physical properties of Portland cement, laboratory tests, special types of cements.
Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density, laboratory tests.
Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete

Unit II Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage and durability, laboratory tests on concrete.

Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions.

Unit-III Special concrete: Light weight concrete, fibre reinforced concrete, Roller compacted concrete, self compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete.
Special concreting techniques: Guniting, grouting and shotcreting concrete, introduction & application of Ferrocement.

SECTION-B

Unit-IV Introduction of mix design, factors governing mix design, IS code method of mix design (IS: 10262 – 1982) and Indian Road Congress (IRC) – 44 methods.

Unit-V Basic elastic theory and concept of reinforced concrete, types of reinforcement.
Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, and chajjas.

Unit-VI Analysis and design of doubly reinforced rectangular beam by working stress method section for simply supported span.
Shear and Bond: Shear stress in reinforced concrete beam section, shear reinforcement, bent up bars and stirrups, bond stress, local and average bond stress, and development length.

Students must be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold (Publishers) ltd.
2. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks : Concrete Technology, ELBS
4. Gambhir, M. L. : Concrete Technology, Dhanpat Rai and Sons
5. Orchard D. F. : Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S. : Concrete Technology, S. Chand
7. Varshney, R. S. : Concrete Technology, Oxford Pub. house.
8. IS: 456 – 2000,
9. IS: 10262 – 1982,
10. Krishna Raju : Design of Concrete Mixes, Mc – Graw Hill.

11. Shah and Kale : Reinforced Cement Concrete Design,
12. Sushil Kumar : Treasure of Reinforced Cement Concrete

4CE06 GEOTECHNICAL ENGINEERING – I-LAB

PRACTICALS :-

Based on above syllabus, following ten practical are required to be formed and a laboratory report be submitted by vevery student. Practical-examination will be viva based on above syllabus.

EXPERIMENTS :-

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying method.
3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination f Atterbergs limits (LL, PL and SL)
6. Determinatin of Compaction properties (Standard Proctor Test)
7. Determination of permeability of falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial of UU type
11. C.B.R. test.
12. Consolidation test

4CE07 FLUID MECHANICS – I - LAB

PRACTICALS :-

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva-voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoullis theorem.
2. Reynolds experiment to determine type of flow.
3. Determination of coefficient of discharge for Venturimeter
4. Determination of coefficient of discharge for Orificemeter
5. Determination of hydraulic coefficients of orifice.
6. Determination of metacentric height.
7. Determination of friction factor for GI pipe
8. Determination of coefficient of discharge for rectangular notch .
9. Determination of coefficient of discharge for triangular notch.
10. Determination of coefficient of discharge for trapezoidal notch.
11. Determination of coefficient of discharge for mouthpiece.
12. Determination of Viscocity of fluid at different temperatures.

4CE08 SURVEYING – I-LAB

PRACTICALS –

Any 7 practicals mentioned below shall be performed by each student, Observations, calculations and relevant work to be submitted in the form of field book and 4 drawing in A-1 size sheet as a sessional work.

1. Measurement of length – use Distomat.
2. Chain and Compass surveying.
3. L Section & C/section of road.
4. Plane table survey.
5. Theodolite traverse.
6. Study and use of minor instruments.
7. Measurement of area of a irregular figure by digital planimeter.
8. To find corrected bearing using prismatic compass (local attraction).
9. To find R.L. of given point (differential levelling)

Practical examination shall consists of field exercise and vivavoce based on the above syllabus and practical work.

4CE09 REINFORCED CEMENT CONCRETE – I -LAB

PRACTICALS:

- Compulsory site visit and submission of site visit report.
- Minimum seven out of following list:

1. Fineness of cement:
2. Soundness of cement
3. Consistency and setting time of the cement
4. Compressive strength of cement
5. Sieve analysis of aggregate.
6. Bulking of sand (fine aggregate).
7. Silting of sand.
8. Workability by slump cone test.
9. Workability by compaction factor test.
10. Workability by flow table method.
11. Compressive strength of concrete.
12. Mix Design (Compulsory) by IS method.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3ME01 MATHEMATICS-III

Section-A

UNIT-I : **Ordinary differential equations:-** Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (10 Hrs)

UNIT-II **Laplace transforms :** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function. Solution of Linear differential equations. (10 Hrs.)

UNIT-III a) Partial differential equation of first order of following form- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii)f (x,p)=g(y,q); (iv) Pp+Qq=R (Lagranges form); (v) z=px+qy+f (p,q) (Clairaut form)

b) Statistics : Curve fitting by method of least squares (Straight and parabola only), Correlation, Regression.

c) Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (10 Hrs.)

Section-B

UNIT-IV **Complex Analysis :-** Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation), singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

UNIT-V **Numerical Analysis :** Solution of algebric and transcendental equations by Newton-Raphson method & method of false position. Solution of system of linear equations by Gauss-Seidal method, Relaxation method. Solution of first order ordinary differential equations by Picard's, modified Euler's, Runge-Kutta and Taylor's method. (10 Hrs.)

UNIT-VI **Vector Calculus :-** Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function,

Directional derivatives, Divergence and curl of a vector point function and their physical meaning, line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

Books Recommended:-

Text Books:

1. Text book on Applied Engineering Mathematics, Vol. II, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics, B.S Grewal, Himalaya Publishing House.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Book :

1. Advanced Engineering Mathematics, Erwin Kreyzig, John Wiley.

3ME02/ 3PE02 MECHANICS OF MATERIALS / STRENGTH OF MATERIALS

SECTION-A

Unit-I 1. Mechanical properties: Concept of direct, bending and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, and other metals, factor of safety,

2. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit-II 1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shear force, bending moment and loading intensity.

2. Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section, leaf springs.

Unit-III 1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.

2. Shear stress distribution on beam rectangular and circular cross sections.

SECTION – B

Unit-IV Thin and thick cylinders and thin spherical shells subjected to internal pressures.

Unit –V 1. Strain energy under uniaxial tension and compression impact loads and instantaneous stresses.

2. Principal Stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses.

Unit-VI Deflection of beams

Deflection in statically determinate (simply supported) beams subjected to point loads, uniformly distributed loads, moments by Macauley's method.

Books Recommended:

Text Books :

1. F. L. Singer : Strength of Materials, Harper and Row Publication, New York .
2. Ramamruthm : Strength of Materials, Danpat Rai and Sons, New Delhi .

Reference Books :

1. E.P.Popov : Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young : Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Shames, I. H. : Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 1990.
4. Beer and Johston : Mechanics of Materials, McGraw Hill.
5. D. S. Prakash Rao : Strength of Material : A Practical Approach, I ed, University Press, Hydrabad.

3ME03 FLUID POWER-I

Section - A

UNIT-I : - 1) Introduction to the study of fluid motion. Mechanical properties of fluids and their influence on flow characteristics.

2) Fluid Statics:- Fluid pressure, pressure variation in fluids, manometers, forces on plane and curved surface buoyancy. (12 Hrs)

UNIT-II:- Buoyancy, stability of floating bodies. Kinematics and dynamics of fluid flow:- Types of flows, Stream lines, potential lines, flow net, continuity equation. One and two dimensional motion, one dimensional method of flow analysis. Bernoulli's

equation. Venturimeter, Momentum equation for steady flow. Vortex motion. (8 Hrs)

UNIT-III:- Dimensional analysis: Dimensional homogeneity and dimension less ratios. Dimensionless parameters. Similitude and model studies. (6 Hrs)

Section - B

UNIT-IV:- Motion of viscous fluids:-Introduction to laminar and Turbulent flows. Boundary layer concept. Separation. Drag lift on immersed bodies. Reynolds number and its significance. (7 Hrs)

UNIT V:- Darcy weisbach equation i.e. Equation of pipe flow, friction charts and its use, Minor losses in pipes and fittings, losses due to sudden enlargement and contraction, Hydraulic and energy gradient lines, pipes in series and parallel. Elementary concept of water hammer. (8 Hrs)

UNIT VI:- 1. Principles of fluid machinery: Dynamic action of fluid force exerted by fluid jet on plane, curved, stationary and moving vanes. Velocity diagrams, Work done by impact, pressure due to deviated flow.

2. General Theory of Hydrodynamic Machines:- Eulers equation, Degree of reaction, classification of machines according to degree of reaction. Efficiencies: Volumetric efficiency, Hydraulic efficiency, mechanical efficiency and overall efficiency. (7 Hrs)

Books Recommended :-

Text Books:-

1. CSP Ojha, R. Berndtsson, Fluid Mechanics and Machinery; Oxford university.
2. Bansal R.K., Fluid Mechanics and Fluid Machines; Laxmi publications.

Reference Books:-

1. R.K.Rajput; Engineering Fluid Mechanics; S. Chand publications.
2. Dr. Mody & Seth; Hydraulics and Fluid Mechanics; Standard book house
3. S. Ramamrutham, Hydraulic, Fluid Mechanics & Fluid Machines, Dhanpatrai publishing company.
4. Strecter, Fluid Mechanics, Tata McGraw Hill.

3ME04 ENGINEERING THERMODYNAMICS

Section-A

Unit-I Introduction to basic concepts of thermodynamics,

Macroscopic and microscopic approaches, properties of system, state and equilibrium, processes and cycle. Temperatures and Zeroth law of thermodynamics, Quasi-static process, Forms of energy and its conversion.

Gas Laws and Ideal gas equation of states, difference between gases and vapours, equation of state, gas constant and universal gas constant. (08 hrs)

Unit-II Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams.

First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law applied to closed system under going a cycle, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Change in internal energy and Heat transfer during various non-flow processes. (10 hrs)

Unit-III First Law applied to flow processes: Steady state, steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes. (9Hrs)

SECTION - B

Unit-IV Second Law of thermodynamics: Limitations of Ist law, Thermal energy reservoir, heat engines refrigerator and heat pumps. Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, two propositions regarding the efficiency of Carnot cycles. The thermodynamic temperature scale. Reverse carnot cycle. COP of heat pump and refrigeration. Inequality of Clausius. (7 Hrs)

Unit-V Entropy: Entropy-a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, lost work. Principle of increase of entropy.

Availability and irreversibility:- Available energy referred to cycle, decrease in available energy with heat transfer through a finite temperature differences. The Helmhltz and Gibbs functions, Availability, Irreversibility and effectiveness. (8 Hrs)

UnitVI a) Air Standard Cycles: Ottto, diesel, semidiesel, sterling and joule cycles etc., their efficiencies and mean effective pressure.

b) Vapour Cycles:- Rankine and Modified Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram. (No numerical on this unit) (8 Hrs)

Books Recommended

Text Books

1. Engineering Thermodynamic - by P.K.Nag.
2. Thermodynamics Volume: I & II; R. Yadav;

Reference Books

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G.J.Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson

3ME05 MANUFACTURING PROCESSES-I

Section - A

Unit-I :- Introduction to manufacturing processes & classification; Introduction to pattern making- Pattern materials, pattern making tools, allowances, Types of patterns, functions of patterns, General properties of moulding sands, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making, core prints, core boxes. Sand casting Processes - Basic principle and Terminology of sand casting, gating system, types of gate, risers, etc. (9Hrs)

Unit-II:- Technology of melting and casting - Melting furnaces, crucibles, pit, open hearth, gas fired cupola, cupola operation and electric hearth furnaces, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace.

Defects in castings and its types, Causes and remedies of casting defects. Origin and classification of defects, shaping faults, Inclusion and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Inspection and testing of castings:- Radiography, ultrasonic, Eddy current testing, fluorescent penetrant test. (7 Hrs)

Unit III:- Casting processes and their principle of operation and applications permanent mold casting, slush casting, shell

molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipment and processes for Gravity, pressure and vacuum casting methods, cleaning of castings, Modernisation & Mechanisation of Foundries. (8 Hrs)

Section - B

Unit IV :- Mechanical working of metals: Principle of hot and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Shearing operations, tube drawing, wire drawing, spinning, embossing and coining, squeezing and bending operations, rotary swaging, Rolling, types of rolling mills, forging operations, upset forging. (8 Hrs)

Unit V:- Joining processes:- Mechanical joining processes, Mechanical fastening, riveting, soldering, brazing Welding, Types of welding processes-Arc welding: principle and working, Gas welding- principle and working Types and purpose of Electrodes, Electrode coatings(flux). TIG & MIG processes – Working principles and its applications, shielding gases, MIG-Spray transfer and dip transfer processes. (6 Hrs.)

Unit VI:- Submerged arc welding & resistance welding :- Heat generation in resistance welding, operational characteristics of resistance welding processes such as spot welding, projection welding, butt welding.

Principle of operation of friction welding, forge welding, plasma arc, thermit welding. Welding defects, Testing and Inspection of welds, Ultrasonic, Electroslag, Electron Beam, laser welding, weldability.

Surface Treatment-Electroplating, electroforming, and iodising, metal spraying, shot peening, polishing, mechanical cleaning. (9 Hrs)

Books Recommended

Text Books:-

1. Workshop Technology Vol. I by Bawa, Tata McGraw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

References:-

1. Workshop Technology Vol I by Raghuwanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A.Lindberg, PHI Pub 2001.

4. Foundry Technology by Goel Sinha.

3ME06 / 3PE06 MECHANICS OF MATERIAL-LAB. / STRENGTH OF MATERIALS-LAB.

Practicals:

Minimum Six to Eight out of following:

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Deflection of springs.

Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3ME07 FLUID POWER-I-LAB.

Practical Term Work:-

At least six practical's (study/Trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students.

1. Study of Manometers.
2. Measurement of fluid pressure by manometer.
3. Determination of metacentric height.
4. Verification of Bernoulli's equation.
5. Flow measurement by venturimeter.
6. Study of venturimeter.
7. Determination of Reynolds number.
8. Velocity distribution in Boundary layer & thickness of B.L.
9. Determination of co-efficient of friction for pipes.
10. Determination of head loss due to sudden enlargement.
11. Determination of head loss due to sudden contraction.
12. Determination of losses in bends.
13. Determination of losses in elbows.
14. Study of flow through pipes in series & parallel.
15. Verification of momentum equation.

Note :- Practical examination shall consist of oral or Experimentation based on above term work.

3ME08 MANUFACTURING PROCESSES-I –LAB.

Practice:-

1. Study of safety precautions in workshop practices.
2. Foundary:- Any two of the following jobs Sand preparation and practice in moulding of various types of patterns:- Pattern making 1 job, Moulding 1 job Casting 1 job.
3. Joining Processes:- 2 composite jobs involving electric welding, gas welding and resistance welding process.

A journal should be prepared and submitted on above term work.

The practical examination shall consist of a job preparation and college assessment should be based upon the jobs, termwork and viva examination.

SEMESTER : FOURTH

4ME01 /4PE01 BASIC ELECTRICAL DRIVES & CONTROL

Section-A

Unit I : Concept of general electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Introduction to mechatronics, Theory and principle of Power Transistor, SCR

Unit II : Basic characteristics of D.C. motor, Torque equation, Modified speed – Torque characteristics. Starting and braking of Electrical D.C. motors, comparison of mechanical and electrical braking methods. Introduction, Principle, construction and working of Servo motors, stepper motors, Brushless D.C. motors.

Unit III : Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phase Induction motors, applications. Starting and braking of 3 phase induction motors. Classification of single phase induction motors. construction, principle and working and applications. Principle and working of universal motor.

Section-B

Unit IV : Conventional methods of speed control of A.C. and D.C. motors. Thyristorized stator voltage control of 3 phase induction motor, (v/f) control method, slip-power recovery scheme. Thyristorized armature voltage control of D.C. motors using phase control & Thyristorized chopper.

Unit V : Basic principle, construction & applications of sensors and transducers, contact - non- contact type, optical proximity

sensors. Switches, contact type, magnet type, electromagnetic type, sound, light, pressure, vibration transducers, Hall effect-sensors A.C./D.C. Tachogenerators.

Unit VI: Industrial applications - classes of duty selection of an electric drive for particular applications such as steel mill, paper mill, cement mill, textile mill, sugar mill, electric traction, coal mining, etc. Induction heating, surface hardening & Dielectric heating.

Books Recommended

Text Books:-

1. A First Course on Electrical Drives - S.K. Pillai.
2. Basic Electrical Technology (Vol. 11) - B.L. Theraja

Reference Books :

1. Drives and Control - N. Dutta
2. Mechatronics - W.Bolton, Addison Wesley, Longman Ltd., 1997.
3. A Course in Electrical, Electronics Measurement and Instrumentation, By A.K.Sawhney, Dhanpat Rai & Sons, 2006

4ME02 ENGINEERING METALLURGY

Section - A

Unit I : - Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, lever rule for phase mixtures. Solidification of pure metals, nucleation and growth, ingot structure, dendritic solidification (8)

Unit II : Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Microstructure of slowly cooled steel, Estimation of carbon from microstructure, structure property relation, Introduction to composite materials, advantages and applications. (8)

Section-B

Unit IV : Cast irons **:** Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabalizing, Constitution and properties of white, gray, Nodular and Malleable cast irons, their applications, Alloy cast irons.

Non Ferrous Metals and Alloys : Types, Properties and uses of Brasses and Bronzes. Important alloys of

Aluminium, Lead, Tin and Zinc, their applications. Bearing materials, Season cracking, precipitation hardening. (8)

Unit V : Principles of Heat Treatment: - Annealing, Normalizing, Tempering Iso-thermal transformation diagrams(S-curve), super imposition of continuous cooling curves on 's' Curve, pearlite, bainite and martenste transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability. (8)

Unit VI : Methods of surface hardening: Carburizing, Nitriding, Cyaniding, Flame and Induction Hardening.

Mechanical working of Metals: - Hot and cold working, Relative advantages and disadvantages, study of stress strain curve, Luder's bands, Work hardening, strain Ageing; Recovery, Recrystallization and grain growth.

Metallurgical factors affecting various Mechanical working processes, preferred orientation, Deformation mechanisms-Slip& twining, critical resolved shear stress.

Powder Metallurgy: Concept, Methods of Manufacture of metal powders, compaction Process- Single die and double die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T. Advantages, limitations and applications of powder metallurgy. (8)

Book Recommended:-

Text Books:-

1. Introduction to physical metallurgy ;Sidney H Avner, TATA Mc-Graw hill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication

Reference Books:

1. Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Physical metallurgy for engineers, Clarke and Varney, second Edn.,1987.
3. Power metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallugrgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Meallurgy- C Daniel Yesudian, Scitech Publication

4ME03 ENERGY CONVERSION-I

Section - A

Unit I Properties of Steam: Triple point and critical point, Sensible heat, latent heat, superheat and total heat of steam. Wet steam, dryness fraction, Internal energy of steam, External work of evaporation, Specific volume, enthalpy, internal energy and entropy of steam. T-S diagram Mollier chart, Steam tables and their use. Work done and heat transfer during various thermodynamics processes with steam as working fluid. Throttling of steam, determination of dryness fraction using various calorimeters. (8 Hrs)

Unit II Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump. Boilers: Introduction to water tube boilers used in thermal power plants, packaged Boilers (fire tube), High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings and accessories—devices for improving Boiler efficiency. Principle of fluidized bed combustion. Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximum discharge, efficiency of chimney, reasons for draught loss. (7 Hrs)

Unit III FUEL & ASH HANDLING : Elementary treatment on coal, coal transportation from mine to site and site to boiler house. Fuel bed firing and suspension firing, Equipments of Mechanical grate firing, pulverised coal firing including crushers & pulverisers and burners. Oil handling system,and burner equipment,Elementary treatment on ash handling. Type of dust collectors and disposal of dust. Boiler performance:- Boiler rating, boiler power, equivalent evaporation, efficiency. Effect of accessories on boiler efficiancy and heat balance. (8 Hrs)

Section - B

Unit IV Steam power plant: General features, representation of Ranking cycle on phasediagrams. layout,site selection, concept of co-generation. CONDENSERS : Need,Types of condensers, quantity of cooling water required. Dalton's law of partial pressure, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance. Condensate pump and air extraction pumps, air enjectors Cooling water system: cooling ponds, spray tanks, cooling towers: Natural and mechanical wet type cooling tower. (7 Hrs)

UNIT V Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no

nunmerical on concept of super saturated flow & wilson line Steam Turbines:- Principle of working, Types of steam turbines such as impulse, reaction, axial & radial flow, back pressure & condensing turbines. Compounding. Reheat, regenerative cycles, bleeding. Analysis limited to two stages only. (7 Hrs)

UNIT VI Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blading. Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Height of turbine blades. LOSSES IN STEAM TURBINES:- Nozzle losses:- blade friction, partial admission, disc friction, gland leakage losses and velocity losses. Governing of steam turbines. (10 Hrs)

Recommended Books:

Text books

1. Thermal engineering; Mahesh M Rathore; Tata McGraw-Hill
2. Thermal Engineering R.Yadav; Central publication

Reference books:

1. Steam Turbine; Kearton; Oscar *Publications*
2. Thermal Power Engineering; Mathur Mehta; Tata McGraw-Hill
3. Power Plant Engineeirng; R.K.Rajput; Laxmi Publications
4. Thermal Engineering, P.L.Ballaney; Laxmi *Publications*

4ME04 MANUFACTURING PROCESSES -II

Section - A

UNIT I :- Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Cutting forces and power consumption, Machinability, Cutting fluids, Machine Tool classification. (8 Hrs)

UNIT II:- Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism, introduction to Automatic screwmachines & Single spindle and multi-spindle automat. (10 Hrs)

UNIT III:- a) Drilling M/cs general purpose, Mass production and special purpose drilling M/cs.

b) Boring M/c :- Horizontal, Vertical and jig Boring M/c.

c) Introduction to Broaching and its types, reaming operation. (8 Hrs)

Section - B

UNIT IV:- a) Milling M/c :- Types, Types of Milling Cutters, Dividing head, Compound and differential indexing.

b) Gear producing M/cs.

c) Study of various parts and operations of power hack saw. (6 Hrs)

UNIT V :- a) Grinding Machines: Bench grinders, surface grinders, centreles grinders, types of bonds & Abrasive modification of grinding wheels.

b) Study of various part & Operation of Shaper, Planer, Sloter. (6 Hrs)

UNIT VI:- Unconventional Machining Processes:-

a) Mechanical Processes:- Ultrasonic Machining - principle and applications. process parameters; Abrasive and water parameters involved.

b) Thermal processes:- Election Beam Machining – Generation of beam, principle and applications : Laser Beam machining applications : Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications.

c) Electro Chemical Machining- Classification, fundamentals: Electro mechanical milling.

d) Electric discharge Machining - Types dis-sie-onking, wire EDM, Mechanism of material removal, process parameters, advantages and applications. (8 Hrs)

Books Recomonded:

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.
2. Workshop Technology - By Hajra Choudhaury Vol II.

References:-

1. Pandya & Shah, Modern Machining process, Tata McGraw Hill 1998.
2. Workshop Technology, O.P. Khanna, Dhanpatrai & Sons.
3. Workshop Technology - By Raghuwanshi. Vol II.

4ME05 MACHINE DESIGN & DRAWING-I

Section - A

Unit I- a) Sectional Views

Conversion of pictorial view in to sectional orthographic projections, Sectional views with different types of projections, Missing views (12 Hrs)

Unit II- a) Development of surfaces

Development of surfaces of cubes, prisms, cylinders, pyramids, cones & their cut sections

b) Intersection of solids-prism and prism, cylinder and cylinder, cylinder and prism, cone and cylin-der, cone and prism. (12 Hrs)

Section B

Unit III- a) Meaning of Design, Phases of Design, Design considerations

b) Simple stresses, Thermal stresses, Torsional Stress, stresses in straight & curved beams and its application- hooks, c-clamps

c) Design & drawing of riveted joints- Caulking & fullering, failures, strength & efficiency of riveted joints.

d) Welded joints- Symbolic representation, Strength of transverse & parallel fillet welded section

e) Design & drawing of Knuckle Joints (12 hrs)

Unit IV-a) Design of Helical springs- Types of springs, stresses in helical springs, Wahl's stress factor, Buckling & surge, tension spring

b) spiral & leaf springs

c) Design of power screw-Torque required to raise loads, efficiency & helix angle, overhauling & self locking of screw, acme threads, stresses in power screw. (12 hrs)

Books Recommended

Text Books :

1) Machine Drawing by N. D. Bhatt, Charator Publication
2) Machine Design by R. S. Khurmi & J. K. Gupta , S. Chand Publication

Reference Books :

1) Machine Design by Dr. P. C. Sharma & Dr. D. K. Agrawal, Katsons Books publication
2) Design of Machine elements by C. S. Sharma, Kamlesh Purohit, PHI publication
3) Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publication
4) Machine Design, Jindal, Pearson publications
5) Design Data Book by- P.S.G. Koimbatore
6) Design Data Book by Mahadevan,

(Use of any data book from the above will be permitted during the examination).

4ME06 / 4PE06 BASIC ELECTRICAL DRIVES & CONTROL-LAB.

List of Experiments

Any eight practicals from the following list:

1. To study the Specification of Various Electrical Machines.
2. To study the D.C. Motor Starters.
3. To study the Running and Reversing of D.C. Motor.
4. Speed Measurements using Magnetic Pick-up.
5. To study the Speed reversal of counter Current Breaking of 3-phase Induction Motor.
6. To control the speed of D.C. Motor by a) Armature Control b) Field Control.
7. To perform Load Test on Induction Motor.
8. To study Dynamic/Rheostatic Breaking of D.C. Motor.
9. To study Characteristics of Thyristor.
10. To study the speed -Torque Characteristic of Servo Motor.

4ME07 ENGINEERING METALLURGY-LAB.

List of Practicals: - (At least eight practicals out of the following list.)

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.
3. Moulding of specimen for micro-examination.
4. Study of micro structures of Annealed and normalized plain carbon steels.
5. Study of micro structures of alloy steels and H.S.S.
6. Study of micro structures of various cast irons.
7. Study of micro structures of non ferrous metals.(brasses, bronzes)
8. Study of micro structures of hardened and tempered steels.
9. Study of Iron carbon Equilibrium diagram & Allotropic forms of iron.
10. Study different Heat Treatment Process for steel.
11. Study of different surface Hardening processes for steels.
12. Study of effect of alloying elements on the properties of steels.
13. Measurement of hardenability by Jominy end quench test apparatus.
14. Study of hardness tester and conversion of Hardness number
15. Industrial visit to study heat treatment plant.
16. Measurement of particle size, grain size, nodularity, coating thickness etc. by using some software like Metzer Microcam 4.0

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

4ME08 ENERGY CONVERSION–I-LAB.

Practical Term Work:-

At least six practicals (Study/trials) based on above syllabus, as given below shall be included in the report by the students.

1. Study of a water tube boiler (Babcock Wilcox boiler)
2. Study of a locomotive boiler.
3. Study of a high pressure boiler.
4. Study of boiler accessories.
5. Trial on a boiler and heat balance sheet.
6. Study of boiler mountings.
7. Study and trial on a steam turbine.
8. Study of condensers.
9. Study of condensate and air extraction pumps.
10. Study of steam power plant.

Practical Examination:- Shall consist of based on above term work and syllabus.

4ME09 MANUFACTURING PROCESSES–II-LAB.

Practicals:-

1. Demonstration of operations related to lathe, shaper, slotter, drilling & grinding m/cs.
2. One job on lathe covering taper turning and threading.
3. One job on shaping covering plane and inclined surfaces.
4. One job on milling machine.

The above jobs should include drilling, grinding, tapping etc.

Term work should be submitted in the form of journal.

N.B. :- The practical examination shall consists of preparation of practical jobs and assessment by external and internal examiner.

4ME10 MACHINE DESIGN & DRAWING-I-LAB.

List of Practical's

Any Six of the following

1) Sectional views & missing views of objects
2) Development of surfaces
3) Intersection of Solids
4) Conventions for various components like bearing, gears, springs, key & key ways, threads, tap holes and materials, Surface roughness etc
5) Design & Drawing of cotter joint
6) Design & drawing of screw jack
7) Design & drawing of flywheel
8) Design & drawing of helical spring

Any one practical from the above list should be done using software.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL ENGINEERING
(ELECTRONICS & POWER) /
ELECTRICAL & ELECTRONICS ENGINEERING /
ELECTRICAL ENGINEERING
(ELECTRICAL & POWER) /
ELECTRICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER

SEMESTER : THIRD

BRANCH ABBRIVIATIONS **:-**
EP : Electrical Engg. (Electronics & Power)
EX : Electrical & Electronics Engg.
EL : Electrical Engg. (Electrical & Power)
EE : Electrical Engg.

3 EP01/3EX01/3EL01/3EE 01 MATHEMATICS-III

SECTION-A

UNIT-I : Ordinary differential equations:- Completer solution, Operator D,Rules for finding complementary function, the inverse oprator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. Simultaneous linear differential equations with constant co-efficient, Applications to electrical circuits.

UNIT-II : Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function.

UNIT-III : a) Application of L.T. to linear differential equations with constant coefficients & Simultaneous linear differential equations.

b) Fourier transforms- Definition, standard forms, inverse Fourier transform, Properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

SECTION-B

UNIT-IV : a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients.

b) Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

UNIT-V : Vector calculus: Scalar and vector point functions, Differentiation of vectors, Curves in space,Gradient of a scalar point function, and their physical meaning, expansion formulae (without proof).

UNIT-VI : Line,surface,volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof).

BOOKS RECOMMENDED:-

1) Advanced Engineering Mathematics, 3 edi – Potter, Oxford University Press, 2008
2) Mathematical Techniques – Jordan and Smith 4/e – Oxford University Press, 2008
3) A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
4) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
5) Advancing Engg. Mathematics by E.K.Kreyzig.

3 EP02/3EX02/3EL02/3EE 02 NETWORK ANALYSIS

SECTION-A

Unit I : a] **Terminal Element Relationships:** V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] **Basic Nodal and mesh Analysis:** Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : **Network Theorems :** Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliman's theorem, Substitution

theorem, Compensation theorem, Tellegen's theorems

Unit III : **Time Domain Analysis of Circuits:** Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] **Review of Laplace Transforms:** Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. ***(Review to be done by students. No class hour will be spent for this review.)***

b] **Transformation of a Circuit into s-domain:** Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] **Sinusoidal Steady State analysis: Intro**duction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] **Fourier Series:** Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : **Two Port Networks:** two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero

plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis 6/e By Hayt & Kemmerly TataMcgraw Hill 2004
2) Network Analysis, By M.E. Van Valkenberg PHI 2005
3) Electrical Linear Circuits – David Bell Oxford University Press 2008
4) Linear Circuit Analysis 2/e – DeCarlo and Lin Oxford University Press 2009
5) Network Analysis, P.Ramesh babu, SCITECH Publications,Chennai 2009
6) Circuit and Network Analysis By Sudhakar Shyammohan Tata Mc Graw Hill 2005
7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010

3 EP03/3EX03/3EL03/3EE 03 ENERGY RESOURCES AND GENERATION

SECTION A

Unit I : **Thermal and Hydro Power plant:** Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Unit II : **Nuclear and Diesel Power plant**: Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant

Unit III : **Solar Energy and its measurement**: Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency

SECTION B

Unit IV : a] **Fuel cells:** Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system

b] **Wind Energy**: Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy

storage, application of wind energy.

Unit V : **Ocean and tidal energy:** Ocean energy resources, ocean energy routes, ocean thermal energy conversion, progressive wave, wave data collection, Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in simple single basin tidal system

Unit VI : **Other non- conventional energy resources:** Operating principle of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation, principle and operation of fuel cells, classification and types of fuel cells, performance characteristics of fuel cells.

Books Recommended :-

1) Energy Science, Principles Technologies & Impacts, John Andrews & Nick Jelley, Oxford University Press, 2009
2) Renewable Energy – Power for Sustainable Future, Godfrey Boyle, Oxford University Press, 2004
3) Conventional Energy Technology By S.B.Pandya, Tata McGrawHill, 2005
4) Non Conventional Energy Resources By G.D.Rai, Khanna Publishers, 2001
5) Energy and Atmosphere By I.M.Campbell, Wiley, New York, 2006
6) Solar Energy By S.P.Sukhatme, Tata Mc-GrawHill, 2006
7) Conventional Energy Resourses By B.H.Khan, Tata McGrawHill, 2003.

3 EP04/3EX04/3EL04/3EE 04 ELECTRONIC DEVICES AND CIRCUITS

SECTION-A

UNIT-I : P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge rectifier. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II : Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-III Study of typical transistor amplifier circuits

i) Emitter follower,
ii) Darlington emitter follower.
iii) Bootstrap emitter follower,
iv) RC coupled amplifier,

v) Transformer coupled amplifier,
vi) Cascaded amplifier,
vii) Direct coupled amplifier,
viii) Cascade stage.

SECTION-B

UNIT-IV : Class 'A' 'B' 'AB' and 'C' amplifiers, configuration of audio amplifiers, Calculations of power gain, efficiency, dissipation and distortion, oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V : Theory, construction and applications of Schottky diode,Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI : FETs (JFET & MOSFET) : Types, Characteristics and parameters (u, gm & Rds),Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

BOOKS RECOMMENDED:

1) Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011
2) Electronic Devices and Circuits 5/e – David Bell Oxford University Press
3) Microelectronic Circuits 5/3 – Sedra nad Smith Oxford University Press
4) Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3 EP05/3EX05/3EL05/3EE 05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

SECTION A

Unit I : **Measuring Instruments**: Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electro dynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type.

Unit II : **Watt meters & Energy meters**: Electro dynamic & Induction type: construction, theory of operation, torque equation, errors & demerits, Electronic energy meter.

Analysis of three phase balanced load, Blondel's Theorem, Measurement of active & reactive power & energy in single phase & three phase circuits.

Unit III : a] **Instrument Transformer**: Need of extension of range: extension using shunt & multipliers Instrument transformers:

CT & PT, Theory & construction, Phasor diagram, Ratio & Phase angle error, causes of error, applications Hall effect sensors for voltage and current measurement.

b] **Special Measuring Instruments** :- Maximum demand indicator, Trivector meter, Frequency meter, P.F. meter, Phase sequence indicator, Synchroscope, stroboscope, potentiometers.

SECTION B

Unit IV : **Measurement of circuit parameters**: Different methods of measurement of low, medium & high value of resistance, sensitivity & accuracy of different methods.

AC & DC bridges : Wheatstone, Kelvin, Maxwell, Wein, Hay, Desauty, Anderson, Schearing

Unit V : **Generalized instrumentation system** , characteristics of measurement & instrumentation system Transducers : Definition, classification, specification, selection & loading effect, Displacement, Velocity, force, & Torque transducers, Resistive, Inductive, capacitive, Strain gauge, Piezoelectric, current & voltage transducers.

Unit VI : **Transducers for pressure & temperature**: Manometer, Elastic members (Bellows, Bourdon tube, Diaphragm), RTD, Thermocouple, Thermister, Infrared & Crystal Cathode ray oscilloscope: Time, frequency & phase angle measurement using CRO. Spectrum & Wave analyzer.

Books Recommended

1) Electronic Measurement & Instrumentation by Oliver – cage, TMH 4th reprint 2010
2) Electronic Instrumentation by H.S Kalsi, TMH 3rd edition, 2nd reprint 2011
3) Instrumentation for scientists and Engineers – Turner Oxford University Press 2008
4) Electronic Instrumentation & Measurement , David Bell Oxford University Press 2nd Ed
5) A course in Electrical, Electronics measurement and Instrumentation, By A.K.Sawhney Dhanpat Rai & sons 2006
6) Electrical measurement and measuring Instruments By Golding Wheeler Publishing 2003
7) Electronic measurement and measuring Instruments By Coo.

3 EP06/3EX06/3EL06/3EE 06 NETWORK ANALYSIS LAB

Any TEN experiments based on contents of 3 EP02/3EX02/ 3EL02/3EE 02 NETWORK ANALYSIS

3 EP07/3EX07/3EL07/3EE 07 ELECTRONIC DEVICES AND CIRCUITS LAB

Any TEN experiments based on contents of 3 EP04/3EX04/ 3EL04/3EE 04 ELECTRONIC DEVICES AND CIRCUITS

3 EP08/3EX08/3EL08/3EE 08 ELECTRICAL MEASUREMENT AND INSTRUMENTATION LAB

Any TEN experiments based on contents of 3 EP05/3EX05/ 3EL05/3EE 05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

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SEMESTER : FOURTH

4EP01/4EX01/4EL01/4EE 01 ELECTRICAL MACHINES-I

SECTION A

Unit I : **D.C. Machines**

Construction, principle of operation, Emf equation, torque equation. Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation.

Unit II : **D.C. Generators.**

Types, characteristics and applications of d.c. shunt, series and compound generators.

Parallel operation of d.c. shunt, series and compound generators. Introduction for conducting and reporting the test on d.c. machines as per Indian standard.

Unit III: **D.C. Motors**

Characteristics, applications of d.c. shunt, series and compound motors, starting and speed control, losses, efficiency and testing.

SECTION-B

Unit IV: **Single phase Transformer.**

Heat run test, separation of core losses in to its component, parallel operation, equivalent circuit. Autotransformer - construction, working, merits, demerits and application.

Introduction for conducting and reporting the test on transformer as per Indian standard.

Unit V: **Three phase Transformer:**

Construction, working, types, connections, applications, testing, parallel operation, open delta, power transformer, distribution transformer construction.

Unit VI: Three phase to single phase, two phase, six phase, twelve phase conversion. Three-winding transformer and tap

changing transformer. Wave forms of no-load current and inrush current phenomenon.

Books Recommended

Electrical Machines by D.P.Kothari, I.J.nagrath TMH 4th edition, 2nd reprint 2011

ELECTRIC MACHINERY and Transformer, 3E – Bhag S Guru Oxford University Press

Advance Electrical Technology By H.Cooton. 1999

Substation Equipment By Satnam and Gupta 2003 .

4EP02/4EX02/4EL02/4EE 02 ELECTROMAGNETIC THEORY

SECTION A

Unit I : Review of Vector Analysis :cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculas. Line integral and multiple integrals. Gauss theorem.

Unit II : Electrostatics : Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III: Electrostatics fields in dielectrics : electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

SECTION-B

Unit IV: Magnetic fields : Biot-Stewart law, Ampere's law in integral and differential form. Contunuity equation, time of relaxation. Vector and Scaler magnetic potential, electric current, J vector.

Unit V : Magnetic fields in materials : magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI: Maxwell equations and wave equations : Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration poynting vector.

Books Recommended

1) Engineering Electromagnetics by W.H.Hayt, J.A.Buck, TMH 7th edition 2010

2) Foundation of Electromagnetic Theory, John Reitz, F.J.Milford, R.W.Christy, Pearson education, 4th edition 2010

3) Elements of Engineering Electromagnetics, Nannapaneni Narayana Rao, Pearson education, 2006

4) Principles of Electromagnetics 4/e Mathew Sadiku Oxford University Press

5) Field Theory, D. Ganesh rao, C.K.Narayanapa PEARSON education ,2010

4EP03/4EL03/4EE 03 ANALOG AND DIGITAL CIRCUITS

SECTION-A

Unit I : Introduction to IC's : Characteristics of IC components, Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amo, Measurement of op-amp parameter.

Unit II : Linear and Non-linear Application of Op-amp:- Inverting and noninverting amplifiers, voltage follower, integrator, differentiator differential amplifier, Sinusoidal RC-phaseshift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps. Astable, bistable and monostable multi vibrator using op-amps.

Unit III : Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78 **, 79 ** and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, astable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

SECTION-B

Unit IV : Basic Logic Circuits : Logic gate characteristics, NMOS invertor, propagation delay, NMOS logic gate, CMOS invertor, CMOS logic gates, BJT invertor, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V : Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder, ROM, Two dimensional addressing of ROM,ROM applications, PROM,EPROM,PAL AND PLAS.

Unit VI : Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters, Dynamic MOS shift registers, RAM, Bipolar RAM Cells.

BOOKS:-

1. Millman, Microelectronics, 2nd Ed., McGraw Hill.
2. Gayakwad, Op-Amp & LLG, 2nd Ed.
3. Malvino & Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.

4. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EP04/4EL04/4EE 04 MATHEMATICS-IV

SECTION-A

Unit I : a) Complex variables : analytic functions, Cauchy-Riemann conditions. Harmonic function, Harmonic conjugate functions, Milne's method.

b) Confirmed mapping : mapping by elementary functions of the type $W=z+c$, $W=cz$, $W=1/z$, $W=z^2$, $W=e^2$, $W=z+1/z$ and bilinear transformation. (10 Hrs.)

Unit II : Complex Integral : singular points, Taylor's series, Laurent's series, Cauchy's integral theorem and Cauchy's integral formula.

Residue : Cauchy's residue theorem. Contour integrals. Integration forms : f(x) dx, f (sinx, cos x) dx (10 Hrs.)

Unit III: Patial differential equations : first order and first degree p.d. equation type.

(i) f (p, q) = 0, (ii) f (p, q, z) = 0, (iii) f (p, q, x, y) = 0 (iv) f (p, q, x, y, z) = 0 etc.

Lagrange's form Pp + Qq = R. Clarinet's form Z = px + qv + f (p, q).

Equation reducible to standard form. Homogeneous P.D.E. of nth order. (10 Hrs.)

SECTION-B

Unit IV: Special functions : solution of Legendre's and Bessel's equations by Frobensious method, Bessel's function Ist kind generating function, recurrence relating values of $J_{1/2\,(x)}$, $J_{-1/2(x)}$, $J_{3/2\,(x)}$ etc.Legendre's function of Ist kind : generating function, Rodrigues function, recurrence relation, Legendre's polynomials and orthogonal properties. (10 Hrs.)

Unit V : Statistics & Probability : Axioms, conditional probability, Bay'e theorem, mathematical expectations, probability distributions : Binomial, Possion and Normal. (10 Hrs.)

Unit VI: a) Curve fittings by method of Least Squares. Correlation and regression.

b) Matrix differential equation : solution and integrated solution, Sylvester's theorem, solution of differential equations by matrix method and Peano Baker method. (10 Hrs.)

BOOKS RECOMMENDED :

1) Pipes : Mathematics for Engineers and Physicist.
2) P.N. Wartikar and J.N.Wartikar : A Text Book of Applied Mathematics.
3) B.S.Grewal : Advance Engineering Mathematics.

4) S.G.Gupta : Statistical Methods.
5) Speigal : Statistics (Schaum's series)
6) Speigal : Complexva (Schaum's series)

4EP05/4EX05/4EL05/4EE 05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION A

Unit I : Solution of Algebraic & Transcendental equations : Floating point number representation, errors, accuracy, stability of algorithms. Bracketing methods : bisection method and False Position method.

Open methods : Newton-Raphson method, Secant method and Successive Approximation method.

Comparison of different iterative methods. Implementation of these methods in C.

Unit II : Solution of Simultaneous Algebraic equations : Iterative methods : Jacobi's method and Gauss-Seidel method. Direct methods : Gaussian elimination method & Matrix Inverse method. Finding Eigen values of a matirx, determination of largest Eigen value. Implementation of these methods in C.

Unit III : Interpolation : Evenly spaced points : formation of forward & backward difference table, Newton's forward & backward difference interpolation formulae. Unevenly spaced points : divided difference table and Newton's divided difference interpolation formula, Lagrange's method. Interpolation with Cubic splines. Implementation of these methods in C.

SECTION-B

Unit IV : Numerical Differentiation and Integration : Numerical differentiation : Taylor's series method, Richardson extrapolation method, numerical differentiation using interpolation polynomial (first & second derivative near the begining & end of the table). Numerical Integration : Trapezoidal Rule, Simpson's Rules, Romberg method, Gaussian quadrature method. Implementation of these methods in C.

Unit V : Solution of ordinary differential equations : Initial value problem : Taylor's series method, Runge-Kutta methods - second & fourth order, Euler's method, Euler's modified method. Solution of simultaneous & higher order differential equations using Runge-Kutta fourth order method. Stiff differential equations and their solutions. Boundary value problem : Finite difference method and Cubic spline method. Implementation of these methods in C.

Unit VI : Principles of Object Oriented Programming : OOP paradigm, basic concepts of OOP, benefits of OOP, basic data types, users defined data types, derived data types, operators and control statements.

Books Recommended

1) Numerical Methods with Programms in C by T.Veerarajan, T.Ramachandran TMH 2nd edition, 6th reprint 2011
2) Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford University Press , 2008
3) Numerical Methods for Engineers and Scientists – Guha Oxfor University Press 2008
4) Computer Fundamentals and Programming in C – Dey and Ghosh Oxford University Press 2008
5) Chapra S.S. & Canale R.P. : Numerical Methods for Engineers, 4th edition, McGraw Hill.
6) Balguruswami E. : Object Oriented Programming with C++, Tata McGraw Hill, New Delhi.
7) Nakamura S. : Applied Numerical Methods in C, Prentice Hall.
8) Faires & Burden : Numerical Methods, 7th edition, Thomson Learning.

4EP06/4EX06/4EL06/4EE 06 ELECTRICAL MACHINES I LAB

Any TEN experiments based on contents of 4EP01/4EX01/ 4EL01/4EE 01 ELECTRICAL MACHINES-I

4EP07/4EL07/4EE 07 ANALOG AND DIGITAL CIRCUITS LAB

Any TEN experiments based on contents of 4EP03/4EL03/ 4EE 03 ANALOG AND DIGITAL CIRCUITS

4EP08/4EX08/4EL08/4EE 08 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Any TEN experiments based on contents of 4EP05/4EX05/ 4EL05/4EE 05

NUMERICAL METHODS AND COMPUTER PROGRAMMING

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. to i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)

SEMESTER : FOURTH

BRANCH ABBRIVIATION :-
EX : Electrical & Electronics Engg.

4EX03 LINEAR INTEGRATED CIRCUITS

SECTION A

Unit I : **Op-amp Fundamentals:** Differential amplifiers, ac and dc analysis of differential amplifiers, review of operation amplifier- block diagram representation, basic configurations, ideal op-amp, negative feedback, non – ideal closed loop characteristics.

Unit II : **Basic op-amp Circuits:** voltage follower, sign changer, adder, subtractor etc, I to V and V to I converters, current amplifiers, difference amplifiers, instrumentation amplifiers and their applications, transducer bridge amplifier.

Uniy III : **Op-amp Parameters:** Input bias and offset current, input offset voltage, input offset error compensation, slew rate, common mode rejection ratio etc, frequency response, input and output impedance, operation limits, compensated and uncompensated op-amps, compensation techniques.

SECTION B

Unit IV : **Non-linear Circuit Applications:** Voltage comparator and its applications, Schmitt trigger and its application, precision rectifiers, limiters, analog switches, peak detectors, sample and hold circuits, integrator and differentiator, log/antilog amplifiers, practical log/antilog circuits, analog multipliers, opamp as phase detector, op-amp electronic thermometers.

Unit V : **Active Filters:** Classification, transfer function, butter worth filters. low pass, high pass, band pass, band stop, notch and all pass.

Unit VI : a] Timer: IC 555, functional diagram, monostable and astable multivibrator.

b] **Voltage regulators:** Series op-amp regulators, IC voltage regulators, switching regulators etc, IC 723.

Text Books

1) Op-amps and Linear Integrated Circuits Technology, R.A.Gaikwad,

PHI publication, 1999

2) Design of Operational Amplifier and Analog Integrated Circuits, S.Franco TMH Publication, 2002

References

1) Linear Integrated Circuits, D.Roy Chaudhari ,New Age International Publisher, 2005

2) Operational Amplifiers & Linear ICs by David A.Bell , Oxford University Press,2011

4EX04 SIGNALS AND SYSTEMS

SECTION A

Unit I : **Introduction to Signals and Systems:** Signals and Systems, Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Time Domain and Frequency Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit II : **Fourier series and Its Properties** Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III : **Analysis of LTI Discrete-Time Systems:** Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

SECTION B

Unit IV : **Sampling:** Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit V : **The Z Transform:** The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI : **Discrete Fourier Transform and Fast Fourier Transform**

Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Books Recommended

1) Principles of Linear Systems and Signals, 2e (international version) – Lathi B. P. Oxford University Press

2) Signals & Syatems, Smarajit Ghosh, PEARSON education, 2006

3) Signals & Syatems,D Ganesh rao, satish Tunga, PEARSON education 2010

4) Principles of Signal Processing & Linear Systems (international version) Lathi B P. Oxford University Press

5) Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999

6) Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005

7) Signals and systems, Oppenheim and Schafer Prentice Hall India Of India 2nd Edition 1997

4EX07 LINEAR INTEGRATED CIRCUITS LAB.

Any TEN experiments based on contents of 4EX03 LINEAR INTEGRATED CIRCUITS

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

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SYLLABUS
PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
ELECTRONICS & TELECOMMUNICATION /
ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: THIRD

3 XT 01 / 3 XN 01 MATHEMATICS-III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D,Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's an Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform,initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity,shifting,multiplication by k,change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms,inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Prtial differential equation of first order of following form-

(i) f(p,q)=0; (ii)f(p,q,z)=0; (iii) f(x,p)=g (y,q); (iv)Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Comples Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation,magnification,inversion and bilinear transformation),singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT -VI Vector calculas:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals,irrotational and solenoidal vetor fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A text book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika Prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral Transforms by Goyal & Gupta.

3XT02 /3XN02 COMPUTER PROGRAMMING AND APPLICATIONS

SECTION-A

Unit I : Principles of object oriented Programming: OOP'S paradigm, basic concept of OOP'S Benefits of OOP'S, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++: Functions, Function over loading, Friend Functions, types of classes and its use, concept of object and its implementation, constructor and destructors.

Unit III: Operator's overloading:

Operator and their definition,overloading unary and binary opeator, Rules for overloading operators, overloading binary operators using friends and string manupalation.

SECTION-B

Unit IV : Inheritance and Polymorphism:

Defining derived classes, single and multiple inheritance,

multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual function.

Unit V : Solution of Nonlinear and Polynomial Equations:

False position, modified false position, secant, Newton Raphson Method.

Solution of Linear Systems of Equations: Gauss elimination method, L.U. factorization method, Gauss seidel iterative method.

Unit VI: Solution of differential equation: Euler's method, Runge Kutta method, Predictor Corrector method.

Numerical Integration: Trapezoidal rule, Sympson's 1/3 and 3/8 th rules.

Finite differences: Newton forward and backward interpolation formula.

Textbooks:

1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata - Graw Hill publishing Co.Ltd., New Delhi,1995.

2) Introduction to method of Numerical Analysis- S. S. Shastry, Second Edition, PHI Pvt. Ltd., New Delhi.

Reference Books:

1) Object Oriented Programming in Turbo C++ Rober Lofore Galgotia Publications Pvt.Ltd., New Delhi,1995

2) The C++ Programming Language (Third Edition) Bjarne Stroustrup Pub.Co.,New York,1995 (AddisonWesley)

3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesely Pub. Company,1995

4) Computer Oriented Numerical Methods:-V. Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.

5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI publication.

3XT03 /3XN03 ELECTROMAGNETIC FIELDS

SECTION-A

Unit I: Review of Vector Analysis:

Cartesian, cylindrical and spherical co-ordinate systems, vector products, Projection of Vectors, Gradient, Divergence & Curl, Stokes & divergence theorem. (08)

Unit II: Electrostatics:

Coulomb's law, Electric field intensity, Evaluation of electric field intensity due to line charge, surface charge & volume charge distribution, Electric flux density, Gauss Law,

Electrostatics potential, Potential gradient, Electric dipole & Polarization . (08)

Unit III: Magneto statics: Amper's law of forces, Biot-Savart's law, Ampere's law in integral and differential form., Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux & flux density, Magnetic dipole moment, Magnetization. (08)

SECTION-B

Unit IV: Boundary conditions & Maxwell's equations:

Boundary condition of dielectric-dielctric interface, dielectric-conductor interface, boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equation for steady & time varying fields. (08)

Unit V: Electromagnetic wave propagation:

Electromagnetic wave equation for free space, lossy dielectrics, perfect conductors, propagation constant, attenuation constant, phase shift constant, Skin depth, Concept of power flow, Poynting Theorem, , Reflection of a plain wave in a normal incidence at dielectric-dielectric interface, dielectric-conductor interface. (10)

Unit V: Radiation:

Magnetic scalar and vector potential, retarded potential, Electric & Magnetic fields Power radiated & radiation resistance, due to oscillating dipole, quarter wave monopole & half wave dipole. (08)

Text Books:

1) Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill

2) Jordan E.C. and Balamin K.C.: "Electromagnetic Waves and Radiating System " Prentice Hall of India Private Limited (Second Edition)

Reference Books:

1) Mathew N.O.Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press

2) Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)

3) Ramo S. and Whinnery R.: " Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.

3XT04/3XN04 ELECTRIC DRIVES & MEASUREMENTS

SECTION- 'A'

Unit-I : Measurement of resistance: Kelvin Double Bridge, Loss of charge method and megger. Measurement of Inductance and Capacitance: Maxwell's bridge, Hay's bridge, Anderson's bridge, Schering bridge,D Sautys Bridge and Carey Foster

bridge. Measurement of Q factor and tan ¢.

Unit-II : Measurement of active and reactive power in 3-phase balanced and unbalanced load. Electrodynamometer type power factor meter, frequency meter. Watt meter, Digital Energy Meter

Unit-III : D.C.Motors: Electrical and mechanical characteristics of motor,Speed control methods for constant torque and constant horse power. Application of D.C.motors. Braking-resistance, plugging and regenerative braking

SECTION- 'B'

Unit-IV : Inducation Motors: Characteristics, Speed control methods: Armature voltage, V/f control, rotor control, slip power recovery scheme and applications, plugging, Resistance braking, Regenarative Braking.

Eddy current coupling and its application.

Unit-V : Transformers: 3 phase ?transformers, rectifier transformers, pulse transformers. Open delta connection, Scott connection, Ferrite core transformer.

Unit-VI : Construction, principle of operation, characteristics and applications of : Tachogenerator, (DC & AC), Stepper motor, A.C.Servo motor 1 Phase ?induction motors and Universal motor.

TEXT BOOKS:

i) M.V.Deshpande:- Elements of Electrical Machines.

ii) A.K.Sawhney:- Electrical and Electronic Measurement and Instrumentation.

REFERENCE BOOKS:

i) E.W.Golding:- Electrical measurement and measuring Instrument, ELBS Pub.

ii) First Course on Electrical Drives-S.K.Pillai

iii) B.L.Theraja VOL II :- Electrical Engineering.

3XT05/3XN05 ELECTRONICS DEVICES AND COMPONENTS

SECTION A

Unit I : Construction, selection and failures of

- Resistors: Fixed type, Variable Type , Network and Chip type
- Capacitors: fixed and variable Type

Unit II

- Switches & Relays: Types, Construction and Testing
- Fuses, Cables and Connectors: Types, Construction, Specification and Application
- Introduction to Heat sink, Choke and Transformer

Unit III : Basics of Electronic Component layout, PCB material, Properties and specifications, Basic manufacturing process of PCB , Soldering and De-soldering Techniques.

SECTION B

Unit IV : P-N Junction diode theory- V-I Characteristics, Temperature dependency, Diode Resistance, Zener diode : characteristics, Avalanche & Zener breakdown, Testing of diode using Ohmmeter and CRO

Unit V: Theory, Construction, Characteristics and application of Tunnel, Varactor, Shottkey diode Opto-Devices: LED, Photo Diode, LCD

Unit VI : Theory of PNP and NPN Transistor, Transistor Configurations, Their Characteristics and current Components. Transistor as an amplifier, Testing of Transistor using Ohmmeter and CRO

Text Books:

1. Maduri Joshi, " Electronic Component and Material" 3rd Edition, Shroff Publication
2. Millman H Halkies, " Integrated Electronics" TMH Co. New Delhi

References:

1. Bosshart, " Printed Circuit Board" TMH
2. David Bell' " Electronic Devices and Circuits" Oxford University Press, 2010
3. Boylestad R, "Electronic Devices and Circuits" Prentice Hall of India Pvt. Ltd. New Delhi.

3XT06/3XN06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Minimum Eight experiments based on the 3XT2/3XN2 out of which at least four experiments should based on the last two Units.

3XT07/3XN07 ELECTRIC DRIVES & MEASUREMENTS-LAB.

Minimum Eight experiments based on **3XT4/3XN4**.

3XT08/3XN08 ELECTRONICS DEVICES AND COMPONENTS-LAB.

Minimum eight Practicals Should be conducted based on the **3XT5/3XN5**. (atleast one on PCB)

SEMESTER : FOURTH

4XT01/4XN01 COMMUNICATION ENGINEERING-I

SECTION-A

Unit I Signal and Noise : Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic, Frequency response, bandwidth, bandwidth requirement for different types of signals such as telephone speech, music and video. External and Internal noise, signal to noise ratio, noise figure, noise factor measurement, equivalent noise Temperature, Friiss formula. (6)

Unit II Signal Analysis : Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density, Correlation: Auto-correlation, Cross-correlation. (9)

Unit III Probability and Random Signal Theory : Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions, Ergodicity, Gaussian Process, White Gaussian Noise. (8)

SECTION-B

Unit IV Wave Propagation : Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading, single hop and multi hop propagation, duct propagation. (7)

Unit V RF Transmission Lines : Parallel and coaxial transmission line, equivalent circuit of transmission line, standing wave, characteristic(shunt) impedance, quarter wave and half wave length transform, Smith chart, Single stub (shunt) matching using smith chart, balun. (8)

Unit VI Antenna Basics & Types of Antenna : Principle of radiation, antenna power gain, beam width, polarization, bandwidth and radiation resistance, Isotropic radiator, Resonant antenna: Half wave, Folded dipole antenna, Non resonant antenna, antenna arrays, parasitic reflector, parasitic director, design of yagi-uda antenna (up to 5 elements) Long, wire, helical, rhombic, discone, log periodic, loop antenna, low, medium and high frequency antenna. (10)

Text books:-

(1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(2) Simon Haykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

Reference books

(1) Collins Dennis,Collins John "Electronic Communications" (PHI)

(2) B. P. Lathi : " Modern Digital and Analog Communication systems" 3rd Edition, Oxford Uni. Press, New Delhi.

(3) Taub and Schilling D.L. : Principles of Communication Systems, Mc-Hill Co, Tokeyo, 1994 (II Ed.)

(4) Hari Bhat: "Analog communication, 2nd Edition Pearson India, 2010"

4 XT 02/4XN02 ELECTRONIC DEVICES AND CIRCUITS-I

SECTION-A

Unit I : Rectifiers : Half wave, full wave and bridge rectifiers and their analysis. Filters : Analysis of capacitor filter, Theory of L, LC & CLC (p) filter, Zener diode as a Voltage regulator.

Unit II : DC load line and operating point (Q point); Methods of biasing & stability factor; ac equivalent circuit and hybrid model analysis of CE configuration.

Unit III : Feed back Amplifier and Oscillator : Classification of amplifier: Voltage current, trans-conductance, Trans-resistance amplifier, feedback concept, effect of negative feedback in amplifier, Methodology of feedback in amplifier and analysis. Oscillators : Barkhausen's criterion for sustained oscillations; study of Harley, Collpit, RC oscillators and crystal oscillator.

SECTION-B

Unit IV : Study of multistage transistor amplifier circuit

i) RC coupled amplifier,
ii) Transformer coupled amplifier,
iii) Direct coupled amplifier,
iv) Emitter follower; Darlington emitter follower, Bootstrapping principle,
v) Cascade stage.

Unit V : Power Amplifier : Transformer coupled Class A amplifier, Transformer coupled Class B amplifier & transformer coupled Class AB amplifier, capacitor coupled and direct coupled output stages, modifications to improve power amplifier performance, Class C amplifier and analysis.

Unit VI : JEET : Theory, Construction and Characteristics; parameters (m, g_m & rds); Biasing of JEET amplifiers, MOSFET : Theory, Construction and Characteristics of enhancement & depletion type MOSFET

UJT: Theory, Construction and Characteristics; UJT as relaxation oscillator.

Text Books :

1) David Bell : Electronic Devices and Circuits, Oxford University Press, 2010.
2) Milliman H. and Halkies : Integrated Electronics, Tata McGraw Hill, New Delhi.

Reference Books :

1) Mottershead Allen : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, 1986
2) Boylestad R. : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, V Edi. 1993
3) Ramanan K.V. : Functional Electronics, Tata McGraw Hill, New Delhi, 1989
4) Milliman S., Taub H and Halkies : Electronics Devices and Circuits, McGraw Hill Int. Co., Auckland, 1982

4 XT 03 / 4 XN 03 NETWORK ANALYSIS

SECTION-A

Unit I : a] Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems.

Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by

differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
3) Electrical Circuits – David Bell, Oxford University Press, 2008
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009

5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009

6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005

7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4XT04/4XN04 INDUSTRIAL MANAGEMENT & QUALITY CONTROL

SECTION-A

UNIT- I **Principles and Techniques of Management** : Meaning of and differences among business, management, administration and organisation, Principles of management, functions of management, planning, organisation structure and relationships, direction, co-ordination, control, motivation, delegation and decentralisation, communication, leadership and decision making. (7)

UNIT- II Market and Materials Management :

A) Marketing strategy, market research, consumer behaviour, advertising and sales promotion, channels of distribution, pricing of products.

B) Classes of material, scope of material control, scope of purchasing department, purchasing procedures, order procedures, inventory control, introduction to production, planning and control. (9)

UNIT- III **Personnel Management :** Meaning and functions of personnel management, recruitment, selection, promotion, wages and salary administation, training and development, functions and scope of trade unions in Indian industries. Welfare of labour, Problems of labour turn over & retention.

Merit Rating: Job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. (9)

SECTION-B

UNIT- IV Project and Financial Management :

A) Case studies of project report, preparation of profit and loss statement and balance sheet, ratio analysis.

B) Principles of costing , cost sheet preparation, variance analysis, meaning and application of various budgets, types of budgets and their importance. (9)

UNIT- V **Quality Control :** Concept of quality and quality control, elements of quality, factors controlling quality of design and conformance, process control, inspection planning and scheduling, 7QC (Seven Quality Control) techniques, vendor

inspection, sampling inspection, sampling plans, Quality audit system. (8)

UNIT- VI **Quality Management :** Concepts and applications of Kaizen, quality circle, ISO 9000 series, just-in-time, quality planning and total quality management, elements of TQM, Quality Circles. (8)

TEXT BOOKS:

1. INDUSTRIAL ENGINEERING AND MANAGEMENT ,O P Khanna ,2011 ,JAIN BOOK DEPOT,Post Box No. 51, New Delhi - 110001 (INDIA),81-899-2835-3.
2. INDUSTRIAL & BUSINESS MANAGEMENT ,Telsang Mertand.T, S.Chand & Company Limited, NEW DELHI. ,81-219-2056-6.
3. MANAGEMENT : PRINCIPLES, PROCESSES, AND PRACTICES, Anil Bhat, Arya Kumar , 2008 , Oxford University Press, NEW DELHI., 978-01-956-9445-1.
4. TOTAL QUALITY ,BHARAT WAKHLU ,2/e, 2007 ,S.Chand & Company Limited, NEW DELHI. ,81-219-2866-4.
5. TOTAL QUALITY CONTROL, 4TH ED. ,Armand V. Feigenbaum, 2005 ,Tata McGraw-Hill Education, New Delhi. ,978-00-702-2003-4.

REFERENCE BOOKS:

1. PRINCIPLES OF BUSINESS MANAGEMENT ,Dr. Virendra Sharad Sherlekar ,Prof.S.A.Sherlekar ,3/e, 2009 ,Himalaya Publishing House Pvt. Ltd, MUMBAI. ,978-81-8488-082-3 .
2. FUNDAMENTALS OF FINANCIAL MANAGEMENT ,BOSE, D. CHANDRA ,2/e ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-4074-9.
3. PRINCIPLES OF MANAGEMENT AND ADMINISTRATION • ,Chandra Bose , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-1929-5.
4. PROJECT MANAGEMENT ,Prof. Abdul Matheen ,2/e, 2009 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0694-4.
5. TOTAL QUALITY MANAGEMENT • ,Suganthi & Samuel , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2655-2.
6. TOTAL QUALITY MANAGEMENT ,Dr. S. Kumar ,1/e, 2006 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0568-8.
7. QUALITY MANAGEMENT, Kaniska Bedi ,2006 ,Oxford University Press, NEW DELHI . ,978-01-956-7795-9.
8. TQM : PLANNING, DESIGN & IMPLEMENTATION, Khanna, V.K., 1/e, 2009, New Age International (P) Ltd., Publishers, NEW DELHI., 978-81-224-2233-7.

9. Fundamentals of Quality Control and Improvement, Mitra Amitava, 2/e, 2009 ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2377-3.

4XT05/4XN05 INSTRUMENTATION

SECTION-A

Unit I : Transducer & Instrumentation systems (1)Transducer classification: Active/Passive. Primary/Secondary. Analog/ Digital and transduction Principles. Basic Signal conditioning Circuits. Resistive/Capacitive/Inductive reactance bridge. Current/Voltage Sensitive Wheatstons bridges & Generalized instrumentation system with particular examples (9 Hrs)

Unit II : Static characteristics, errors & statistical parameters: (1) Static characteristics: Accuracy, Precision, Sensitivity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean Average deviation Standard deviation. Probable error, Histogram, Normal & Gaussian curve of errors. (7 Hrs)

Unit III : Electronics Instrumentation: (1,2,3):Analog & Digital data acquisition system, Analog electronic multimeter, Introduction to digital voltmeter & universal counter. Stripchart & X-Y recorders. Optical Encoders. Siesmic mass vibration transducer. (3)Introduction to microphones & loud speaker. (9 Hrs.)

SECTION-B

Unit IV : Measurement of Temperature & Strain (1,3) Temperature Sensors: LM335, RTD. THERMISTORS,

Thermocouples, Thermocouples laws & its compensation methods. Pyrometers: Total/Partial radiation & optical pyrometers. Strain Gauges, Gauge factor. Strain measurement & temperature compensation methods.

Unit V : Measurement of Displacement. Pressure & Level. Displacement Measurement: (1) using resistive, capacitive, inductive (LVDT & RVDT) & Eddy current. Pressure Measurement: (1) Elastic, Inductive, Peizoelectric & capacitive transducers, Low pressure measurement using ionization gauge, pirani gauge, thermocouple vacuum gauge. Level Measurement: (1, 3) Using ultrasonic, capacitive, inductive, resistive with float, gamma rays & eddy currents techniques. (8 Hrs.)

Unit VI : Measurement of Flow, Humidity, Velocity (1) Flow Measurement: using ultrasonic, electronaquatic & hotwire

Anemometer. Humidity Measurement : using resistive, Capacitive & Crystal transducers. Velocity Measurement: Using photo detectors (both linear & angular velocity). Introductory block diagram of smart sensors , Wave analyzer & spectrum analyzers.

Books Recommended:

1) Sawhney A.K.: A course in Electrical/Electronics Measurement & Instrumentation, Dhanpat Rai & Sons., Delhi.
2) Rangan C.S., Sharma G.R. , & Mani V.S.V.: Instrumentation Devices & System,Tata Mc-Graw Hill.
3) R. K. Rajput: Electrical & Electronics Measurement & Instrumentation.

Reference Books :

1) Patranbis D. : ' Sensors & Transducers', A.H.Wheeler & Company, Prayag, India.
2) H. S. Kalsi : Electronics Instrumentation, Tata McGraw Hill, 2nd Edition
3) U.A. Bakshi & A. V. Bakshi : Electronics Instrumentation, Technical Publication
4) Robert A. Witte: Electronics Test Instrumentation : Analog & Digital Measurement.

4 XT 06/4 XN 06 ELECTRONIC DEVICES AND CIRCUITS-I-LAB.

Any TEN experiments based on contents of 4 XT 02/4XN 02 ELECTRONIC DEVICES AND CIRCUITS-I

4 XT 07/4XN 07 NETWORK ANALYSIS - LAB.

Any TEN experiments based on contents of 4 XT 03 / 4 XN 03 NETWORK ANALYSIS

4 XT 08/4XN 08 INSTRUMENTATION-LAB.

Minimum Eight experiments based on 4XT 05/4XN 05 INSTRUMENTATION

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
INSTRUMENTATION ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER
THIRD SEMESTER

3IE 01 /3 XT 01 / 3 XN 01 MATHEMATICS – III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D,Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's an Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform,initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity,shifting,multiplication by k,change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms,inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Prtial differential equation of first order of following form-

(i) f(p,q)=0; (ii)f(p,q,z)=0; (iii) f(x,p)=g (y,q); (iv)Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Comples Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation,magnification,inversion and bilinear transformation),singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT -VI Vector calculas:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals,irrotational and solenoidal vetor fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A text book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika Prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral Transforms by Goyal & Gupta.

3 IE 02 ELECTRONIC DEVICES AND CIRCUITS

UNIT-I: P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II Theory and Analysis of BI Junction transistor, 'H' Parameter, Methods of biasing, their needs, 'Q' and stability factor.

UNIT-III: Study of typical transistor amplifier circuits:

i) Emitter follower,
ii) Darlington emitter follower.
iii) Bootstrap emitter follower,
iv) RC coupled amplifier,
v) Transformer coupled amplifier,
vi) Cascaded amplifier,
vii) Direct coupled amplifier,
viii) Cascade stage.

UNIT-IV: Class 'A', 'B', 'AB' and 'C' amplifiers, Configuration of audio

amplifiers, Calculations of power gain, efficiency, power dissipation and distortion, Oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V: Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI: FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm & Rds), Biasing of FET Amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

TEXT BOOK:

1) Mottershead Allen: "Electronics Devices & Circuits" Prentice Hall of India Private Limited, New Delhi, 1986.

REFERENCE BOOKS:

1) Milliman H. and Halkies: "Integrated Electronics" ,Tata Mc-Graw Hill Book Co., New Delhi.
2) Boylestad R. and "Electronics Devices & Circuits" , Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.
3) Ramanan K.V.: "Functional Electronics", Tata Mc-Hill Publication Co. Ltd.,New Delhi, 1989.
4) Milliman S., Tube H. and Halkies: "Electronics Devices & Ciruits", Mc-Ggaw Hill Int. Co., Auckland, 1982.

3 IE 03 ELECTRICAL MEASUREMENT

UNIT-I : Introduction: Digital MultiMate's , Kilowatt meter, Data types, Measurement standards for time , frequency, voltage , current. . Introduction to reliability and safety. Response of indicating instruments for step, linear and sinusoidal inputs.

General purpose, Cathode Ray Oscilloscope, front panel control , CRT Block schematic, controls on CRO panel, Measurement of phase, frequency, Time duration.

UNIT-II: DC Bridges: Wheatstone Bridge, Bridge sensitivity, analysis by Thevenin's theorem, Errors in bridge circuits, Null type, Current and Voltage sensitive bridges, Kelvin Bridge.

AC Bridges: Inductance bridge (Maxwell's), capacitance bridge (Hay's), Wein bridge, Anderson bridge, Schering bridge, Storage & dissipation factors & their measurements. (09)

UNIT-III: Potentiometers: Measurement of voltage & current calibration sensitivity, self balancing techniques, Multirange potentiometers.

Recorders: Curvilinear & rectilinear recording, strip-chart, X-Y recorders & Dual Trace Oscilloscopes, Synchronization, Z

modulation.

Unit-IV : Construction, working principle of AC tacho generator, DC tacho generator, Two dial DC potentiometer, Coils and chokes

Safety: safety in electrical Ckts. , fundamental safety rules and electrical system earthling

Unit- V : Arithmetic Operations & Floating point Arithmetic, Boolean Algebra, OR, AND, NOT, NOR, AND, EX-OR,EX-NOR Operation, Negative & Positive Logic, Laws of Boolean Algebra, Reduction of Boolean Functions. Different Codes and their Conversions (BCD, Octal, Hex,Excess Three, Gray),

Unit- VI : Wave and Spectrum Analyzer, Harmonic Distortion Analyzer, Heterodyne Frequency meter, Function Generator.

Text Books:

1. Electronic Instrumentation Techinques by Cooper & Helfrick.
2. Modern Digital Electronics by R.P. Jain

Ref. Book:

1. Electronic Instrumentation & Measurement by Sawhney

3 IE 04 SENSORS & TRANSDUCER

UNIT I : Transducer :Defination, Classification, Selection criteria. Errors, loading effects, Transducer specifications, calibration. Generalized Instrumentation diagram.

UNIT II: Displacement Measurement: Resistive methods, Inductive Methods, Capacitive Methods.

Force & Weight: Load cell (Electrical, Pneumatic, Hydraulic), LVDT, Piezoelectric, Vibrating wire.

Torque: Strain gauge, Inductive, Digital method.

UNIT III: Temperature Transducers: Temperature scales, Bimetallic strip, Semiconductor temperature detector (thermister , LM 335). Resistance thermometer, Thermocouples, Thermopile, Crystal, Infrared thermometers

UNIT IV : Flow Transducers: Basic measurement principles, Bernoulli's theorem, Differential pressure type (Orifice, Ventury , Anubar Pitot tube),Variable area type, Magnetic, Ultrasonic, Positive displacement type ,Mass flow meter, Anemometer, Total flow meter.

Level Transducers: - float type displacer, Diaphragm box level gauge, DP cell, Ultrasonic, Capacitive , resistive.

UNIT V: Pressure Transducers: Pressure scales , Manometers, Elastic(Bellows, Bourdon tube, Diaphragm)type, Electrical pressure sensors (LVDT, Strain gauge, load cell, Piezo-electric, Capacitive),Differential pressure sensors(Capacitive, Force

balance & vibrating cylinder type),vacuum pressure measurement, thermal conductivity & ionization type, Transducers for very high pressure measurement.

UNIT VI: Humidity Transducers: Psycrometer, Hygrometer (Hair, wire & Electrolysis type),Dew point meter .Piezo-electric humidity meter, Infrared conductance & Capacitive type probes for moisture measurement. Sound level measurement.

Text Books:

1. Sensor and Transducer by D. Patranbis
2. Sensor and Transducer by Dr. A.D. Shaligram

Ref. Books:

1. Electronics Instrumentation and measurement by A.K. Sawhney
2. Electrical and Electronics measurement and Instrumentation By R. K. Rajput
3. Process Control By B.G. Liptak
4. Industrial Instrumentation & Control By S.K. Sing.

3 IE 05 ANALYTICAL INSTRUMENTATION

Unit I : Introduction to Elements of analytical Instruments, Ultraviolet (UV) and Visible absorption instruments components, Beer-Lamberts law, monochromator : design and associated equipment, monochromator performance. UV and Visible instruments : colorimeters, spectrophoto-meters : single and dual beam, dual wavelength and double monochromator, Infra-Red (IR) spectrophotometers : basic components, types.

Unit II : Flame photometry : principle, constructional details, fuel gases, atomizer, burner, optical and recording systems.

Atomic absorption spectrometers: theoretical concepts, instrumentation: hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic systems.

Unit III: Nuclear magnetic resonance (NMR) spectrometry: principle, nuclear spin, nuclear energy levels, resonance condition, NMR absorption spectra, chemical shift, constructional details, spin decoupler, Fourier transform NMR spectroscopy.

Unit IV : Fluorimeters and phosphorimeters : principle, single and double beam filter fluorimeters, ratio fluorimeters, spectrofluorimeters, phosphorescence spectrometer.

Raman spectrometry : Raman effect, Raman spectrometer.

Photoacoustic and photothermal spectrometers.

Mass spectrometery : Principal &operation ,basic

components, gas chromatograph mass spectrometer (GCMS) system.

Electron and ion spectroscopy : Instrumentation for electron spectroscopy ,

Unit V : Radio chemical instrumentation: radio chemical methods, radiation detectors (ionization chamber, Geiger-Muller, proportional and Scintillation counters), pulse height analyzer.

X-ray spectrometry: spectrum, instrumentation, diffractometers and absorption meter.

Unit VI : Gas and liquid chromatography : classification, basic parts, carrier gas, sample injection system, thermal compartment, detectors (thermal conductivity, flame ionization, electron capture, Argon ionization), introduction to liquid chromatography.

Methods of gas analysis : oxygen, carbon monoxide, nitrogen analyzer, gas density analyzers.

Refractometry : principle, Abbe and dipping types.

Interferometry : principle, types-Rayleigh, Jamin and Twyman.

Text Books

1) R.S.Khandpur : Handbook of Analytical Instrumentation

2) Willard, Merrit and Dean : Instrumental Methods of Analysis

Ref. Book:

1. E.W.Ewing : Instrmental methods of Chemical Analysis

2. R.D.Braun : Introduction to Instrumental Analysis

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3 IE 06 ELECTRONIC DEVICES AND CIRCUITS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE02.

3 IE 07 ELECTRICAL MEASUREMENT-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE03.

3 IE 08 SENSORS & TRANSDUCER-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE04.

3 IE 09 ANALYTICAL INSTRUMENTATION-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE05.

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FOURTH SEMESTER

4 IE 01 ELECTRICAL MACHINES

SECTION-A

UNIT-I: **D.C Machines**

Construction details, EMF equation, Methods of excitation, Self and separately excited generators, characteristics of series, shunt and compound generators, Principle of operation of D.C. motor, back emf and torque equation, characteristics of series, shunt, and compound motors, starting of D.C motors, types of starters, and speed control of D.C shunt motors

UNIT-II: **Transformers**

Construction details, Principle of operation, EMF equation, transformation ratio, Equivalent circuit, Loses in Transformers, Open and short circuits tests, Auto Transformers, Pulse transformer, Instrument Transformer (CT and PT),Condition of parallel operation, Connection of three phase Transformer-Star/Delta ,Delta/Star, Scott connection (Phase inversion).

UNIT-III: Synchronous Machines

a) Alternator; Construction details, synchronous speed, emf equation, winding factors, regulation by synchronous method.

b) **Synchronous Motors**:

Concept of rotating magnetic field, principle of working, effect of variation of load.

Characteristics and applications.

UNIT-IV: **Induction motor**

Construction, types, principle of operation of three phase induction motor, equivalent circuit, performance characteristics, Starting and speed control, Different types of starters, and applications.

Single phase induction motor: principle of working, type applications.

UNIT-V : **Special purpose machines**

Principle, working, Characteristic and applications of stepper motor. Principle, working, Characteristic and applications Servomotors, and Principle, working, Characteristic and applications universal motors.

UNIT-VI: **Transmission and Distribution**

Structure of electric power system, Generation, transmission ,Sub-transmission and distribution systems, EHVAC and EHVDC transmission systems, Substation layout, insulators and cables.

Text books:

1. Electrical Machines-Nagrath Kothari(Tata Mc Ggraw Hill)
2. Theory of AC Machines-Langsdrof (Tata Mc Ggraw Hill)
3. Electrical Engineering –Vol I,Direct Currents-C Dewes

Ref. books:

1 Fundamentals of Electric Machines-B.K.Gupta,Vandana Singhal
2 A Text Book of Electrical Engineering-B.L.Tharaja Volume II and III.
3 Performance and Design of DC Machine-Clayton and Hancokk

4 IE 02 COMPUTER PROGRAMMING AND APPLICATIONS

Unit I : Principles of object oriented Programming-Oops paradigm, basic concept of Oop's Benefits of Oop's, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++ Functions, Function over loading, Friend and Virtual Functions, Difference between class and structures, Array of objects, object as a function argument , constructor and destructors.

Unit III: Operator's overloading Operator and their definition, overloading unary and binary operator , Rules for overloading operators, overloading binary operators using friends and string manupalation.

UNIT IV- Inheritance and Polymorphism- Defining derived classes, single and multiple inheritance, multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual base class , virtual function.

Unit V: INTRODUCTION TO SPICE/ PSPICE**:-**Description, types , circuit elements, sources, Types of analysis ,output commands, Format of files.

DC CIRCUIT ANALYSIS**:** Registors , modelling of elements, Independent & dependent sources, DC output variables, types of DC analysis.

TRANSIENT ANALYSIS **-** Capacitors & Inductors, modeling of transient sources, transient Response.

AC CIRCUIT ANALYSIS: AC output variables AC sources & analysis.

UNIT VI : SPICE COMMANDS & DEVICES SIMULATION : Advanced commands, modeling and analysis of diode, BJT & FET

TEXT BOOK :

1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata Mc-Graw Hill publishing Co.Ltd., New Delhi,1995.

REFERENCE BOOKS :

1) Object Oriented Programming in Turbo C++ Rober Lofore, Galgretia Publications Pvt.Ltd., New Delhi,1995
2) The C++ Programming Language (Third Edition) - Bjarne Stroustrup Pub.Co.,New York,1995 (Addison Wesley)
3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesely Pub. Company,1995
4) SPICE FOR CIRCUITS AND ELECTRONICS USING PSPICE Muhammad H. Rashid. (PHI).

4 IE 03/4 XT 03 / 4 XN 03 / 4 BM 03 NETWORK ANALYSIS

SECTION-A

Unit I : a] Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems

Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution

Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
3) Electrical Linear Circuits – David Bell, Oxford University Press, 2008
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009
5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009
6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005
7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4 IE 04 ADVANCE SENSORS AND TRANSMITTERS

Unit I: Intelligent sensor: Introduction, Features , desirable on chip signal processing, present status.

MEMS Sensor: Introduction, MEMS sensor-Design challenges, MEMS sensor-generation & development.

Unit II: PH & Conductivity sensors: PH scale and standard principal of pH measurement ,different types of reference & measuring electrode .Principal of conductivity measurement, conductivity cells & bridges

Unit III: Digital transducer: Digital encoder, disc type, incremental shaft, linear displacement transducer, moir, fringe techniques, digital tachometer , digital torque sensor (inductive pickup, photo electric pickup, proximities sensor)

Unit IV: Density measurement: Introduction, various scale, hydrometer type, vibrating densitometer, gas Densitometer, ultrasonic sludge densitometer, centrifugal gas density sensor.

Viscosity measurement: Definition, capillary type, cone plate, rotameter type

Unit V: Vibration: Vibration measurement , accelerometer , sismic type, jerk meter.

Biosensor Technology: Introduction, Nanosensor: Nanotechnology Introduction, nanosensor development, future of nanosensor.

Unit VI : Transmitters: Buyancy ,differential pressure, temoerature, electro hydraulics,2 wire transmitters,

Converters:Resistance to current,voltage to current,pneumatic to electrical & electrical to pneumatic

Positioners : necessity, types and effect on performance of control valve, Actuators: pneumatic, hydraulic, electrical, electro-pneumatic, electro-hydraulic.

Text Books:

1. Sensors and Transducer by Dr. A.D. Shaligram First Edition
2. Sensors and Transducer by D. Pathanbis

Ref. Book:

1. Electronics Instrumentation and Measurement by A.K. Sawhney
2. Process Control By B.G. Liptak

4 IE 05 TELEMETRY AND TELECONTROL

Unit I : Introduction to communication systems: Basic communication systems, interface & distortion, signal characterization in time domain and frequency domain .

Unit II : Modulation Techniques: Different kinds of SSB & FM Modulators & demodulators.

Unit III: Antenna- Principle of radiation, isotropic, radiator, resonant antenna, non resonant antenna, half wave dipole antenna, folded dipole, parasitic reflector, parasitic director, antenna arrays, yagi-uda antenna, antenna power gain, beam width, polarization, radiation resistance

Unit IV: Digital communication : Sampling theorem, Nyquist frequency, Sampling techniques, & signal reconstruction, pulse modulation-(PCM) principle of delta modulation ASK, FSK, PSK coding formats.

Unit V: Multiple access Schemes: TDMA, FDMA CDMA, spared spectrum communication, D.S. spread spectrum, Frequency hoping spread spectrum, comparison

Unit VI: Smart transmitters, typical telemetry & telecontrol schemes for industrial application telemetry errors caused by noise, telemetry & carrier communication systems

TEXT BOOKS:

1) Electronic Communication D Roddy and Coolen

2) Electronics Communication System G. Kennedy TMH

3) Modern Digital and Analog Communication System B.P. Lathi, Oxford University Press, New Delhi.

Ref. Books

1. Digital Communication by K. Sam Shanmugam

2. Digital Communication by J.G. Proakis, Fourth edition.

4IE06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE02.

4IE07/4 XT 07/4 XN 07/4 BM 08 NETWORK ANALYSIS-LAB.

Any TEN experiments based on contents of 4 IE 03/4 XT 03/ 4XN 03/ 4BM 03 NETWORK ANALYSIS

4IE08 TELEMETRY AND TELECONTROL-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE05.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

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SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING /
COMPUTER ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3KS01/3KE01 MATHEMATICS – III

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: **Laplace transforms**:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) **Difference equation:-** solution of difference equations of first order Solution of difference equations of higher order with constant co-efficients b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) **Fourier transforms**:- Definition, standard forms, inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) **Partial differential equation** of first order of following form:- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii) f (x,p)=g (y,q); (iv) Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form)

UNIT-V: **Complex Analysis** :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation),singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: **Vector calculus**:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A Text Book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral transforms by Goyal & Gupta.

3KS 02/3KE02 PROGRAMMING METHODOLOGY

Objectives:

- Study of the basic concepts of Java such as operators, classes, objects, inheritance, packages and exception handling.
- Study of concepts like enumerations, generics, logging, API, assertions, Applets, AWT.
- Preparing the students to learn Object Oriented Programming Methodology.

SECTION A

Unit I: **Introduction to Object Oriented Programming**: Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. **Java Programming Constructs:** Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, Flow of Control.

Unit II: **Classes and Objects:** Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: **Inheritance:** Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface, Packages, java.lang package, Enum type.

SECTION B

Unit IV: **Exception:** Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. **Input/Output:** The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: **Applets:** Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base () and get Code Base () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: **Event Handling:** Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. **Abstract Window Toolkit:** Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Book:

Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.

Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)
4. Liang: A text Book of Java Programming, (PHI)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KS 03/3KE03 ELECTRONIC DEVICES AND CIRCUITS

Objectives:

- Study of the basic electronic device Semiconductor diode and zener diode and its applications.
- Study of electronic device Bipolar Junction Transistors and its applications.
- Study of electronic device Field Effect Transistors and its applications.

· Study of Optoelectronic devices.

SECTION-A

Unit I: pn-Junction Diode, Characteristics and Parameters, Diode Approximation, DC load line analysis, Temperature effects, Diode AC models, Zener diodes, Half- Wave Rectifications, Full-Wave Rectifications, Half-Wave Rectifier Power Supply, Full-Wave Rectifier Power Supply, RC and AC Power Supply Filters.

Unit II: BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common-Collector Characteristics, Transistor testing.

Unit III: DC Load Line and Bias Point, Base Bias, Collector-to-Base Bias, Voltage-Divider Bias, Comparison of Basic Bias Circuits, Troubleshooting BJT Bias Circuits, Bias Circuit Design.

SECTION-B

Unit IV: Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Data Sheets and Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion _Enhancement MOSFET, VMOSFET, Comparision of p-Channel and p-Channel FETs.

Unit V: BJT Phase Shift Oscillators, BJT Colpitts Oscillator, BJT Hartley Oscillator, BJT Wein Bridge Oscillator, Oscillator Frequency stabilization: Frequency Stability, Piezoelectric Crystals, Crystal Equivalent Circuit, Crystals Control of Oscillators.

Unit VI: Optoelectronic Devices: Light Units, Light-Emitting Diodes, Seven-Segment Displays, Photoconductive Cells, Photodiodes and Solar Cells, Phototransistors, Optocouplers, Phtomultipler Tube, Laser Diode.

Text Book:

David A. Bell: Electronic Devices and Circuits, Fifth Edition, Oxford University Press.

Reference Books:

1. Malvino: Principles of Electronics, TMH.
2. Millman & Halkies: Electronic Devices & Circuits, McGraw Hill.
3. Millman & Halkies: Integrated Electronics, McGraw Hill.
4. Millman: Microelectronic, McGraw Hill.
5. Roberts and Sedra: SPICE, Second Edition, Oxford University Press.
6. Sedra and Smith: Microelectronic Circuits, Oxford University Press.

3KS 04/3KE04 DISCRETE STRUCTURE

Objectives:

· Learn basic terminology, formal logic, proofs, sets, relations, functions, recursion
· Use formal logic proof and logical reasoning to solve problems
· Relate the ideas of mathematical induction to recursion and recursively defined structures
· Learning graphs, trees and related algorithms
· Relate interpret and apply these concepts to various areas of Computer Science

SECTION A

UNIT I: **Mathematical Logic:** Statements & Notation, Connectives, Equivalence Formula, Duality Law, Tautological Implication, Normal forms, Parenthesized Infix notation and Polish Notations.

UNIT II: **Theory of inference:** The theory of inference for the statement calculus, Validity using truth tables, Predicate calculus, Inference theory of the Predicate Calculus.

UNIT III: **Set Theory:** Basic concepts, Venn Diagrams, Representation of Discrete Structure, Relation and ordering, Partial Ordering, Functions, Recursions, Sets and predicates.

SECTION B

UNIT IV: **Algebraic Structures:** Semi-groups and Monoids, Product & Quotients of semi-groups, Polish expression & their compilation, Groups, Product and Quotients of Groups.

UNIT V: **Lattice & Boolean Algebra:** Lattices, partially ordered sets, Boolean algebra, Functions on Boolean Algebra, Boolean Functions as Boolean Polynomials, Minimization of Boolean Functions.

UNITVI: **Graph Theory:** Basic concepts, Paths, Reachability & connectedness, Matrix representation of graphs, Trees: tree searching, Undirected trees, Minimal spanning trees.

Text Book:

J.P.Trembley,R.Manohar:"Discrete Mathematical Structures with application to Computer Science" 1988(MCG)

Reference Books:

1. C.L.Liu : "Combinational Mathematies" Mc Graw Hill, 1988
2 Stanant "Discrete Structure" Prentice Hall.
3. C.L.Liu "Element of Discrete Mathematics" Second Edition McGraw Hill, 1987
4. Norman L.Biggs "Discrete Mathematics" Second Edition,Oxford

University Press, Indian Edition.
5. N. Chandrasekaran & M. Umaparvathi, "Discrete Mathematics" PHI (EEE) 2010.
6. Purna Chandra Biswal, "Discrete Mathematics & Graph Theory" Second Edition, PHI (EEE)2009.
7. Chakraborty and Sarkar," Discrete Mathematics" Oxford University Press, Indian Edition,2011.

3KS 05 / 3KE05 COMPUTER ORGANIZATION

Objectives:

- To understand the relationship between instruction set architecture, micro architecture, and system architecture and their roles in the development of the computer.
- Be aware of the various classes of instruction: data movement, arithmetic, logical and flow control.
- Explain how interrupts are used to implement I/O control and data transfers.
- Understand how a CPU's control unit interprets a machine –level instructions.
- Identify various types of buses in Computer systems.
- Understand memory hierarchy.
- Understand various peripheral devices.

SECTION-A

Unit-I: **Basic Structure of Computer:** Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Addressing Modes, Basic I/O Operations, Stacks, Queues & Subroutines.

Unit-II: **Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing, Microinstruction Pre-fetching, Emulation.

Unit-III: **I/O Organization:** Accessing I/O Devices, Interrupts, Direct Memory Access, Bus arbitration, I/O Hardware, Processor Bus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.

SECTION-B

Unit-IV: **Memory Unit:** Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size & Cost Considerations. Cache Memories: Performance considerations. Virtual Memories, Address Translation, Memory Management Requirements.

Unit-V: **Arithmetic:** Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplication of Positive numbers, Booth's Algorithm, Integer Division, Floating-Point Numbers and related operations.

Unit-VI: **Computer Peripherals:** Input-Output Devices like Video displays, Video terminals, Graphics input devices, Printers. Online storage devices: Magnetic disks, Magnetic tape, Systems, CD-ROM systems. Communication devices: Modems.

Text-Book:

V.Carl Hamacher & S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

References:

1. Stallings. W: Computer Organization & Arcitecture, Fifth Edition, Pearson Education.
2. Tenanbaum A.S: Structured Computer Organization, Fifth Edition, Pearson Education.
3. Hayes J.P: Computer Architecture & Organization, Fourth Edition, McGraw- Hill.
4. M. Mano & Kime Logie: Computer Design Fundamentals, Second Edition, Pearson Education.

3KS 06 / 3KE06 Programming Methodology Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3KS 07 / 3KE07 Electronic Devices & Circuits Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3 KS 08 / 3 KE 08 COMPUTER LABORATORY I [WEB TECHNOLOGY]

Unit I: **HTML**: HTML Coding, Basic Web Graphics, Web Page Design & Site Building, Adding Multimedia to the Web.

Unit II: **Paint Shop Pro/Photoshop**: Photoshop components, working with Photoshop, Image Basics, File Formats, color Palette, Layers, Creating New Images, Brushes, Grids & Gides, Scaling & Positioning Images, Moving & Merging Layers, Tool Palette, Screen Capturing, Grey styling, Animation.

Unit III: **Image Handling**: Scanning Images, Adding Text to the Images, Designing Icons, Creating Background Images, Color Models, Color Calibration, Creating Gradients, Oil Paint Effect.

Unit IV: **Multimedia**: Creating Clippings, Animation with Sound Effects, Adding Audio or Video, Windows Media Player Active x control, Agent Control, Embedding VRML in a web Page, Real Player Active x Control.

Unit V: **Applications**: Flash, Working with Layers, Working with Movies, The Drawing Tools, Color Selection, Symbols, Flash Buttons, Flash Menu Smart Clip, Interactivity with Action Script, Frame Actions and the Timeline, Exporting Animation, Applications in Flash.

TEXT BOOK:

1. Meenakshi G. M., "Web Graphics", Scitech Publications (India) Pvt. Ltd.,2007.

REFERENCE BOOKS:

1. Joel Sklar, "Textbook of Web Design", Cengage Learning.
2. James L. Mohler & Jon M. Duff, "Designing Interctive Web Sites", Cengage Learning.
3. Dr. Raja Subramanian, "Creating Web Sites in Engineering", University Science Press (An Imprint of Laxmi Publication Pvt. Ltd.).
4. Uttam K. Roy, "Web Technologies", Oxford University Press.

Minimum eight experiments/programming assignments must be completed based on the above syllabus covering each of the units.

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SEMESTER : FOURTH

4KS01/ 4KE01 DATA STRUCTURES

OBJECTIVES:

- Study the representation and use of primitive data types and built in data structures.
- Study how the data structures are allocated and used in memory.
- Study common applications of each of the data structures.
- Implement the user defined data structures in a high level language

SECTION A

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. 08Hrs

Unit-II: Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi-

demensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices. 08Hrs

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists. 08Hrs

SECTION B

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. 08Hrs

Unit-V: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffnan's algorithm. General trees. 08Hrs

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. 08Hrs

Text Book:

Seymour Lipschutz: Data Structures with C, Schaum's Outline Series, Mc Graw-Hill, International Editions.

References:

1. Forouzan, Gilberg, Mahalle, Jogalekar: Data Structures and Algorithms, CENGAGE Learning.
2. Reema Thareja: Data Structures using C, Oxford University Press, 2011.
3. Arpita Gopal: Magnifying Data structures, PHI(EEE), 2010.
4. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
5. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.
6. Standish: Data Structures in Java, Pearson Education.

4KS02/ 4KE02 ANALOG & DIGITAL ICS

AIM To understand the functions of various digital and analog ICs and their applications in the design of electronic circuits.

OBJECTIVES :

- To get the knowledge about the characteristics and operation of

different analog ICs.

- To study the applications of the above ICs in the design of electronic circuits.
- To get basics knowledge about digital ICs and digital systems.
- To study the design of combinational circuits and sequential circuits.

Unit-I : **OPERATIONAL AMPLIFIERS :** Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting and non-inverting amplifiers, adder/ subtractor, integrator, differentiator, Schmitt Trigger, analog multiplier.

Unit-II : **TIMERS & PHASE LOCKED LOOP :**

Timers: Block schematic of timer IC 555, Application of timer 555 as astable, monostable, bistable multivibrator, Delayed timer, Saw tooth generators. Phase Locked Loops: Operation of phase lock loop system, transfer characteristics, lock range, capture range, study of PLL IC-LM 565 and its application as AM detector, FM detector and Frequency Translator.

Unit-III. **NUMBER SYSTEMS :**

Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r s and (r-1)s Complements, Subtraction using 1s and 2s. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes.

Unit-IV : **BOOLEAN FUNCTIONS USING GATES :**

Boolean theorems, Minterm and maxterm representation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

Unit-V : **COMBINATIONAL CIRCUITS :**

Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractor, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean Expression Implementation using these ICs.

Unit-VI : **SEQUENTIAL CIRCUITS :**

Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC Specifications.

Text Books:

1. Ramakant A.Gayakwad, „OP-AMP and Linear ICs, Prentice Hall, 1994.
2. M.Morris Mano "Digital Design" (2/e) (PHI).

Reference Books :

1. R F. Coughlin;F.F.Driscoll: Operational Amplifiers & Linear Integrated Circuits, Pearson
2. Sedra & Smith : Microelectronics Circuits, 5e, Oxford University Press
3. Jain R.P. "Modern Digital Electronics" (TMH).
4. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).

4KS03/ 4KE03 OBJECT ORIENTED PROGRAMMING

SECTION A

Unit I: **Objects & Classes in C++:** Declaring & using classes, Constructors, Objects as function arguments, Copy Constructors, Static class data, Arrays of Objects, C++ String class.

Unit II: **Operator Overloading:** Overloading Unary & Binary Operators, Data Conversion, Pitfalls of Operator Overloading, Pointers & Arrays, Pointers & Functions, New & Delete Operators, Pointers for Objects.

Unit III: **Inheritance in C++:** Derived Class & Base Class, Derived class Constructors, Function overloading, Class hierarchies, Public & Private Inheritance, Multiple Inheritance, Containership: Classes within Classes.

SECTION B

Unit IV: **Virtual Function Concepts**: Abstract Classes & Pure Virtual Functions, Virtual Base classes, Friend functions, Static Functions, Assignment & copy initialization, the this pointer, Dynamic type information.

Unit V: **Streams & Files in C++:** Stream Classes, stream errors, disk file I/O with streams, File Pointers, Error handling in file I/O, File I/O with member functions, Overloading the extractions & Insertions operator, Memory as a Stream Object, Command Line Arguments, Multifile Programs.

Unit VI: Function Template, Class template, Exception Syntax, Multiple exceptions, Exception with Arguments, Introduction to Standard Template Library, Algorithms, Sequential Containers, Iterates, Specialized iterates, associative containers, Function objects.

Text Book:

Robert Lafore: Object Oriented Programming in C++, Galgotia Publication.

Reference Books:

1. Herbert Schildt: C++: Complete Refernce,TMH.
2. Bjarne Stroustrupe: C++ Programming Language, Addision Wesley.
3. Venugopal: Mastering C++, TMH.
4. Lipmann: C++ Primer, Addision Wesley.
5. Sourav Sahay: Object Oriented Programming with C++, Oxford University Press.

4KS04/ 4KE04 ASSEMBLY LANGUAGE PROGRAMMING

SECTION-A (8 hrs/unit)

Unit I: 8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation.IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming : Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

SECTION B

Unit IV: The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. 8086 I/O programming using 8255.

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation.
8086 Interrupt-driven programming using 8259.

TEXT BOOKS:

1. W. A. Triebel & Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor (2/e) (PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
3. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall .

4KS05/ 4KE05 THEORY OF COMPUTATION

SECTION A

Unit I: Alphabet, Language, Operations, Finite State Machine, Definitions, Finite Automation Model, Acceptance of Strings and Languages. Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA. Conversion of NFA into DFA, Equivalence between two FSM's, Moore and Mealy Machines.

Unit II: Regular Sets, Regular Expressions, Identity Rules. Manipulation of Regular Expressions, Equivalence between RE and FA. Inter Conversion, Pumping Lemma, Closure Properties of Regular Sets (proofs not required), Regular Grammars, Right Linear and Left Linear Grammars, Equivalence between Regular Linear Grammar and F A inter conversion between RE and RG.

Unit III: Context Free Grammar, Derivation trees, Chomsky Normal Form, Greibach Normal Form, Push down automata, Definition, Model, Acceptance of CFL, Equivalence of CFL and PDA, Interconversion, Enumeration of properties of CFL (proofs omitted).

SECTION B

Unit IV : Turing Machine, Definition, Model, Design of TM, Computable Functions, Recursive enumerable language, Church's hypothesis, Counter machine, Types of TM's.

Unit V: Chomsky hierarchy of languages, Linear bounded automata and Context Sensitive Language, Introduction of DCFL and DPDA, Decidability of problems.

Unit VI: Undecidability: Properties of recursive & non-recursive enumerable languages, Universal Turing Machine, Post-correspondence problem, Introduction to recursive function theory.

Text books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation,
2. Peter Linz: An Introduction to Formal Languages and Automata (Chapter 1 to 12 except 6.3 & 7.4),

Reference Books:

1. Rajendra Kumar: Theory of Automata, Languages & Computation, TMH, 2010.
2. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
3. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, Mc Graw Hill,2010.
4. John C. Martin: Introduction to Languages and the Theory of Automata.
5. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation.
6. Mishra & Chandrashekharan: Theory of Computation.
7. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press,2011.

4KS06/4KE06 Data Structures Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS07/4KE07 Analog & Digital IC's Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS08/4KE08 Object Oriented Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4KS09/4KE09 Assembly Language Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 to ES-4 *i.e. at the end of this syllabus.

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SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTER
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3 IT 01/3 KS 01 / 3 KE 01 MATHEMATICS-III

SECTION-A

UNIT-I: Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: Laplace transforms:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) Difference equation:- solution of difference equations of first order Solution of difference equations of higher order with constant coefficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) Fourier transforms:- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Partial differential equation of first order of following form:- (i) f (p, q)=0; (ii)f (p, q, z)=0; (iii) f (x, p)=g (y, q); (iv) Pp + Qq = R (Lagranges Form); (v) Z = px+qy+f (p,q) (Clairaut form)

UNIT-V: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation),singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics, Vol. II by P.N.Wartikar and J.N.Wartikar
2) Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
3) Advancing Engg. Mathematics by E.K.Kreyzig.
4) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
5) Higher Engg. Mathematics by B.S.Grewal.
6) Control System by Gopal and Nagrath.
7) Integral Transforms by Goyal & Gupta.

3 IT 02 PROGRAMMING METHODOLOGY

(8 Hrs. / Unit)

Unit I: Introduction to Computer and Languages, OOPS and Software development: Software Engineering and SDLC. Java Basics: Program Components, Compilation cycle. Introduction to Applet and Application, Data types and Variables

UnitII : Operators: Arithmetic operators, relational operators, Assignment operators. Control statement: Selection statement: if, nested if, switch statement. Repetition statements: while, do-while, for, nested loops. Introduction to Math class. Arrays: Basics, One dimensional, Multidimensional, Array of Objects, Passing array to method.

Unit III: Introducing classes, class fundamentals, declaring objects, methods, class data,& instance data, constructor, this keyword, access control, Introduction to String and String Buffer classes.

Unit IV: Event handling: Event handling mechanism, Delegation Event model, Event, Event Listener: Action Listener, mouse Listener, mouse Motion Listener, window Listener , Introduction to AWT, AWT classes: Button, Text Field, Label. Working with Graphics, Working with colors. AWT controls Fundamentals: Adding and removing controls, responding to control. Using

delegation Event model: Handling mouse events

Unit V: Applet class and its methods, Adapter classes, Inheritance, Polymorphism, Abstract classes and Interface, Packages. Multithreaded Programming: The java thread model, Creating a thread, Creating multiple threads.

Unit VI: Java File I/O: File, File Dialog object, Low and High level File I/O, the Stream classes, Byte Stream: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, Print Writer, Exception handling: Exception types, uncaught Exceptions using try and catch, throw, throws, finally. GUI objects programming: Frame class, menus and other GUI objects.

TEXT BOOK:

1) Herbert Schildt : Java Complete References(McGraw Hill)

REFFERENCE BOOKS :

1) C.Thomas Wu: An Introduction to OOP with Java(McGraw Hill)
2) E. Balaguruswami : Programming with JAVA (4th edition), McGraw Hill
3) Sachin Malhotra : Programming in JAVA, Oxford Press.

3 IT 03 DISCRETE STRUCTURE

(7 Hrs. / Unit)

UNIT I : Mathematical Logic : Statements & Notation , Connectives , Normal forms , The Theory of Inference for the statement calculus , Predicate calculus , The Theory of the Predicate Calculus.

UNIT II: Set Theory : Basic concepts of Set Theory , Representation of Discrete Structure, Relation and ordering, Functions , Recursion.

UNIT III : Algebraic Structures : Algebraic Systems , Semi groups and Monoids , Grammars and Languages, Polish expression & their compilation , Groups , Semi groups.

UNIT IV : Lattice & Boolean Algebra : Lattices as Partially ordered sets, Boolean Algebra, Boolean Functions, Representation of Boolean Functions , Minimization of Boolean Functions.

UNIT V: Graph Theory : Basic concepts of Graph Theory , Paths , reachability & connectedness, Matrix representation of graphs , Storage Representation and Manipulation of Graphs.Trees :Tree Traversal , Minimal spanning trees. PERT.

UNIT VI: Compultability theory :Finite state machines , Finite state acceptors and regular grammers. Turning, machines and partial recursive functions.

TEXT BOOK :

1. J.P.Trembley, R.Manohar :"Discrete Mathematical Structures with Application to Computer Science" 1988 (Tata McGraw Hill)

REFERENCE BOOKS:-

1. S.K. Chakraborty & B.K.Sarkar ;"Discrete Mathematics" OXFORD.
2 Swapan Kumar Sarkar: "A Text Book of Discrete mathematics" (S.CHAND).
3. Bernard Kolman,Robert C.Busby, Sharon Ross: "Discrete Mathematical Structures" Third Edition PHI

3 IT 04 ELECTRONICS DEVICES AND CIRCUITS

UNIT I: Semiconductor Devices: PN Junction Diode, Zener diode BJT & FET transistor. Rectifying circuits & DC power supplies: HWR, FWR, BR, and Comparison. Inductor and capacitor Filter circuits for D.C. Power supplies.

UNIT II: Transistor biasing: The CE amplifier (Simple analysis), Operating point, Stability Factor of self (Potential divider) bias Definition of Hybrid parameters. RC Oscillator: phase shift oscillator and Wein – Bridge oscillator, Transistor as a switch.

UNIT III: Opto- Electronics Devices: fundamental of light, photoconductive sensors, photodiodes, phototransistors their principle of operation & application. Opto – couplers. Introduction to P-spice: Circuit element sources in PSPICE, Modeling analysis of diode, BJT & Op-Amp.

UNIT IV: Operational Amplifier: Block diagram of op-amp, Differential amplifier, transfer characteristics, CMMR improvement, constant current source, dc level shifting, study of IC uA741. Inverting & non-inverting amplifier,

UNIT V: Linear & non-linear application of Op-Amp: voltage follower, Integrator, Differentiator, voltage to current converter, sinusoidal RC Oscillator. Comparator, Astable Monostable, & Bistable Multivibrator. 3 pin IC Voltage regulator 78XX, 79XX.

UNIT VI: Timer: block diagram of IC 555, application of Timer IC 555 as astable, monostable multivibrator, phase lock loops: operations of phase lock loop system, transfer characteristics, lock range capture range.

Text Books

1. N.N.Bhargava, D.C.Kulshreshtha, S.C.Gupta: Basic Electronics & Linear circuits, (TTTI)

2. M.H. Rasid: SPICE for circuits & electronics Using PSPICE (PHI)
3. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)

Reference Books

1. Malvino: Principals of Electronics(TMH)
2. Millman & Halkins: Electronics Devices & Circuits (MC Graw Hill)
3. K.R.Botkar: Integrated circuits (Khanna P
4. D.Roy Choudhury & Shail Jain: Linear Integrated circuits (NAIL)

3 IT 05 ASSEMBLY LANGUAGE PROGRAMMING

Unit I: Microprocessor 8086 architecture-BIU and EU, pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation, Maximum and Minimum Modes.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions, and logical instructions. Shift and rotate instructions and their use in 8086 programming

Unit III: 8086 programming: 8086 flag register and Flag control instructions control flow and jump instructions, Loops & loop handling instructions. Stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Concept of Macros and their types. 8086 programming using these instructions

Unit IV: Memory system design: Address decoding techniques, static-RAM interfacing, Dynamic-RAM (DRAM): refreshing techniques, interfacing and DRAM controllers; direct memory access (DMA). Interfacing Chips- SRAM and EPROM with 8086, 8237 DMA: pin diagram, internal organization, modes of operation

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. Programmable Interval Timer / Counter 8253: pin diagram, internal organization, modes of operation

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts, Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation...

TEXT BOOKS:

1. Avtar Singh & Walter A. Triebel: The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware, and Applications, PHI, 2003.
2. K.M Bhurchandi, "Advanced Microprocessor and Peripherals Architecture, Programming and Interfacing", Tata Mc Graw Hill , 2006.
3. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
4. Liu Gibson: Microcomputer Systems: The 8086/8088 Family-Architecture, Programming And Design , PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall
3. D. V. Hall: Microprocessors and Interfacing, TMH.

3IT06 **Programming Methodology Lab.:** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 02 syllabus covering each of the units.

3IT07 **Electronics Devices & Circuits Lab. :** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 03 syllabus covering each of the units. At least two experiments must be conducted using PSPICE.

3IT08 **Assembly Language Programming Lab. :** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 04 syllabus covering each of the units.

3IT09 **Computer Lab-I (Linux,Unix) Lab. :** Minimum Eight experiments/programming assignments must be completed based on Linux and /or Unix.

SEMESTER : FOURTH

4IT01 DATA STRUCTURES

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Subalgorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit-II : Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices.

Unit-III : Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists.

Unit-IV : Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.

Unit-V : Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffnan's algorithm. General trees, M-way search Trees.

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

Textbook :

Seymour Lipschutz : " Theory & Problems of Data Structures" Schaum's Outline series (Mc Graw-Hill) International Editions.

REFERENCES :

1. Reema Thareja : Data Structures Using C. (Oxford)
2. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
3. Trembley, Sorenson:- An Introduction to Data Structures with Applications.
4. Aho Ullman : Analysis and Design of Algorithms.

5. Bhagat Singh, Naps : Introduction to Data Structures.

4IT02 COMMUNICATION ENGINEERING

Unit I AM Transmitters

Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter, Generation of SSB-SC by phase-shift method.

Unit II AM Receivers

TRF receiver, Superhetrodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, Communication Receiver, Selectivity filter method, Phase shift method , sensitivity, Image rejection ration of communication receiver,Noise calculation in DSB-FC,DSB-SC & SSB-SC

Unit III FM Transmitters

FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparision, Pre-emphasis and De- emphasis.

Unit IV FM Receivers

Details of FM receiver, blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, AudiQ Amp!., AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster seeley and ratio detectors, Stereo FM receiver, Noise in FM Reception, FM threshold effect.

Unit V Pulse Modulation Technique : The sampling theorem, Sampling of Band-Pass Signal, Linear and Non linear quantization, Aliasiry effect, Aperture effect, Reconstruction of filter, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Time Modulation, PCM, DM, ADM

Unit VI Signal Analysis

Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Delta Function, Fourier Transform of Periodic functions, fundamental of Power Spectral Density & Energy Spectral Density, Correlation, auto-correlation, Cross-correlation.

Text Books

(1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(2) Taub and Schilling D.L. : Principles of Communication Systems, Mc-

Hill Co, Tokeyo, 1994 (II Ed.)

Reference books:-

(1) B. P. Latbi : "Modern Digital and Analog Communication Systems" Oxford University Press, New Delhi.
(2) Hari Bhat: "Analog Communication, 2nd Edition Pearson India, 2010"
(3) S. Kundu: " Analog & Digital Communication, Pearson India, 2010"
(4) R.P.Singh, S.D. Sapre: Communication System, Anolog and Digital, Tata Mc-Graw Hill Co., New Delhi.

4IT03 OJECT ORIENTED TECHNOLOGIES

UNIT I : Introduction to Object Oriented Programming**:** Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming. Objects & classes in C++: Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects,

UNIT II : C++ string Class. Operator overloading :Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers& Arrays. Pointer & functions. New & deleter operators. Pointers For objects.

UNIT III : Inheritance in C++ :Derived class & base class, Derived class Constructors, Function overloading, class hierarchies, public and private inheritance, multiple inheritance Containership : classes within classes.

UNIT IV : Virtual functions concepts, Abstracts classes & pure virtual Functions. Virtual base classes, Friend functions, static Functions, Assignment and copy initialization the this pointer. Dynamic type information. Introduction to C++ graphics, creating basic shapes, using colors and styles .

UNITV: Streams & File in C++: Stream classes, stream errors, disk File I/O with streams File pointers, Error handling in file I/O File I/O with members functions, overloading the extractions & Insertion operators, Memory as a stream object, command Line arguments. Multifile programs.

UNIT VI : Function Tamplate, class templates, Exception syntax Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers iterators, specialized iteratrors, associative containers Function objects.

Text Book:

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia Publications)

References:

1. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 - X.
2. Herbert Schildt C++ : Complete Reference (TMH)
3. BPB Editorial Board Advanced C++(BPB Publications)
4. Lipmann C++ Primer (Addison-Welsley)

4 IT 04/ 4 BM 04 SOCIAL SCIENCES & ENGINEERING ECONOMICS

SECTION - A

Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy. (9)

Unit II : Indian Parliament : composition and powers.
President of India : Election and Powers.
Council of Ministers and Prime Minister (9)

Unit III : Impact of Science and Technology on culture and Civilization. Human Society : Community Groups, Social Control : Meaning, Types and Agencies. Marriage and Family : Functions, Types and problems.

SECTION - B

Unit IV: Nature and scope of Economics : Special significance of Economics to Engineers.
Production : Factors of production, Laws of return, Various Economic systems, Forms of Business Organisation. (9)

Unit V : Banking : Functions of Central and Commercial Banks.
Taxation : Principle of taxation, Direct and Indirect taxes.
Market : Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly. (9)

Unit VI: Economics of Development : Meaning, Characterisitcs of under development, obstacles to Economic growth and vicious circle of poverty.
Economic Planning : meaning, objective and salient features of current five years plan of India.
Planning horizons, life structuring the alternatives.
Economics of comparision of different alternative projects. (10)

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. Joshi G.N. : The Constitution of India, Macmillan India Ltd.
3. Mahajan : The Constitution of India, S.Chand, New Delhi.
4. Maclaver and Page : Principle of Sociology.
5. Davis K. : Human Society
6. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
7. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
8. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
9. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
10. Dhingra I.C. : Indian Economy
11. E.Kuper : Economics of W.R.Development, McGraw Hill Co.,
12. Jemes L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

4IT05 NUMERICAL METHODS & OPERATION RESEARCH TECHNIQUES

Unit I : Error Analysis, absolute, relative and percentage errors. A general error formula and error in series approximation, Solution of Non linear and polynomial equations: Bisection Method, False Position method, secant, Newton Raphson methods.

Unit II : Solution of Linear Systems of Equation : Gauss elimination method, Gauss Jorden Method, Gauss Seidel Iterative Method, Gaussian elimination, Matrix Inversion Method, L-U factorization method. Regression, Curve fitting: Least Square Method, Correlations.

Unit III : Integration and Differential equations : Numerical Integration-Trapezoidal, Simpsons one third and three eight rules, Romberse Method. Newtons forward and backword interpolation formula. Numerical differentiation : Maximum and minimum values. Lagrange's Interpolation Method, Euler's method, Runge Kutta methods, Predictor Corrector method, Taylor Series.

Unit IV : Operations Research Models and Dynamic Programming : Operations research models- classification of problems, phases of operation research, scope and limitation of operations research. Dynamic programming : Investment

problem Stagecoach Problem, Equipment Replacement problem, conversion of final value problem into an intial value problems.

Unit V : Linear Programming and Sequencing: Linear programming – Concept of Linear Programming, simplex method, Big-M Method, Two Phase Simplex Method, concept of duality, transportation problems, Assignment Problem, Hungarian Method. Sequencing Problem: Two-Machine, N-Jobs, and Three Machine Problem.

Unit VI : PERT and CPM : Pert Networks, ET, TE, TL, SE and Critical path, Probability of completion. Decision theory : Introduction, Minimax decision procedure, Bayes decision procedure with and without data, Regret function Vs. Loss function.

TEXT BOOKS :-

1) Computer Oriented Numerical Methods : V.Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2) Introduction to Operation Research : Billy, E.Gillett, Tata McGraw Hill Pub. Co. Ltd., New Delhi.

REFERENCE BOOKS

1) Introduction to Methods of Numerical Analysis : S.S.Shastry, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2) Optimization Theory and Applications : S.S.Rao, Second Edition, Wiley Eastern Limited, New Delhi.
3) J. N. Kapoor- Mathematical Statistics Tata McGraw Hill Pub. Co. Ltd.

4IT06 **Data Structures Lab :** Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4IT07 **Communication Engineering Lab :** Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT08 **Object Oriented Technologies Lab :** Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT09 **Computer Lab-II (HTML) :** Minimum Eight experiments/ programming assignments must be completed based on HTML.

This Lab is based on Web publishing. The topics to be covered include

1. Web Publishing
2. Web Page Design
3. Exposure to IE & NN Browsers

4. Dynamic HTML.

Each group of 2 students should build their own Website.

Text Book: M. Petrovsky : Dynamic HTML in Action (TMH)

*****

Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. ES-1 to ES-4 i.e. at the end of this syllabus.

*****

ENVIRONMENTAL STUDIES

Total Marks : 100

PART-A

SHORT ANSWER PATTERN **25 Marks**

1. The Multidisciplinary nature of environmental studies
- . Definition, scope and importance.
- . Need for public awareness.

(2 lecture hours)

2. Social Issues and the Environment
- . From Unsustainable to Sustainable development
- . Urban problems related to energy
- . Water conservation, rain water harvesting, watershed management
- . Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- . Envionmental ethics : Issues and possible solutions.
- . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- . Wasteland reclamation.
- . Consumerism and waste products.
- . Environment Protection Act.
- . Air (Prevention and Control of Pollution) Act.
- . Water (Prevention and Control of Pollution) Act.
- . Wildlife Protection Act.
- . Forest Conservation Act.
- . Issues involved in enforcement of environmental lesislation.
- . Public awareness. (7 lecture hours)

3. Human Population and the Environment
- . Population growth, variation among nations.
- . Population explosion - Family Welfare Programme.
- . Environment and human health.
- . Human Rights.
- . Value Education.
- . HIV / AIDS.
- . Women and Child Welfare.
- . Role of Information Technology in Environment and human health.
- . Case Studies. (6 lecture hours)

PART-B

ESSAY TYPE WITH INBUILT CHOICE **50 Marks**

4. Natural resources :
- . **Renewable and non-renewable resources :**
  - . Natural resources and associated problems.
    - - Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
    - - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
    - - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
    - - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
    - - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
    - - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- . Role of an individual in conservation of natural resources.
- . Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems
- . Concept of an ecosystem.
- . Structure and function of an ecosystem.
- . Producers, consumers and decomposers.
- . Energy flow in the ecosystem.
- . Ecological succession.
- . Food chains, food webs and ecological pyramids.
- . Introduction, types, characteristic features, structure and function of the following ecosystem :-
  - - Forest ecosystem
  - - Grassland ecosystem
  - - Desert ecosystem
  - - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)

6. Biodiversity and its conservation
- . Introduction - Definition : genetic, species and ecosystem diversity.
- . Biogeographical classification of India.
- . Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- . Biodiversity at global, National and local levels.
- . India as a mega-diversity nation.
- . Hot-spots of biodiversity.

. Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
. Endangered and endemic species of India.
. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

. Definition
. Causes, effects and control measures of :-
- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

. Solid Waste Management : Causes, effects and control measures of
. Role of an individual in prevention of pollution.
. Pollution case studies.
. Diaster management : floods, earthquake, cyclone and landslides.

(8 lecture hours)

PART-C

ESSAY ON FIELD WORK 25 Marks

8. Field work

. Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
. Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
. Study of common plants, insects, birds.
. Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(**Notes :** i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net **(R)**
3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
4) Clark R.S., Marine Pollution, Clanderson Press Oxford **(TB)**

5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7) Down to Earth, Certre for Science and Environment **(R)**
8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.
9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai **(R)**
10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Ca mbridge Univ. Press 1140p
11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications **(TB)**
14) Miller T.G.. Jr., Environmental Science, Wadsworth Publishing Co. **(TB)**
15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
16) Rao M.N. & Datta A.K.,1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18) Survey of the Environment, The Hindu **(M)**
19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science **(TB)**
20) Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media **(R)**
21) Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications **(TB)**
22) Wagner K.D., 1998, Environmental Management, W.B.Saunders Co., Philadelphia, USA 499p.
23) डॉ. विठ्ठल घारपूरे : पर्यावरणशास्त्र- पिंपळापूरे ॲन्ड कंपनी पब्लीशर्स, नागपूर.**(R)**
24) Dr. Deshpande, A.P.Dr. Chudiwale, A.D., Dr. Joshi, P.P., Dr. Lad, A.B.: Environmental Studies, Pimpalapure & Co., Publishers, Nagpur. **(R)**
25) R.Rajagopalan : Environmental Studies, Oxford University Press, New Delhi, 2005 **(R)**

(M) Magazine
(R) Reference
(TB) Textbook

******

DIRECTION

No. 31/2011 Date : 10/06/2011

Subject : Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No. 39 accepted and recommended schemes of teaching & examinations of III to VIII/X as per Credit Grade System of various branches as per Credit Grade System in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of VII & VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice-Chancellor u/s Section 14 (7) of M.U. Act, 1994 on behalf on Academic Council on 9th June, 2011,

AND

Whereas this schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as per Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Engineering & Technology are to be sent for printing.

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers confirmed upon me under sub section (8) of Section 14 of the Maharashtra Universities Act, 1994, hereby direct as under :-

1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering &Technology, Direction, 2011"
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH		Appendix No.
1)	Civil Engineering	A
2)	Mechanical Engineering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Engineering (Electrical & Power)	F
7)	Electrical Engineering	G
8)	Electronics & Telecommunication Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical) Techology	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

Sd/-
Dr. Mohan K. Khedkar
Vice-Chancellor

*****

B.E. / B.Arch. V & VI Semester **Prospectus No. 131741**

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3) Electrical Engineering (Electronics & Power)
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5) Electrical Engineering (Electrical & Power)
6) Electrical Engineering
7) Information technology
8) Architecture
9) Instrumentation Engineering
10) Biomedical Engineering

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 5/2010	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011 Date : 10-06-2011

Subject :- Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology.

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No.39 accepted and recommended schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice Chancellor u/s Section 14(7) of M.U.Act, 1994 on behalf on Academic Council on 9th April, 2011,

AND

Whereas these schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as pere Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Enginering & Technology are to be sent for printing,

Now, therefore, I, Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994 hereby direct as under :-

1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Enginering & Technology, Direction, 2011".
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

	BRANCH	**Appendix No.**
1)	Civil Engineering	A
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7)	Electrical Enginering	G
8)	Electronics & Telecommunications Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology)	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

sd/-
Dr.Mohan K.Khedkar
Vice Chancellor

****

FOUR YEAR DEGREE COURSE IN CIVIL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER - FIFTH

Appendix - A

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5CE01	Reinforced Cement Concrete-II	3	1	-	4	4	4	80	20	100	40	-	-	-	-
02	5CE02	Fluid Mechanics-II	3	1	-	4	4	3	80	20	100	40	-	-	-	-
03	5CE03	Building Planning & CAD	2	-	-	2	2	4	80	20	100	40	-	-	-	-
04	5CE04	Surveying-II	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	5FECE05	Free Elective-I	3	-	-	3	3	3	80	20	100	40	-	-	-	-
06	5CE06	Communication Skills	2	-	-	2	2	2	40	10	50	20	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
07	5CE07	Fluid Mechanics-II - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	5CE08	Building Planning & CAD-lab	-	-	4	4	2	-	-	-	-	-	25	25	50	25
09	5CE09	Surveying-II - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	5CE10	Communication Skills-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
		Total	17	2	10	29	24				550				200	
															GRAND TOTAL : 750	
Free Elective I : (i) Introduction To Earthquake Engineering (ii) Basics of Building Construction (iii) Watershed Management																
SEMESTER : SIXTH																
THEORY																
01	6CE01	Numerical Methods & Computer Programming	4	-	-	4	4	3	80	20	100	40	-	-	-	-
02	6CE02	Structural Design-I	4	-	-	4	4	4	80	20	100	40	-	-	-	-
03	6CE03	Water Resources Engineering-I	3	-	-	3	3	3	80	20	100	40	-	-	-	-
04	6CE04	Transporatation Engineering-II	3	1	-	4	4	3	80	20	100	40	-	-	-	-
05	6FECE05	Free Elective-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
06	6CE06	Estimating & Costing	3	1	-	4	4	4	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
07	6CE07	Numerical Methods & Computer Programming - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	6CE08	Structural Design-I - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	6CE09	Estimating & Costing-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	6CE10	Minor Project - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
		Total	18	2	10	30	26				600				200	
															GRAND TOTAL : 800	

Free Elective II : (i) Disaster Management (ii) Environmental Management

Note: Students will have to opt the Free Electives offered from other courses of their College / Institution / University Department.

FOUR YEAR DEGREE COURSE IN MECHANICAL ENGINEERING

SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - FIFTH

Appendix - B

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5ME01	Production Technology	4	-	-	4	4	3	80	20	100	40	-	-	-	-
02	5ME02	Heat Transfer	4	1	-	5	5	3	80	20	100	40	-	-	-	-
03	5ME03	Measurement Systems	4	-	-	4	4	3	80	20	100	40	-	-	-	-
04	5ME04	Theory of Machines-I	3	1	-	4	4	3	80	20	100	40	-	-	-	-
05	5FEME05	Free Elective-I	3	-	-	3	3	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
06	5ME06	Production Technology-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	5ME07	Heat Transfer-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	5ME08	Measurement Systems-Lab	-	-	2	2	1	-	-	-	-	-	-	25	25	12
09	5ME09	Theory of Machines-I-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	5ME10	Computer Software Applications-I-Lab	-	-	2	2	2	-	-	-	-	-	25	25	50	25
		Total	18	2	10	30	26				500				225	
															GRAND TOTAL : 725	

Free Elective-I **1) Manufacturing Techniques 2) Ergonomics 3) Production Management 4) Project Management**

SEMESTER : SIXTH

THEORY																
01	6ME01	Fluid Power-II	4	1	-	5	5	3	80	20	100	40	-	-	-	-
02	6ME02	Computer Software Applications	3	-	-	3	3	3	80	20	100	40	-	-	-	-
03	6ME03	Control System Engineering	4	-	-	4	4	3	80	20	100	40	-	-	-	-
04	6ME04	Theory of Machines-II	4	1	-	5	5	3	80	20	100	40	-	-	-	-
05	6FEME05	Free Elective-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
06	6ME06	Communication Skills	2	-	-	2	2	2	40	10	50	20	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
07	6ME07	Fluid Power-II-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	6ME08	Computer Software Applications-II-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	6ME09	Theory of Machines-II-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	6ME10	Communication Skills-Lab	-	-	2	2	2	-	-	-	-	-	25	25	50	25
		Total	20	2	8	30	26				550				200	
															GRAND TOTAL : 750	

Free Elective-II **1) Automobile Engineering 2) Non-conventional Energy Systems 3) Energy Management**

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : ELECTRICAL ENGINEERING (ELECTRONICS & POWER)- SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - FIFTH

Appendix - C

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	5EP01	Control Systems - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5EP02	Microprocessor & Microcontroller	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5EP03	Electrical Machines - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5EP04	Signals & Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEEP05	Free Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5EP06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5EP07	Control Systems - I -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5EP08	Microprocessor & Microcontroller -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5EP09	Electrical Machines - II- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5EP10	Communication Skills- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	21	_	8	29	25				550				200	
															TOTAL	750

Free Elective -I 1) Energy Audit & Management 2] Electrical Drives

			Semester : Sixth													
THEORY																
01	6EP01	Electrical Power - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6EP02	Optimisation Techniques	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6EP03	Power Electronics	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6EP04	Computer Aided Machine Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEEP05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6EP06	Electrical Energy Utilisation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6EP07	Power Electronics - I Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6EP08	Computer Aided Machine Design Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6EP09	Electrical Energy Utilisation Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	23	_	6	29	26				600				150	
															TOTAL	750

Free Elective -II 1) Electrical Estimating & Costing 2] Power Supply Systems

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : ELECTRICAL & ELECTRONICS ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - FIFTH

Appendix - D

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	5EX01	Control Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5EX02	Digital Electronics	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5EX03	Electrical Machines - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5EX04	Electrical Power - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEEX05	Free Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5EX06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5EX07	Control Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5EX08	Digital Electronics Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5EX09	Electrical Machines - II Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5EX10	Communication Skills Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	21	_	8	29	25				550				200	
															TOTAL	750

Free Elective -I 1) Energy Audit & Management 2] Electrical Drives

Semester : Sixth																
THEORY																
01	6EX01	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6EX02	Optimisation Techniques	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6EX03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6EX04	Microprocessor & Microcontroller	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6EX05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6EX06	Power Electronics - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6EX07	Electrical Power - II Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6EX08	Microprocessor & Microcontroller Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6EX09	Power Electronics - I Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	23	_	6	29	26				600				150	
															TOTAL	750

Free Elective -II 1) Electrical Estimating & Costing 2] Power Supply Systems

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : ELECTRICAL ENGINEERING (ELECTRICAL & POWER) SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendis - E

Semester : Fifth

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5EL01	Control Systems - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5EL02	Microprocessor & Microcontroller	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5EL03	Electrical Machines - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5EL04	Signals & Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEEL05	Free Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5EL06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5EL07	Control Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5EL08	Microprocessor & Microcontroller Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5EL09	Electrical Machines - II Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5EL10	Communication Skills Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	21	_	8	29	25				500				200	
															TOTAL	750

Free Elective -I 1) Energy Audit & Management 2] Electrical Drives

Semester : Sixth

THEORY																
01	6EL01	Electrical Power - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6EL02	Optimization Techniques	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6EL03	Power Electronics	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6EL04	Computer Aided Machine Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEEL05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6EL06	Electrical Energy Utilisation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6EL07	Power Electronics - I Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6EL08	Computer Aided Machine Design Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6EL09	Electrical Energy Utilisation Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	23	_	6	29	26				600				150	
															TOTAL	750

Free Elective -II 1) Electrical Estimating & Costing 2] Power Supply Systems

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : ELECTRICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - FIFTH

Appendix - F

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	5EE01	Control Systems - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5EE02	Microprocessor & Microcontroller	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5EE03	Electrical Machines - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5EE04	Signals & Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEEE05	Free Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5EE06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5EE07	Control Systems -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5EE08	Microprocessor & Microcontroller -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5EE09	Electrical Machines - II -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5EE10	Communication Skills-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	21	_	8	29	25				550				200	
															TOTAL	750

Free Elective -I 1) Energy Audit & Management 2] Electrical Drives

Semester : Sixth																
THEORY																
01	6EE01	Electrical power - I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6EE02	Optimisation Techniques	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6EE03	Power Electronics	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6EE04	Computer Aided Machine Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEEE05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6EE06	Electrical Energy Utilisation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6EE07	Power Electronics - I -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6EE08	Computer Aided Machine Design -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6EE09	Electrical Energy Utilisation - Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	23	_	6	29	26				600				150	
															TOTAL	750

Free Elective -II 1) Electrical Estimating & Costing 2] Power Supply Systems

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : INFORMATION TECHNOLOGY - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - FIFTH **Appendix - G**

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	5IT01	Operating Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5IT02	Digital Integrated Circuits	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5IT03	Computer Architecture & Organisation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5IT04	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
05	5FEIT05	Free Elective I*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	5IT06	Operating Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	5IT07	Digital Integrated Circuits-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5IT08	Communication Skills-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5IT09	Computer Lab-III (VC++)	1	--	2	3	2	_	_	_	_	_	25	25	50	25
		TOTAL	18	--	8	26	22				450				200	
														TOTAL	650	

Free Elective I* (i) Introduction to Computer Networks (ii) IT Ethics & Practices

Semester :SIXTH																
THEORY																
01	6IT01	Principles of Management	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6IT02	Database Management Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6IT03	Theory of Computation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6IT04	Computer Networks	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEIT05	Free Elective II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	6IT06	Database Management Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	6IT07	Computer Networks-Labs	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6IT08	Computer Lab-IV (UML)	1	_	2	3	2	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	23				500				150	
														TOTAL	650	

Free Elective II* (i) E Commerce (ii) Knowledge Management

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FIVE YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH OF ARCHITECTURE - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - H

SEMESTER : FIFTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
1	05AR01	Building Materials & Construction - V	3	_	_	3	3	4	80	20	100	40	_	_	_	_
2	05AR02	Building Services & Equipment	3	_	_	3	3	4	80	20	100	40	_	_	_	_
3	05AR03	Architectural Structure - IV	2	1	_	3	3	3	80	20	100	40	_	_	_	_
4	05AR04	Specification	2	_	_	2	2	3	80	20	100	40	_	_	_	_
5	05FEAR05	Free Elective -I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
SESSIONAL / PRACTICAL																
6	05AR06	Architectural Design Studio - V	_	_	6	6	6	_	_	_	_	_	75	75	150	75
7	05AR07	Building Materials & Construction Studio - V	_	_	4	4	2	_	_	_	_	_	25	25	50	25
8	05AR08	Interior Design -I	_	_	2	2	1	_	_	_	_	_	25	25	50	25
9	05AR09	Working Drawing - II	_	_	4	4	2	_	_	_	_	_	25	25	50	25
		TOTAL	13	1	16	30	25				**500**				**300**	
														TOTAL		**800**

Note: Consider one hour Lecture / Tutorial and P/D is equal to one credit for the subjects of Architectural Design and for all other subjects consider 1hour Lecture & Tutorial = 1credit & 2hour Practical /Design studio. = 1 credit .

Semester : Sixth

THEORY																
1	06AR01	Architectural Design - VI	2	_	_	2	2	18	150	_	150	60	_	_	_	_
2	06AR02	Building Materials & Construction - VI	3	_	_	3	3	4	80	20	100	40	_	_	_	_
3	06AR03	Architectural Structure - V	2	1	_	3	3	3	80	20	100	40	_	_	_	_
4	06AR04	Estimate & Costing	3	_	_	3	3	3	80	20	100	40	_	_	_	_
5	06FEAR05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
6	06AR06	Acoustics & Illumination	3	_	_	3	3	3	80	20	100	40	_	_	_	_
SESSIONAL / PRACTICAL																
7	06AR07	Architectural Design Studio - VI	_	_	6	6	6	_	_	_	_	_	75	75	150	75
8	06AR08	Building Materials & Construction Studio - VI	_	_	4	4	2	_	_	_	_	_	25	25	50	25
9	06AR09	Interior Design -II	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	16	1	12	29	26				**650**				**250**	
														TOTAL		**900**

Free Elective-II (1) Climate Resonsive Architecture (2) Sustainable Architecture

Noet : Students will have to opt the free electives offered from other courses of their college / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : INSTRUMENTATION ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - I

SEMESTER : FIFTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME: HOURS / WEEK Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	EXAMINATION SCHEME: THEORY DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL MAX. MARKS EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5IE01	Introduction to Microprocessor & Microcontrollers	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5IE02	Power Electronics	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5IE03	Control Systems	4	_	_	4	4	3	80	20	100	40				
04	5IE04	Electronics Instrumentation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEIE05	Free Elective- I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5IE06	Biomedical Instrumentation	4	_	_	4	4	3	80	20	100	40				
PRACTICALS / DRAWING / DESIGN																
07	5IE07	Introduction to Microprocessors-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5IE08	Linear Intregated Circuits -Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5IE09	Biomedical Instrumentation -Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	23	_	6	29	26				600				150	
														TOTAL	750	

Free Elective -I : 1) Sensor & Transducers , 2) Advance Sensors and Transmitters

Semester : Sixth

Sr. No.	Subject Code	Subject	TEACHING SCHEME: HOURS / WEEK Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	EXAMINATION SCHEME: THEORY DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL MAX. MARKS EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	6IE01	Control System Components	4	1	_	5	5	3	80	20	100	40	_	_	_	_
02	6IE02	Unit Operation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6IE03	Digital Circuits Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6IE04	Analog and Digital Integrated Circuits	4	1	_	5	5	3	80	20	100	40	_	_	_	_
05	6FEIE05	Free Elective -II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6IE06	Communication Skills	2	_	_	2	2	2	40	10	50	20				
PRACTICALS / DRAWING / DESIGN																
07	6IE07	Control System Components -Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6IE08	Power Electronics-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6IE09	Communication Skills Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	21	2	6	29	26				550				150	
														TOTAL	700	

Free Elective-II : 1) Control system and Components 2) Industrial Auomation & Process Control

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : BIOMEDICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - J

Semester : Fifth

Sr. No.	Subject Code	Subject	TEACHING SCHEME HOURS / WEEK Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	EXAMINATION SCHEME THEORY DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL MAX. MARKS EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5BM01	Data Structures & Algorithms	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5BM02	Bio Control Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5BM03	Bio Medical Instrumentation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5BM04	Communication Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEBM05	Free Elective-I	3	_	_	3	3	c	80	20	100	40				
06	5BM06	Pathology & Microbiology	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5BM07	Data Structures & Algorithms-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5BM08	Bio Medical Instrumentation-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5BM09	Communication Engineering-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	**23**	**0**	**6**	**29**	**26**				**600**				**150**	
															TOTAL	**750**

Free Elective I : (i) Medical Instrumentation (ii) Principles of Biomaterials and Biomechanics

Semester : Sixth

THEORY																
01	6BM01	Diagnostics and Therapeutic Equipments	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6BM02	Microprocessors and Applilcations	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6BM03	Radiological Equipments	4	1	_	5	5	3	80	20	100	40	_	_	_	_
04	6BM04	Physiological Modelling and Simulation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEBM05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6BM06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6BM07	Microprocessors and Applilcations-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6BM08	Physiological Modelling and Simulation-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6BM09	Communication Skills-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	6BM10	Medical Instrumentation-Lab	_	_	2	2	2						25	25	50	25
		TOTAL	**21**	**1**	**8**	**30**	**27**				**550**				**200**	
															TOTAL	**750**

Free Elective II : (i) Modelling and Simulation (ii) Biomedical Image Processing

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
CIVIL ENGINEERING EXAMS.
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

5CE01: REINFORCED CEMENT CONCRETE – II

SECTION – A

Unit I : 1. Design of circular tanks with rigid and flexible base resting on firm ground by working stress method.
2. Design of rectangular water tanks resting on firm ground by using IS code method (working stress method).

LIMIT STATE METHOD:

Unit-II : 1) Introduction to limit state method, basic concept of singly, doubly reinforced and flanged beams, shear and comparison with working stress method.
2) Analysis and design of one way single span and continuous slabs.

Unit-III 1) Analysis and design of two way solid slabs.
2) Staircases, Design of Dog legged type staircase only.

SECTION-B

Unit-IV: Analysis and complete design of beams, rectangular and flanged sections for bending moment and shear.

Unit-V: 1) Analysis and design of columns for axial load, uniaxial and biaxial bending. (Problem on uniaxial bending only)
2) Design of Isolated footings: Square and rectangular footings subjected to axial load only, Design problem on footing with uniform & non-uniform depth.

Unit-VI: 1) Design of grid slab by I.S. code method.
2) Detailing for earthquake resistant construction. Introduction, Cyclic behavior of concrete and reinforcement, significance of Ductility, Ductility of detailing for beams, Columns, joints & shear walls.

Note: Students should use the latest I.S. codes.

BOOKS RECOMMENDED:

1. Jain A.K.: Plain & Reinforced Concrete, Vol. I & II
2. Sinha S.K. & Roy S.K.: Fundamentals of RCC.
3. Pillai & Menon: RCC Design.
4. Dr.Shah V.L. & Karve S.R.: Limit State Design.

5CE02: FLUID MECHANICS-II

SECTION – A

Unit-I : Turbulent flow through pipes: Karman-Prandtl's equation (No Proof), Nikuradse's experiment, Velocity distribution laws & universal resistance laws, Hydraulically smooth & rough pipes.

Unit -II: Uniform flow, Open channel flow, Types of flow, , geometric elements of rectangular & trapezoidal sections, Chezy's & Mannings equations, most efficient rectangular & trapezoidal section, Energy & momentum principles, Normal & critical depth, specific energy diagram, discharge diagram. Analysis of surface profile by Ven-Te-Chow method.

Unit-III: Gradually varied flow, Dynamic equation of G.V.F. with proof, Analysis of Surface profiles, single step method. Rapidly varied flow; Hydraulic jump in horizontal rectangular channel, specific force diagram, elements of jump, relation between conjugate depth.

SECTION - B

Unit-IV: Dimensional Analysis ; Buckingham's Pie theorem, it's application, similitude, Dimensionless numbers, Re, Fr, We, Predominant forces & their ratio, Model Analysis - Geometrically similar models, Reynolds law, Froudes law, Model study of spillways.

Unit V : Impact of jet on stationary & moving plates, symmetrical, asymmetrical curved vanes; Moment of momentum equation (statement only), velocity diagrams. Elements of Hydroelectric Plant, Hydraulic turbines; classification of turbines, Description of Pelton wheel & Francis turbine, calculation of work done, power & efficiency, specific speed.

UnitVI: Classification of pumps ; centrifugal pumps, main parts & working, velocity diagrams, work done, efficiency, priming of pumps, brief introduction of reciprocating pump, Jet pump, Submersible pump, Hydraulic Ram (No numerical).

BOOKS RECOMMENDED:

1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition, Standard Book House, New Delhi-6
2) Ranga Raju : Open Channel Flow.
3) Dr. Jain A.K. : Fluid Mechanics.
4) Subramanya K. : Flow in Open Channel.
5) Chow V.T. : Open Channel Hydraulics.
6) Garde & Mirajgaonkar : Fluid Mechanics.

5CE03 : BUILDING PLANNING AND CAD

SECTION – A

Unit- I : Introduction: Importance of building drawing for Civil Engineering in construction & estimation, Method of drawing – Selection of scales for various drawings, types of line, methods of dimensioning in architectural drawing.
Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS : 962. Combined first angle & third angle method of projection. Layout of sheet for civil engineering drawing, Requirements of drawing as per plan sanctioning authorities.

Unit-II : Concept of line plan & working drawings of the building. Developing working drawings of the building from the given line plan Details to be incorporated in the working drawing. Necessity and use of working drawing. Concept of site plan, block plan and layout plan. Importance and details to be incorporated. Concept of foundation plan, importance and use. Developing working drawing and foundation plan for load bearing and framed structures. Plumbing & electric plan.

SECTION - B

Unit-III: Planning of residential building. Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement. Climate and design consideration. Orientation of buildings, requirement of the owner, alternatives of building types viz. individual bungalows, semidetached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building. Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Criteria for earthquake resistant planning of building.

Unit-IV: Building rules and by laws, for residential buildings, conversion of land to non-agricultural lands, layout for a housing project. Types of public building and their requirements, planning of public building. Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post-office. Free-hand sketching : Importance in Civil engineering. Free hand sketching of components of buildings and elevation features of building such as balconies, chajjas, etc. Perspective drawing, Staircase planning & drawing.

UNIT-V: (Only for laboratory work)

AUTOCAD: Understanding basic concepts such as Absolute, relative & world Co-ordinates, Drawing units, drawing limits, extend, layers, line types, object snapping, filters.
Drawing entities in AutoCAD/Felix CAD, various drawing commands, use of object snaps & filters, Editing the drawing different editing commands, Dimensioning commands, Text commands, Hatching commands viewing the drawing different views, view ports, zooming in & out, panning, saving & printing in different scales.

IMPORTANT NOTE:-

1) Theory questions only on unit first four units.
2) No theory questions on unit V

BOOKS RECOMMENDED:

1) Shah, Kale & Patki, Building Planning & Drawing, Tata McGraw-Hill plubication
2) Dr. Kumar Swamy & Rao Swamy, Charotar publications
3) Chery R ,Auto cad Pocket reference, BPB Publication.

5CE04 : SURVEYING-II

SECTION- A

Unit-I: Tacheometry: Stadia methods, fixed hair and movable hair and tangential method, formulae for distance and reduce level determination. Theory of analytic lens, Beaman's stadia arc, Auto reduction tacheometer such as Jeffcot Hammer fennel.

Unit-II :
1. Curves : Classification, degree of curve, elements of circular and compound curves, theory and methods of setting out simple curves, Instrumental method of setting out compound curves.
2. Transition curves. : Ideal transition curves, characteristics methods of determination of length, Elements of different types and methods of setting out.

Unit-III
1. Triangulation : principles, classification of triangulation system, triangulation figures, their choice of station, phase of signals, towers, satellite station, reduction to center, field work, Reconnaissance, Inter-visibility, angular measurements.
2. Basenet, extension of Basenet, adjustment of field observation, errors in observation, method of least square, weighted observations, figure adjustment (Triangle only).

SECTION B

Unit-IV: 1. Hydrographic surveying: necessity, controls, shore line surveys, gauges, sounding equipments and procedure of taking soundings, methods of location of sounding, three point problem in hydrographic surveying, analytical and graphical methods. Station pointer.

2. Underground Surveying: surface alignment, correlation of surface and underground surveys; Weisbach triangle, transferring levels underground.

Unit-V: 1. Elements of photogrammetry: Basic definitions, terrestrial and aerial photography, scale of vertical photograph, Relief and relief displacements, heights from parallel measurements, flight planning, photographs required.

2. Remote sensing : Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics.

Unit-VI: 1. Field Astronomy : Elements of spherical trigonometry, Napier's rules of circular parts, celestial sphere, ecliptic, circumpolar stars, astronomical terms, Astronomical triangle, co-ordinate systems.

2. GIS & GPS : Components of geographical information system (GIS), advantages, function of GIS, advantages and disadvantages, global positioning system. (GPS), introduction, definitions, GPS receivers, antenna, advantages of GPS.

BOOKS RECOMMENDED :

1. D.Clark. : Plane and Geodetic Surveying Vol II
2. T.P.Kanetkar & S.V.Kulkarni : Surveying and Levelling Part II
3. B.C.Punmia : Surveying Vol. II and III
4. Prof.Agor : Surveying
5. Prof. Shahane : Advanced Surveying.

5FECE05: FREE ELECTIVE-I
(i) INTRODUCTION TO EARTHQUAKE ENGINEERING

SECTION A

Unit-I: Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, Propagation of earthquake waves .

Unit-II: Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph,

accelerogram recording), Determination of magnitude, Epicenter distance, Ground motion and their characteristics, Factors affecting ground motions.

Unit-III: Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings

SECTION B

Unit-IV: Projections & suspended parts, special construction features like separation of adjoining structure, crumble section, stair case etc, twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking.

Unit-V: Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures,

Unit-VI: Behavior of R.C. building in past earthquakes. Concept of earthquake Resistant design, Introduction to IS: 1893

Reference Books:

1 Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007
2. Amita Sinvhal; Understanding Earthquake Disasters, Tata McGraw Hill
3. P. N. Agraval; Engineering Seismology Oxford & IBH Publishing
4. C.V.R.Murty; Earthquake Tips National Information Centre of Earthquake Engineering I I T Kanpur
5. Pankaj Agrawal & Manish Shrikhande ; Earthquake Resistant Design of Structures Prentice- Hall of India

5FECE05: FREE ELECTIVE-I
(ii) BASICS OF BUILDING CONSTRUCTION
SECTION –A

Unit-I : Introduction: Definition of building as per national building code, components of buildings and their function , Types of structure-load bearing structure and frame structures, their relative advantages and disadvantages, load bearing walls and partition walls. Types of foundation- Definition and necessity and types of foundations, precautions to be taken against failure of foundations

Unit-II : Stone Masonry- Technical term, general principles to be observed during construction, selection of stone masonry. Brick Masonry Construction- Technical term, general principles to be observed during construction, commonly used types of bonds

such as Stretcher, Header, English bond Flemish bond and their suitability.

Unit-III: Floors- Types of floors-Basement floor, ground floor and upper floor. Types of upper floors-R.C.C. slab floor, R.C.C. slab and beam floor, R.C.C. grid floor, R.C.C. flat slab floor. Floor Finishes-Types of flooring material, Shahabad , Kota, Granite, Ceramic tiles, Plain tiles, mosaic tiles ,glazed tiles ,different types of floor finishes , their suitability. Method of construction, criteria of selection. Roofs-Flat and pitched roof ,steel roof trusses-types and suitability ,fixing details at supports ,types of roof covering ,AC and GI sheets, acrylic sheets, fixing details of roof covering.

SECTION –B

Unit IV: Door –Purpose, criteria for location, size of door, door frames and its types, method of fixing Windows- Purpose, criteria for location, size and shapes of windows, types of windows and their suitability. Ventilators – Types and their suitability. Fixtures and Fastening for doors and windows. Glass- Types of glass and their suitability. Arches and Lintels - Types and their suitability. Details of R.C.C. lintels and chajja, precast lintels and arches

Unit-V: Stairs- Function, technical terms, criteria for location, types of staircases and their suitability. Plastering and Pointing-Necessity, types, processes of different types of plastering, defects in plaster work Painting and Coloring – Necessity, types, processes of painting and coloring to the wall surface, wooden surfaces, iron and steel surfaces, types of paints and their uses Scaffolding- Purposes, types, suitability.

Unit VI: Special Aspects of Construction, Damp proofing-causes of dampness, its effects, various methods of damp proofing, material used for damp proofing. Fire proof construction- Points to be observed during planning and construction. Fire protection requirement for a multistoried building, Sound proof construction –Sound absorbents and their characteristic. Joints-Expansion and construction joints necessity, details of expansion joint at foundation level and roof level of load bearing structure and framed structure, Provision of construction joints in slabs, beams and columns.

BOOKS RECOMMENDED:

1) Deshpande R.S.. and Vartak C.V.: A Treatise on Building Construction.
2) Sharma S.K. Kaul and B.K. :A.T.B. Building Construction ,S Chand and co.
3) Gurucharan Sing : Building Construction Engineering, Standard Book House ,Delhi-06

4) Sane L.S.: Construction Engineering, Manak Talas, Mumbai
5) Chudley R.: Construction Technology ,Volume I.II.III. and IV,Longmans Group Ltd.
6) ISE National Building code of India,1970

5FECE05: FREE ELECTIVE-I

(iii) WATERSHED MANAGEMENT

SECTION-A

Unit I Engineering Hydrology: Definition and its importance, Hydrological Cycle, Hydrologic equation. Storages, concept of storages, the watershed
Water and Energy: Energy movement, quality of energy, geometry of energy. The energy budget, Instruments and limitations. The role of water in energy sphere.

Unit II Precipitation: Forms, Types. Factor affecting, Measurement
Evaporation: Processes, factor affecting, measurement and estimation
Evapotranspiration: Processes, factor affecting, measurement and estimation
Infiltration: Processes, factor affecting, measurement and infiltration indices

Unit III Run-off: Factor affecting, estimation of runoff, Rainfall-Runoff co-relation
Floods: Floods classification importance, estimation of flood, flood control techniques, Brief description of flood routing.

SECTION-B

Unit IV Common aquifer: Exploration of ground water hydraulics of ground water flow-Measurement of permeability of formations, flow net and their construction .
Boundary Conditions: Unconfined and confined, steady and unsteady flow in to wells and infiltration galleries.

Unit V : Watershed development management-Definition, Need and scope, characterization of watershed criteria survey, Basic data collection and interpretation, Establishment of watershed research stations.
Hydrographs: Typical flood Hydrograph, base flow separation, Unit hydrograph, S-curve hydrograph.

Unit VI Rain water harvesting: Necessity, method of rain water harvesting, water harvesting potentially, elements of typical water harvesting system, cost of water harvesting.
Roles of NGO's Government and Municipal Corporation Limitations, quality assurance of stored water.

Books Recommended:

1) Sharma R.K.: Hydrology and Water Resources Engineering .
2) Peter E.Black: Watershed Hydrology.
3) Dr. Reddy Jayarami P. :Hydrology, Laxmi Pub..Delhi.
4) R.N.Chaturvedi: Water Resources Systems,Planning and Management.
5) Raghunath H.M. :Hydrology,Wiley Eastern Ltd., New Delhi.
6) Subramanya S. : Hudrology, Tata McGRAW Hill

5CE06: COMMUNICATION SKILLS

Unit I : Word Study : synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension over an unseen passage. Most commonly spoken sentences.

Unit II : (a) Verbal communication, its significance, types of written communication, organization of a text (titles, summaries, headings, sequencing, signaling, cueing etc.), important text factors (length of paragraph, sentences, words, clarification and text difficulty).Evaluation of written communication for its effectivity and subject content.

(b) Non-verbal communication, types of graphics and pictorial devices, body language.

Unit III :(a) Specific formats for written communication like business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to- day written communication like application, notices, minutes, quotations, orders, enquiries etc.

(b) Oral communications - important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conferences and workshops.

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Pub. House.
3) Curriculum Development Centre, TTTI WR, Bhopal : A Course in Technical Engish, Somaiya Pub. Pvt. Ltd.]
4) F. Frank Candlin : General English for Technical Students, University of London Press Ltd.

5CE07: FLUID MECHANICS -II – Lab

PRACTICALS –

Minimum 8 practicals out of the list given below are to be performed: The practical examination shall consist of viva-voce based on theory & practicals.

1. Verification of momentum equation.
2. Determination of Chezy's coefficient.

3. Determination of coefficient of discharge of Venturiflume.
4. Study of Gradually Varied Flow.
5. Study of hydraulic jump, calculations of height of jump, length & energy loss.
6. Trial on Pelton wheel.
7. Trial on Francis turbine.
8. Trial on Reciprocating pump.
9. Trial on Centrifugal pump.
10. Trial on Hydraulic Ram.
11. Study of Hot wire Anemometer, Laser Doppler Anemometer.

5CE08: BUILDING PLANNING AND CAD –Lab

Creating drawing of following, manually & by Auto CAD/Felix CAD and printouts to be submitted along with 10 free hand sketches on quarter of the imperial size sheet.

1. Developing working drawing of single storied residential building from the given line plan.
2. Preparing line plan of residential building from the given data. Developing submission drawing of the above as per requirement of the plan sanctioning authority. (Separate data should be given to every student).
3. Developing working drawing of multistoried framed structures (Apartment building) from given line plan.
4. Developing line plans of public building from the given data (minimum 2 line plans)
5. Free hand sketches: development of free hand sketches of components of building and elevation features of building such as balconies, chajjas, etc.

5CE09: SURVEYING -II - Lab

PRACTICALS –

Minimum 8 practicals from the list mentioned below shall be performed by each student and observations, calculation and relevant work shall be submitted as a sessional work.

Practical examination shall consist of field exercise and vivavoce examination based on the above syllabus & practicals.

LIST OF EXPERIMENTS :

1. Ranging circular curve by offsets from Long Chord.
2. Ranging circular curve by offset from tangents.
3. Ranging circular curve by offset from chord produced.
4. Ranging circular curve by single theodolite.
5. Ranging circular curve by double theodolite.
6. Ranging of transition curve.

7. Finding out tachometric constants.
8. Finding out height & distances by tachometry.
9. Practical on Stereoscope.
10. Location of true meridian at the given point.
11. Triangulation by satellite station.
12. Base line measurement.
13. Triangulation
14. Finding out Latitude and Longitude of a place.
15. To find horizontal distance and difference in elevation between two points by using Total station.

5CE010: COMMUNICATION SKILL - Lab

1) Interactive Language Laboratory.
2) Group Discussion
3) Submission of Technical Report.
4) Mock Interview.

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6CE01: NUMERICAL METHODS AND COMPUTER PROGRAMMING
SECTION - A

Unit-I :
1. Basic grammar of FORTRAN, use of library functions
2. FORTRAN coding sheet, input output statements, format for input output statement, flowchart
3. File input output

Unit-II :
1. Control statements: GO TO, computed GO TO, Assigned GO TO, arithmetic IF, logical IF, block IF, DO statement, implied DO loop
2. Type declaration statement, DIMENSION statement, subscripted variables, DATA statement

Unit-III :
1. Sub – programs: Statement function, function sub – program, subroutine sub program. Dummy and actual arguments.
2. COMMON statement, labeled and blank COMMON,

SECTION-B

Computer Programming using FORTRAN 77

Unit-IV:
1. Matrix operations such as:
   a. Addition and substraction
   b. Multiplication
   c. Transpose
   d. Testing summary etc.

2. Fourth order, Runge - Kutta method for solution of first order, second order differential equations and two simultaneous equations.

Unit-V :
1. Solution of quadratic equation
2. Numerical integral using Trapezoidal and Simpson rule
3. Finding root of equation f (x) = 0 by Newton -Raphson, Regula -Falsi and Bisection method.

Unit VI :
1. Centre of gravity, moment of inertia & radius of gyration of Tee section.
2. Bending moment and shear force ordinates for simply supported beam subjected to point and uniformly distributed load only.
3. Design of singly reinforced beam by limit state method.
4. Determination of coefficient of permeability in parallel and perpendicular direction of bedding plane
5. Reduce level by height of instrument method.
6. Determination of Chezy's constant.

BOOKS RECOMMENDED:

1. Rajaraman, Computer Programming in FORTRAN
2. Schaum Series, FORTRAN Programming.

6CE02: STRUCTURAL DESIGN-I

(Steel structures by Limit State method using IS 800: 2007)

Section - A

Unit I:
1. Introduction to WSM, LSM & plastic analysis.
2. Design of bolted & welded connections subjected to axial loading.

Unit II:
1. Design of compression & tension member.
2. Design of Industrial shed

Section - B

Unit III:
1. Design of simple & compound columns for axial & eccentric loading.
2. Design of column bases subjected to axial load & moment, gusseted base & solid slab base.

Unit IV:
1. Design of simple & compound Beams.
2. Design of welded Plate girder.

BOOKS RECOMMENDED:

1. Duggal, S. K., Design of Steel Structures, Tata McGraw Hill Pub. Company Ltd.
2. N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.

3. Shah & Karve, Design of steel structures.
4. Sheyakar, Design of steel structure.
5. Bhavikatti, Design of steel structure

6CE03: WATER RESOURCES ENGINEERING – I
SECTION – A

Unit-I : Engineering Hydrology: Definition and its importance, Hydrological Cycle, Hydrologic equation, Precipitation: Forms, Types, Factors affecting, Measurement, Rain gauge Network, Estimation of Missing data, Consistency of data, Mean Areal Precipitation, Brief introduction of Intensity-duration-Frequency relationship and Artificial rain.

Unit II : Evaporation: Process, factors affecting, measurement and estimation, control of evaporation. Evapotranspiration: Factors affecting, measurement, and estimation Infiltration: Process, factors affecting, measurement, Infiltration indices. Run-off: Factors affecting, estimation of runoff, Rainfall- Runoff co-relation.

Unit-III: Floods: Flood classification, importance, estimation of flood, flood control techniques, Brief description of flood routing. Hydrographs: Typical flood hydrograph, base flow separation, Unit hydrograph, S-curve hydrograph.

SECTION-B

Unit IV: Irrigation Engineering: Necessity and advantages of irrigation, suitability of soils for different crops, standards for irrigation water. Minor Irrigation Works: Necessity and general layout of Bandhara and percolation Tank. Lift Irrigation: Necessity and general layout, main components

Unit-V: Crop Water Requirements: Principal Indian crop seasons and water requirements for different crops, Duty and Delta, Consumptive use of water and its estimation, Irrigation efficiency. Irrigation methods: Comparative study of different irrigation methods with special emphasis on sprinkler and drip irrigation.

Unit VI: Ground water: Aquifer parameters, Well hydraulics for steady flow condition, safe yield and yield tests. Water Harvesting: Definition, Need for water harvesting, water harvesting potentially, elements of typical water harvesting system, Methods of water harvesting, cost of water harvesting,

BOOKS RECOMMENDED :

Hydrology

1) Sharma R.K. : Hydrology & Water Resources Engg.
2) Raghunath H.M. : Hydrology, Wiley Eastern Ltd., New Delhi.

3) Dr.Reddy Jayarami P. : Hydrology, Laxmi Pub., Delhi.
4) Subramanya S. : Hydrology, Tata McGraw Hill.

6CE04: TRANSPORTATION ENGINEERING - II
SECTION – A

Unit-I : RAILWAY: Railway transportation, classification Railway surveying, track standard terminology, track sections in embankment & cutting, high speed trains. Traction and tractive resistance, hauling capacity and tractive effort of locomotives, different types of traction.

Unit-II: Permanent way: requirement, gauges, coning of wheels, components of permanent way, Rail types and functions, defects in Rails, Rail joints, Sleeper density, Rail fixtures & fastening. Geometric design of railway track, gauge, gradients, speed, superelevation, cant deficiency, negative superelevation, grade compensation, curves, Railway accidents and causes.

Unit-III: Points and crossing Left & right hand turnouts, design calculations for turnout & cross over, types of Track junction, long welded rails. Station and yards : types, function, facilities & equipment. Railway signalling and interlocking: objects, classification & types of signals, control & movement of trains.

SECTION - B

Unit-IV: AIRPORT: Development of air transportation in India, Agencies controlling national & international aviation, Various surveys to be conducted, airport site selection, Airport drainage, Aeroplane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, imaginary surfaces approach and turning zone Runway and Taxiway design: orientation of runway, wind rose diagram, basic runway length and corrections, runway geometric design standards.

Unit-V: Airport layout, Terminal area, unit terminal concept, Apron, Apron layout, Aircraft parking & parking system. Visual aids, Airport parking & lighting of runway, taxiway and other areas. Airport traffic control, need of control aids, instrumental landing systems, accidents in the air.

Unit-VI: TUNNELS: Tunnels necessity, types, tunnel economics, tunnel alignment, tunneling methods in soft soil & hard rock. Needle beam method, drift method. Size and shape of tunnels, Tunnel lining, drainage, ventilation & lighting of tunnels.

BOOKS RECOMMENDED :

1) Saxena & Arora : Railway Engineering.
2) Agrawal M.M. : Railway Engineering.
3) Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
4) Srinivasan : Tunnel Engineering.

6FECE05 : FREE ELECTIVE-II
(i) DISASTER MANAGEMENT
SECTION – A

Unit I: What is disaster, types, damage caused, pre-disaster preparedness, post-disaster preparedness, early warning strategies, National disaster management guidelines, role of NGO'S in disaster management.

Unit II: Principles of emergency management, crisis management, International organizations such as Red cross, United Nations, European Union, Indian organizations, Natural hazards in coastal states in India, what is Tsunami, its characteristics.

Unit III: Monsoon in India, its calculations, flood hazard in India. Regions of country prone to floods, flash floods, damages caused due to floods, Do's and Don'ts in Earthquake.

SECTION - B

Unit IV: Application of remote sensing in disaster management, flood forecasting and warning in India, coordination of central water commission and Indian meteorological department, action plan for flood forecasting and warning.

Unit V : Disaster risk reduction programme, institutional strengthening and capacity building for DRR by Central Govt., State disaster management authority, its functions human resource support required at SDMA, need of psychosocial support and mental health in disasters.

Unit VI : Training of human resource in disaster risk reduction planning at state level, awareness among people, key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster, plan to counter, threats to water supply.

Books Recommended;

1) Cuny,Fred C; Disasters and management, oxford Uni. Press.
2) Alexander,David; Principles of emergency planning and management, Terra publishing, ISBN 1-903544-10-6
3) National Disaster Management Authority, Govt. of India, Report.

4) A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed)

Disaster Management IIPA Publication New Delhi, 1994

6FECE05 : FREE ELECTIVE-II
(ii) ENVIRONMENTAL MANAGEMENT
SECTION – A

Unit I : The nature, scope and components of environmental management.
Environmental impact analysis- need and importance, step involved methods of EIA, public participation and communication.

Unit II: Environmental policy analysis- micro level and macro level, methods of policy analysis, steps involved. : Operational methods, quantitative methods, statical analysis public policy analysis resource allocation, environmental economics etc.

Unit III: Environmental management plan (EMP): components of Environmental Management Plan, Preparation of Environmental Management Plan

SECTION – B

Unit IV: Environmental Legislation and Acts: Water (prevention and control of pollution) Act1974,Air (prevention and control of pollution) Act 1981, Environmental protection Act (EPA) 986, Hazardous waste rules1989, Factory Act 1984 amendments in 1987, Environmental Management System: ISO 14000(EMS)
Environmental Audits: methods, components and preparation.

Unit V: Various agencies for Environmental Managements in India: Ministry of environment and forest, central pollution control boards, state pollution control boards, local bodies, - their scopes, organizational and functional issues, their working etc.

Unit VI: Basics of Data Base Management System (DBMS), Geographic Information System (GIS) and remote sensing in Environmental Management.
Information of software for EIA

Books Recommended :

1) Environmental Impact Analysis- a decision Making Tool: By R K Jain
2) Theory and Practice of Environmental Impact Assessment: By Abbasi AND Ramesh

3) Environmental Impact Assessment: By Shrivastava

4) Environmental laws and policy in India, Armin Rozencaranz, Sham Diwan Marhta L. Nobel, Tripathi publication.

5) Environmental Legislation: V Krishnamurthi

6CE06: ESTIMATING AND COSTING

SECTION – A

Unit-I : General: Importance of the subject, purpose of quantity estimates, Modes of measurement and units of measurement as IS1200. Methods of cost estimating in general, various methods of stage-I (approximate) estimates.
Specification: Purpose and principles of specification writing, types of specification writing and developing detailed specification of a few items related to building, Irrigation Work, Road work. Problem on Four rooms for measurement only

Unit–II : Cost Building-up: purpose and principles, importance of Schedule of Rates in cost estimates, factors affecting analysis of rates. Fixed, variable prime and supplementary cost, overhead costs and its allocation. Recommendations from N.B.O. for Task work, No. of workman etc., Schedule of rates, market rate analysis of some specific items including transportation cost. Workout quantities of various materials required for construction, such as cement, steel, bricks, aggregates, timber.

Unit-III: Cost & Quantity Estimate: Methods of detailed estimates, forms used, detailed estimates of Civil Engineering works, Building, Quantity estimates:

SECTION – B

Unit-IV: Earth work estimates in Roads including hill road. Earthwork calculations for earthen dam.

Unit-V : Valuation - Purpose of valuation, value and cost, market value, potential value, sentimental value, scrap value, etc.
Real estate, Guilt edged security. Net & gross return, tenure of land, free hold & lease hold property. Sinking fund, Depreciation, capitalized value, annualized value, of a old building.

Unit-VI: Organisation for construction industry specific to Govt. organisation. P.W.D.Organisation, Site administration,
Labour contracts, BOT. Role of Govt.deptt. as a construction agency, Arranging Works: Methods of carrying out works, Arranging contract work, Tender Notices, acceptance of tender, essentials of contracts, types of contracts, contract documents,

Indian contract law and Engineering contracts, land acquisition Act, Legal aspects of various contract provision. Cost accounting, various methods; classification of cost, direct & indirect charges, distribution of overheads, MAS account, issue rate of store account.

BOOKS RECOMMENDED:

1. R.H.Namavati. : Estimating and Valuation
2. D.N.Datta : Estimating & Costing – Datta Lucknow.
3. Vazirani: C.E.Estimating & Costing, Chandola Khanna Publisher Delhi.
4. B.S.Patil: Estimating Costing – Orient Longmans.
5. P.W. & H.Deptt. Govt. of Maharashtra: Standard Specification
6. Namavati: Valuation
7. Rangawala: Valuation Charotar Book Stall
8. Dhanpat Rai: Text book of Estimates Costing – Anand & Sons, Delhi.
9. B.C.Chakraborty: Principles of Estimation & Costing.
10. Indian Contract Act.

6CE07 : NUMERICAL METHODS AND COMPUTER PROGRAMMING -Lab

PRACTICALS:

Preparation and execution of at least eight computer programs using FORTRAN. A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE08 : STRUCTURAL DESIGN-I – Lab

PRACTICALS:

1. Candidates are required to prepare at least two designs of steel structures based on theoretical course detailed workings are necessary.
2. A compulsory site visit for studying the various aspect and prepare a report. An Journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE09: ESTIMATING AND COSTING –Lab

PRACTICALS –

The candidates submit the following:

1) i) Detailed estimate of a single story building with minimum four room with a flat roof (Given problem.)
   ii) Detailed estimate of road of minimum 1 KM length with Hot mix coat.

iii) Detailed estimate of any two of the following.
a) R.C.C. Frame structure Residential building.
b) Culvert
c) Septic tank for a colony.

2. Specification for 10 items as below.
Building works 6 Items.
Road Work 2 Items.
Irrigation work 2 Items.
3. Analysis of 8 Items.
4. Valuation of building, existing Building should be taken for valuation work.
5 Submission of one working drawing by actual (field visit) visit to the construction site & its estimate.
6. Tender documents for the Building in problem No. 1
a) Tender Notice.
b) Tender.
c) Schedule A and Schedule B.
d) Conditions of contracts regarding time, labour payment, damages.
7. Use of Computer software for detailed estimate of building.
8. Writing specification for any item.

NOTE:- Practical Examination shall consists of viva-voce and a test based on syllabus and sessional work.

6CE10: MINOR PROJECT – Lab

Any one Group Project in details.

1) Irrigation Project
2) Rehabilitation of Village / Town
3) Water Supply Project
4) Sewerage System
5) Bridge on River

Students should conduct a detailed survey in a seven day camp.
Data Analysis, Design & Submit Report & Drawing sheets.

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

FIFTH : SEMESTER

5ME01 PRODUCTION TECHNOLOGY

Section - A

UNIT I : Concept of quality and quality control, quality of design and quality of conformance, Quality characteristics, Cost of quality & Value of quality, Specification of quality, quality control & inspection.
Concept of TQM & Quality assurance,
Concept of variation, variable and attribute data, Frequency distribution, Measures of Central tendency-
Mean, mode & median, Measures of dispersion. -Range, std. deviation & variance. (8)

UNIT II : Concept of universe and population, Normal distribution curve; Control charts for variables, process capability, Control charts for attributes; comparison between variable charts and attribute charts; precision & accuracy, Sampling plans, Operating Characteristic curve, Quality circle. (8)

UNIT III : Basic principles of work study : definition, method study, introduction, objective, procedure, process charts, flow process charts, operation process chart, principles of motion economy, work place layout, multiple activity chart, two handed process chart, simo chat. Work measurement : definition, techniques, time study, rating system, allowances, std, time estimation, PMTS, MTM. (7)

Section - B

UNIT IV : Standards of measurements: line standards, end standard, wave length standard. Limits, fits and gauges : terminology of limits, Fits and gauges, concept of interchangeability, allowance tolerance, Indian Standard Specification for limits, fits and gauges, B.S. System. Limit gauging - design of Go, No Go gauges. (8)

UNIT V : Linear measurement: various comparators such as mechanical, electrical, optical, pneumatic comparators, their principle, operations and applications.
Angular measurements: vernier, optical, bevel protractor universal bevel protector, Sine bar level clinometers, taper gauges. Thread measurement: screw thread limit and fit limits gauging of screw threads (8)

UNIT VI : Gear measurement : alignment error, master gear, Parkinson tester.

Study and use of optical dividing head, auto collimator, tool makers microscope.

Interferometry, flatnesstesting, squareness testing. Surface texture testing.

Coordinate measuring machine- types, role and application. (7)

Books Recommended:

Text Books:

1. Engineering Metrology – R.K.Jain - Khanna Publishers.
2. Statistical Quality Control- M. Mahajan – Dhanpatrai & Co. Pvt. Ltd.
3. Work Study, ILO

Reference Books:

1. Quality Control - By Juran - Mc. Graw Hill Pub. Company.
2. Statistical Quality Control- By Grant E.L. – R.S.L.Leavgen Worth-. Mc. Graw Hill Pub. Company
3. Statistical Quality Control- By Gupta - Dhanpatrai & Com. Pvt. Ltd

5ME02 HEAT TRANSFER

Section - A

UNIT - I : Introduction, heat transfer in engineering, modes of heat transfer, basic laws of heat transfer and their basic equations. Conduction- thermal conductivity and thermal diffusivity effect of phase & temperature on thermal conductivity, one dimensional steady state heat conduction through slab, cylinder & sphere-simple and composite. Combined conduction- convection, overall heat transfer coefficient. General heat conduction differential equation. One dimensional steady state conduction with internal heat generation for infinite slab, wire & cylinder. **(8 Hrs)**

UNIT II : Insulations, critical radius of insulation, Conduction through extended surfaces, analysis of a uniform C.S. fin, fin efficiency, fin effectiveness, Biot number. Introduction to unsteady state heat conduction, Newton's law of cooling, lumped heat capacity analysis. **(8 Hrs)**

UNIT III :

Radiation- general concepts and definitions, black body & grey body concept. Laws of radiation- Kirchoff's, Plank's, Stefan-Boltzman's, Wien's law. Concept of shape factor, emissivity factor and radiation heat transfer equation. (No numericals). Radiation errors in temperature, measurement, radiation shield. **(7 Hrs)**

Section - B

UNIT IV: Forced convection- heat convection, forced and natural convection, boundary layer theory, hydrodynamic & thermal boundary layers, boundary layer thickness. Laminar & turbulent flow over flat plate and through pipes & tubes (only concept, no derivation & analytical treatment). Dimensionless number and their physical significance Reynold, Prandtl, Nusselt, Grashoff number, empirical correlations for forced convection for flow over flat plate, through pipes & tubes & their applications in problem solving. **(8 Hrs)**

UNIT V : Free convection- velocity and thermal boundary layers for vertical plate, free convection over vertical cylinder and horizontal plate/cylinder (only concept, no derivation & analytical treatment). Use of empirical correlations in problem solving. Condensation & Boiling - introduction to condensation heat transfer, film & drop condensation. Boiling heat transfer, pool boiling curves. **(7 Hrs)**

UNIT VI : Heat exchanger - applications, classification, overall heat transfer coefficient, fouling. L.M.T.D. & E.N.T.U. methods, temperature profiles, selection of heat exchangers. Introduction to working of heat pipe with and without wick. **(7 Hrs)**

Books Recommended

Text Books:-

1. Heat and Mass Transfer; R.K Rajput; S. Chand, New Delhi
2. Heat and Mass Transfer; V.M. Domkundwar; Dhanpat Rai & Co. Delhi

Reference Books:-

1. Heat Transfer; J.P. Holman; McGraw Hill
2. Heat Transfer; P.S. Ghoshdastidar; Oxford University Press, Mumbai
3. Heat Transfer; P.K. Nag; TMH.

5ME03 MEASUREMENT SYSTEMS

Section - A

UNIT I : 1. Generalized Measurement system: Significance of measurement, generalized systems. application of measuring instruments. Types of measuring instruments.

2. General configuration and functional elements of measuring instruments, types of inputs, various methods of correction for interferings and modifying inputs. (6 Hrs)\

UNIT II : General performance Characteristics:-

1. Static characteristics, different types of errors, combination of component errors in overall systems.
2. Dynamic characteristics : General mathematical model of zero order, first order and second order instruments,

response of first and second order instruments to following inputs step, ramp, impulse and frequency.

(10Hrs)

UNIT III : Strain Measurement :

1. Types of strain gauges, strain gauge circuits, calibration, Temperature compensation, use of strain gauges on rotating shafts, selection and installation of strain gauges.
2. Pressure Measurements:-
   Basic methods of pressure measurement, manometers, Transducers-elastic, gravitational. elastic : draph, strain gauge pressure cell, High pressure measurement Bridgeman type, low pressure Measurement - Mcleod, Krudsen, ionisation, Thermal conductivity gauges. **(8 Hrs)**

Section - B

UNIT IV : 1. Force Measurement: Various mechanical. Hydraulic, pneumatic and electrical methods.

2. Torque and Power Measurements : Various mechanical, hydraulic & electric methods.
3. Flow Measurements : Construction- Venturi, orifice, Dall tube, Rota meter. Pressure probes- Pitot static tube, yaw tube anemometer, positive displacement flow meters, turbine meter, electro-magnetic flow meter. **(8 Hrs)**

UNIT V : 1. Temperature Measurements : Standards, Various temperature measuring devices, Bimetallic strip, liquid in glass thermometer, pressure thermometers, thermo couples, electrical resistance thermometers, Thermistors, radiation Thermometors.

2. Liquid Level Measurements : Various methods such as- single flot, displacement or force transducers. Pressure sensitivity, bubbler or Page system, capacitance variation type (for both conducting and non conducting type liquids) Resistance variation type, Radioisotope. (8 Hrs)

UNIT VI: 1. Speed Measurements : Various mechanical type techometers, electrical types tachometers, stroboscope etc.

2. Vibration Measurements : Seismic, Strain gauge and peizoelectic accelerometers.
3. Displacement measurements : Linear and angular displacement measurements, LVDT, LDR, Capacitive & inductive pick ups. **(8 Hrs)**

Books Recommended

Text Books:-

1. Measurement Systems : - By Erenest O. Doebelins - MC Graw Hill.
2. Mechanical Measurement & Control: By D.S.Kumar.

References Books:-

1. Mechanical Measurements :- By T.G.Beckwith & N.L.Bulk - Addison Werllv.
2. Instrumental Measurement & Analysis : By Nakra Choudhari Tata Mc Graw Hill.
3. Mechanical Measurement & Instrumentation :By R.K.Rajput,Katsons Books Publications

5ME04 THEORY OF MACHINES-I

Section - A

UNIT I : 1. Introduction to study of mechanisms, machines, basic definitions, different types of links, kinematic pairs. Grashof's law- class-I and class -II mechanisms. Grubler's criterion, Kutrbach's theory. Inversions of four bar, single slider, double slider mechanisms,.

2. Kinematic analysis of mechanisms:- Transmission angle, Mechanical Advantage, coupler curve and their properties, radius of curvature of coupler curves.. **(8 Hrs)**

UNIT II: 1. Velocity analysis:- Relative velocity method, method of equivalent mechanisms, Instantaneous centre of rotation method, body and space centroids,.

2. Acceleration analysis:- Relative acceleration method, analytical method and, Klein's construction for slider crank mechanism. **(10 Hrs)**

UNIT III : Synthesis of Mechanisms:- Introduction to type, number and dimensional synthesis, graphical method of two position, three position and four position synthesis for input output co-ordination, Overlay method, Freudenstien's equation, Blosch's method. **(7 Hrs)**

Section - B

UNIT IV: Frictional torque in pivot and collar bearing. Brakes, Clutches, and Dynamometers: types, constructional details, operation & calculation of leading dimensions. **(8 Hrs)**

UNIT V : Special purpose mechanisms:- Steering mechanisms, Geneva wheel mechanism.
Cams:- Introduction, types of cam & follower, different motions of followers, graphical layout of cam profiles, cam with specified contours. **(8 Hrs)**

UNIT VI : I) Gear :- Introduction, terminology, gear tooth profiles, involumetry, interference, spur, gears, spiral gears, and its efficiency,

II) Gear Trains:- Types of gear trains, speed ratio applications.

(8 Hrs)

Books Recommended:

Text Books:

1) Theory of Machines, S.S.Ratan, Published by Tata Mc Graw Hill.
2) Theory of Machines and Mechanisms, J.E.Shigley, Uicker and Gordon, Published by Oxford University press-New York.
3) Theory of Machine, R.S.Khurmi and Gupta J.K., Published by Eurasia Publishing house-N Delhi.

Reference Books:

1) Theory of Machines, V.P.Singh, Published by Dhanpat Rai-N Delhi.
2) Theory of Machines, P.L.Ballaney, Published by Dhanpat Rai and sons-N Delhi.
3) Theory of Machines and Mechanisms, Rao J.S. and Gupta K.N., Published by Wiley Eastern-N Delhi.
4) Machines and Mechanisms (applied kinematic analysis), David H. Myszka, Published by Pearson Education –Asia.
5) Mechanisms Design (analysis and synthesis), Arthur G.Erdman and George N.Sandoor, Published by Prentice Hall Inc.
6) Theory of Machines and Mechanisms,Ghosh and Amitabh,Published Affiliated East West Press, N-Delhi.

5FEME05 FREE ELECTIVE-I
(1) MANUFACTURING TECHNIQUES

Section A

Unit I : Overview of manufacturing: Manufacturing science, Introduction to various activities in manufacturing, Properties and application of common ferrous and non-ferrous metals, Common methods of manufacturing, Selection of manufacturing process, Selection of material. **(6Hrs)**

Unit II : Various Machining operations – Turning, planning, shaper, milling, drilling, boring and grinding process. Introduction to tools and equipments required to perform various operations. **(8Hrs)**

Unit III: Introduction to metal forming and sheet metal process**:** Forming process- Forging, rolling, extrusion, wire drawing. Sheet metal processes- Forming, bending, drawing, coining, embossing. Cutting process: Punching, blanking, shearing, lancing. **(7Hrs)**

Section B

Unit IV: Casting: Steps involved in casting, advantages of casting, pattern, difference between pattern and casting, pattern allowances, material used for patterns, molding sand, sand mould making core, types of cores, defects of castings, melting furnace(Cupola), casting process and its applications. **(6Hrs)**

Unit V : Joining process with its types, advantages and disadvantages of riveting, soldering, brazing. Arc welding, gas welding, resistance welding, friction welding. **(6Hrs)**

Unit VI: Powder metallurgy: Methods of production of metal powder, steps in powder metallurgy, mixing and blending, compaction, sintering and finishing. Plastic part manufacturing: Process of extrusion, injection molding, blow molding, compression molding, transfer molding, advantages and disadvantages. **(7Hrs)**

Books Recommended:

Text Books:

1. Manufacturing processes –Workshop practice, R.A. Khan, Ali Hassan, Scitech Pub.
2. Workshop Technology - Hajra Chaudhary, Dhanpat Rai and Sons.

References:

1. Processes and materials of manufacture E.P. Degarmo, Prentice Hall of India (PHI)
2. Material and processes in manufacturing Lindberg, Tata McGraw Hill Pub.

5FEME 05 FREE ELECTIVE - I
(2) ERGONOMICS

Section – A

Unit I : Introduction to Ergonomics , Man machine system, brief history of ergonomics, introduction to human anatomy, posture and body mechanics, musculoskeletal problems in seating and standing **(8)**

Unit II : Anthropometry and Work Place Design, Anthropometric data, applying engineering anthropometry to work station design, work place design for standing and seated workers **(7)**

Unit III : Design of Manual Handling Task , Assessment of Work Load, Anatomy and biomechanics of manual handling & design of manual handling task , lifting , lowering and carrying, grasping and pinching, physiology , workload and work capacity. **(7)**

Section – B

Unit IV : Environmental Factors, Auditory environment- basic principles, Noise & vibration, measurement of sound, noise

exposure and hearing loss, annoyance & distraction, interference with communication, structure of ear, Thermal environment-basic principle, factors affecting the human comfort, physical work and heat stress, visual environment-basic principle, main factors in visual environment, illumination and color, lighting, glare Whole body vibration , segmental vibration, sources of vibration, discomfort **(8)**

Unit V : Design of controls and tools, Design of controls, symbols, labels, visual displays of dynamic information, design and selection of tools **(7)**

Unit VI : Applications of ergonomics in various fields, Human errors, accidents & safety. **(7)**

Books recommended

Text books –

1. Introduction to Ergonomics by R S Bridger, Edition 1995, Mc Graw Hill International.

Reference books –

1. Human Factors in Engineering & Design by Mark S Sanders and Ernest J. Mc Cormick, Seventh Edition, Mc Graw Hill International
2. Ergonomics in manufacturing , Edited by Waldermar Karwowski & Gavriel Salvendy, Engineering Management Press (EMP), Georgia
3. Industrial Ergonomics; M.I. Khan; PHI.

5FEME05 FREE ELECTIVE-I
(3) PRODUCTION MANAGEMENT

Section -A

UNIT I : Designing products, services and processes; Historical evolution of productions and operations management, new product designs, manufacturing process technology.
Flexible manufacturing systems(FMS) and computer integrated manufacturing(CIM), design of services and service processes, tools for product development.
Standardization, simplification, specialization, diversification, product analysis.

UNIT II : Forecasting & Facility Location: Types of forecasting models, selection of the forecasting model, need for facility location planning, procedures for facility location planning, facility

location planning, facility location models & facility payout planning.

UNIT III : Job Design & Capacity Planning: effective job design, production and operations standards, method study, work measurement, capacity measuring , capacity planning modeling, capacity strategies.

Section -B

UNIT IV: Aggregate Planning for Production & Scheduling: Operation planning and scheduling systems, the aggregate
planning process, strategies for developing aggregate planning, master scheduling and rough cut capacity planning, aggregate planning for service organizations, loading sequencing, expediting.

UNIT V : Inventory Control: Demand and control system characteristics, inventory concepts, costs Modeling, Deterministic inventory models, stochastic inventory models, inventory control application, just-in-time manufacturing.

UNIT VI: Quality Management: Quality and quality related costs, quality function deployment(QFD), Taguchi's off-line quality control methods, managerial responsibility in managing for quality products & services. TQM. Failure analysis, bath tub curve, Reliability of system, Maintainability and availability.

Books Recommended

Text Books:

1. Production and operations management- concepts models and Behaviour by Everett E. Adam,Jr., & Ronald J. Ebert (Prentice- Hall of India)
2. Production and operations management – Total Quality and responsiveness by Hamid Noori & Russell Radfort (Mc Graw Hill, Inc.)

References Books

1. Industrial engineering & production Management by M. Mahajan (Dhanpat Rai & Co.)
2. Industrial engineering & management by O.P.Khanna(Dhanpat Rai & Co.)
3. Production and Operations Management; J.P. Saxena; McGraw Hill

5FEME05 FREE ELECTIVE-I
(4) PROJECT MANAGEMENT

Section -A

UNIT I : Concepts of Project & Project Selection : Project & development, concept of a project, external causes of delay, Internal constraints, criteria for project selection models,

Types of project selection models, Analysis under high uncertainty, project proposals.

UNIT II : Project organization and planning: organizational form, strategic variables, need for planning, project coordination, negotiation and conflict resolution.

UNIT III: Budgeting and Cost Estimation: estimating project budgets, improving the process of cost estimation, Life-cycle-costing, project cost reduction methods.

Section -B

UNIT IV: Scheduling and resource allocation ; Network Techniques CPM and PERT, Gantt Charts, resource constraints, resource loading, resource leveling, integrated resource management.

UNIT V: Project Control: monitoring and information systems MIS, purposes of control, types of control processes, project cost overruns and cost control, project audit.

UNIT VI: Issues in project Management: Multicultural, issues, project cost escalation, conflict zones in project management, appraisal processes, concepts and techniques,managing project resources flow, project feasibility study.

Text Books:

1. Text Book of Project Management by P. Gopalkrishnan & VE Rama Moorthy (MacMillan India Ltd)
2. Project Management – A Managerial Approach by Jack R. Meredith & Samuel J. Mantel, Jr.(John Wiley & Sons Inc.)

Reference Books:

1. Project Management by Clifford F. Gray/Erik W. Larson (Mc Graw Hill).
2. Project Management by Prassana Chandra.

5ME06 PRODUCTION TECHNOLOGY-LAB.

Practicals : At least six from the below list.

Minimum Six experiments from the following list:

1. Determination of Linear/Angular dimensions of a given specimen/ part using Precision/Non-Precision Measuring instruments.
2. Precision Angular Measurement using Sine Bar/Sine Centre, Autocollimator/Angle Dekkor.
3. Measurement of Gear Tooth Thickness by Gear Tooth Vernier Caliper/Constant Chord/Span Micrometer.
4. Measurement of Circularity/Roundness of a given specimen.
5. Measurement of Screw Thread Element by Floating Carriage Micrometer.
6. Testing of Surfaces by using Optical Flat.

7. Measurements of various angles of single point cutting tool by using Profile Projector and Tool Maker's Microscope.
8. Preparation of X and R chart for the given lot of sample.
9. Preparation of process chart.

Practical Examination :-

The practical examination shall consist of oral on term work and syllabus taken jointly by Internal and External examiner.

5ME07 HEAT TRANSFER-LAB.

List of Practicals (Any six of the following):-

1. Determination of thermal conductivity of a metal bar.
2. Determination of thermal conductivity of insulating powder.
3. Study of heat transfer through composite wall.
4. Study of heat transfer through composite cylinders.
5. Determination of fin efficiency.
6. Verification of Stefan-Boltzman's law.
7. Determination of emissivity of grey body.
8. Determination of heat transfer coefficient for forced convection.
9. Determination of heat transfer coefficient for natural convection.
10. Study of pool & nucleate boiling.
11. Trial on double pipe heat exchanger.
12. Determination of efficiency of cross flow heat exchanger.
13. To write a computer program for conduction heat transfer problem.

Practical Examination:- The practical examination shall consist of oral on the term work and syllabus.

5ME08 MEASUREMENT SYSTEMS-LAB.

List Of Practicals :

Atleast of eight practicals from the following list.

1. Measurement of strain using strain gauges.
2. Calibration of pressure gauge with pressure gauge tester.
3. Measurement of linear displacement by LDR and inductive pick-up transducers.
4. Performance of capacitance transducer as a angular displacement measuring device.
5. Performance of inductive Transducers.
6. Flow measurement.
7. Speed measurement by a stroboscope.
8. Speed measurement by magnetic pick up or phot electric pick up tachometer.
9. Pressure measurement by strains gauge type transducer.
10. Vibration measurement.
11. Liquid level measurement.

12. Temperature measurement.

The practical examination shall consist of viva-voce on the above syllabus & practical work.

5ME09 THEORY OF MACHINES - I - LAB.

PRACTICALS:- At least eight practicals from the below list shall be performed.

1. Study of inversion of four bar mechanism.
2. Study of inversion of slider crank mechanism.
3. Study of inversion of double slider crank mechanism.
4. Study of velocity analysis by relative velocity method/ pole technique.(2 Prob)
5. Study of acceleration analysis by relative acc. method. (2 Prob)
6. Study of brakes.
7. Study of clutches.
8. Study of dynamometer.
9. Study of Graphical layout of cam profile. (3 Prob.)
10. Study of gear trains
11. Problem in position synthesis.
12. Problem in input/output coordination
13. Computer aided synthesis of four bar mechanism.

The practical examination shall consist of viva-voce on the above syllabus & practical work.

5ME10 COMPUTER SOFTWARE APPLICATIONS -I – LAB.

1. 2D & 3D CAD modeling methodology using packages like AutoCAD, CATIA, Pro-E, Solidedge, Unigrpahics, etc..
2. Creation of 2D Drawing (Sketching module) of any three mechanical machine component using any modeling /drafting software.
3. Creation of 3D drawing (part Module) of any three mechanical machine parts using any modeling software.
4. Creation of an assembly using (assembly module) various machine 3D parts using any modeling software.
5. Creation of 3D detailed part for any sheet metal components using 3D Product modeling software.
6. Creation of any one mechanism/animation using any modeling software.

At least five practicals from the above list should be performed.

Practical Examination:-

It shall consist of viva-voce based on term work and syllabus to be examined by internal and external examiner.

SEMESTER : SIXTH

6ME01 FLUID POWER-II

Section - A

Unit I : 1. Prime Movers :- Theory of impulse and reaction machines. Pelton, Francis and Kaplan turbines, their construction, classification, analysis, characteristics and governing, draft tube, unit quantities. **(8)**

Unit II : Centrifugal pumps :- Basic Theory, classification, construction, operation, characteristics, multistage, NPSH and cavitations in pumps. **(7)**

Unit III:
1. Axial flow pump :- Basic theory, construction, operation, and characteristics.
2. Other water lifting devices :-
   (a) Air lift pump.
   (b) Jet Pump.
   (c) Hydraulic Ram.
3. Computational Fluid Dynamics (CFD): Basic Definition, Applications of CFD in the area of research & Industry. Comparison of Experimental Fluid Dynamics and Computational Fluid Dynamics, Importance of Governing Equations and the physical meaning of the involved terms. Equation of continuity, equation of motion & energy balance equation in Cartesian & cylindrical polar coordinates. **(10)**

Section - B

Unit IV : Positive displacement Pumps :-1. Reciprocating Pumps :- Basic theory, types, construction, installation and characteristics. 2. Rotary Pumps :- Basic theory, types, construction and variable delivery pumps. **(9)**

Unit V : Compressible fluid flow :- Perfect gas relationship, speed of sound wave, mach number, Isothermal and isotropic flows, shock waves, fanno and Rayliegh lines. **(8)**

Unit VI :
1. Hydrostatic systems, their function, components and application such as Hydraulic press, lift, crane and fluid drive for machine tools. Intensifier and accumulator
2. Hydrokinetic systems : Fluid couplings and torque converter. **(8)**

Books Recommended :-

Text Books:-

1. CSP Ojha, R. Berndtsson, Fluid mechanics and machinery; Oxford university.
2. Bansal R.K., Fluid mechanics and fluid machines; Laxmi publications.

Reference Books:-

1. Jagdish Lal, Hydraulic machines; Metropolitan Book Co. Pvt. Ltd.
2. Dr. Mody & Seth, Hydraulics and Fluid Mechanics; Standard house book.
3. Sen gupta, Computational fluid dynamics; Pearson Publishers.
4. Sameer sheikh, Iliyas Khan, Treaties on Hydraulics; Pneumatics, R.K. Publication.

6ME02 COMPUTER SOFTWARE APPLICATIONS

Section -A

Unit I : **Introduction to data base management system** (DBMS): Database system application, purpose of database systems, view of data, database languages, relational databases, database design, object based and semi structured databases, data storage and querying, transaction management, data mining and analysis, database architecture, database users and administrators. **(6 Hrs)**

Unit II : **Relational Databases**: Structure of relational database, Fundamental relational algebra operation, Additional relational algebra operation, extended relational algebra operation, Null values, Modification of the database. **(6 Hrs)**

Unit III : **Database design and the E-R model**: Overview of the database process, The entity- relational model, Constraints, Entity-relationship diagrams, Entity- relationship design issues, Weak entity sets, Extended E-R features, Database design of banking enterprise, reduction to relational schemas, other aspects of database design the unified modeling languages. **(8 Hrs)**

Section-B

Unit IV : **Structured Query Language(SQL)** : Introduction, data definition, basic structure of SQL queries, set operations, Aggregate functions, null values, nested sub queries, complex queries, view, modification of the database, joined relations, SQL data types and schemas, integrity constraints. **(8 Hrs)**

Unit V : **Relational Database design**: Features of good relational design, atomic domains and first normal forms, decomposition using functional dependencies, functional-dependency theory, decomposition using functional dependencies, decomposition using multi valued dependencies, more normal forms, database design process, modeling temporal data. **(8 Hrs)**

Unit VI : **Modeling and Simulation :** Model, Types of model, advantages of modeling, need of system modeling, system approach to modeling, Introduction to simulation, modeling of simulation,

environment, component of system, steps in simulation, advantages and disadvantages of simulation, simulation Languages and packages. **(6 Hrs)**

Books Recommended:

Text Books:

1. Database system concepts –A. Silberschatz, H. Korth, Mc-Graw-Hill, 5th Edition.
2. System Simulation –G. Gordon, Prentis Hall international publication
3. Database Management systems; Raghu Ramkrishnan, Johannes Gehrke; McGra Hill International

Reference Books:

1. An Introduction to Database system –C. J. Date, Addison Wesley publication
2. System Simulation with digital computer – Narsingh Deo, Prentis Hall international

6ME03 CONTROL SYSTEM ENGINEERING

Section - A

Unit I: Introduction system concept, open & closed loop systems, Mathematical models of physical systems, transfer functions.Block diagrams reduction and signal flow graphs.

Unit II : Basic control actions and Industrial controllers :-Classification of industrial automatic controllers, control actions, proportional controllers, obtaining derivative and integral control action, effects of integral and derivative control action on systems performance.

Unit III : Transient Response Analysis :- Introduction Std. Test signals, steady state response of first and second order systems for stop, ramp and impulse input, transient response specifications, steady state error & error constants.

Section - B

Unit IV: Concept stability, necessary condition for stability, Rauths stability criterion, Root locus concept, construction of Root loci, systems with transporation lag.

Unit V : Frequency Response methods :-Introduction, concept of Bode diagrams.

Unit VI : Study of important automatic speed control systems in machine tools, Prime movers, system generators, etc. Analysis of performance characteristics.

BOOKS RECOMMENDED:-

TEXT BOOKS :

1. Modern Control System by Richard C. Dorf, Robert H. Bishop, 9th Edition 2007
2. Automatic Control Enginering by F. H. Ravan Mc-Graw-Hill.

REFERENCE BOOKS:

1) Modern Control Engg. - by Katsuhiko Ogata, PHI, 4th Edition 2006.
2) Automatic Control Engg. - by Kuo B.C. & F. Golnaraghi, 10th edition 2008
3) Control System Engg. - by Nagrath & Gopal, 5th Edition 2006

6ME04 THEORY OF MACHINES-II

Section – A

UNIT I : 1. Static equilibrium, superstition principle, Static force analysis applied to plane motion mechanisms, virtual work method, static force analysis without and with friction.

2. Theory of hydrodynamic lubrication, boundary lubrication, film lubrication, rolling friction, performance of bearing. **(9 Hrs)**

UNIT II : 1. D'Alemberts Principle. Engine force analysis-piston effort, thrust along connecting rod, side of cylinder, on the bearings, crank effort and turning moment on the crank shaft.

2. Dynamic equivalent system of connecting rod. Inertia of the connecting rod. Inertia force in reciprocating engines (graphical method).

3. Turning moment diagrams for two stroke, four stroke and multi cylinder engines, fluctuations of speed & energy, Flywheel requirements. **(8 Hrs)**

UNIT III : 1. Space mechanism:- Gyroscope, gyroscopic effect as applied to ship, aeroplane, 4 wheeler, 2 wheeler, universal joint.

2. Vehical dynamics :- Coefficient of adhesion, resistance to vehicle motion, relative drive effectiveness, braking of vehicles. **(7 Hrs)**

Section - B

UNIT IV :

Concept and basic terms of vibratory motions, types of vibrations, basic features or elements of vibrating systems, degree of freedom in mechanical vibratory system.

1. Longitudinal vibrations- Natural frequency of free longitudinal vibrations by equilibrium, energy and Rayleigh method. Effect of inertia constraint in longitudinal vibrations. Damped vibrations with mass, spring and dash pot. Definitions of logarithmic decrement, magnification factor, transmissibility, vibration isolation.

2. Transverse vibrations- natural frequency of free transverse vibrations. Effect of inertia constraints in transverse vibrations. Natural frequency of free transverse vibrations due to point load and uniform distributed load acting over a simply supported shaft. Frequency of free transverse vibrations of a shaft subject to a number of point loads by energy and Dunkerley's method **(9 Hrs)**

UNIT V :- 1. Torsional vibration, single rotor systems, Two Rotor system, three rotor system, geared systems, Graphical method for multi rotor system.

2. Whirling of shaft & critical speeds. **(6 Hrs)**

UNIT VI : Balancing of Machinery:- Static, & dynamic unbalance, balancing of rotating masses in same and different transverse planes, Balancing of single cylinder, multi-cylinder V and radial engines. Partial balancing of reciprocating masses. Balancing of linkages & machine. **(9 Hrs)**

Books Recommended:

Text Books:

1) Theory of Machines, S.S.Ratan, Published by Tata Mc Graw Hill.
2) Theory of Machines and Mechanisms, J.E.Shigley, Uicker and Gordon, Published by Oxford University press-New York.
3) Theory of Machine, R.S.Khurmi and Gupta J.K., Published by Eurasia Publishing house-N Delhi.

Reference Books:

1) Theory of Machines, V.P.Singh, Published by Dhanpat Rai-N Delhi.
2) Theory of Machines, P.L.Ballaney, Published by Dhanpat Rai and sons-N Delhi.
3) Theory of Machines and Mechanisms, Rao J.S. and Gupta K.N., Published by Wiley Eastern-N Delhi.
4) Mechanisms Design (analysis and synthesis), Arthur G.Erdman and George N.Sandoor, Published by Prentice Hall Inc.
5) Theory of Machines and Mechanisms,Ghosh and Amitabh,Published Affiliated East West Press N-Delhi.

6FEME05 FREE ELECTIVE-II
(1) AUTOMOBILE ENGINEERING

SECTION - A

UNIT I : Classification of automobiles, chassis types, Power Unit-Functions, basic working of SI and CI engines, engine parts-types, construction and functions, Multiple cylinder engines, Firing order **(7 Hrs)**

UNIT II : Fuel feed systems- fuel feed systems for petrol and diesel engines, Fuel pumps, fuel filters, Air filters, Basic principles of MPFI and CRDI. Multipoint Fuel Injection Systems (MPFI), Common Rail Diesel Injection Systems(CRDI). Cooling system: purpose, types of cooling system, liquid cooling system-water jacket and ports, water pump and radiators, by pass recirculation system, temperature indicator, antifreeze mixtures. **(7 Hrs)**

UNIT III : The electrical system. Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive. Ignition system:- Battery coil ignition system, Electronic ignition system **(7 Hrs)**

SECTION - B

UNIT IV : **Transmission system:-** Layout, single plate friction clutch and multiplate clutch, clutch troubles and remedies. Gear Boxes:- Sliding mesh, constant mesh gear box, Propeller shaft, Hotchkiss drive, torque tube drive, differential. **(8 Hrs)**

UNIT V : **Braking system:** Mechanical, hydraulic brakes, power brakes, and vacuum brakes Steering system:- Function, types of linkages, steering gears, steering gear ratio, wheel balancing, wheel alignment, camber, castor, king pin inclination, toe-in & toe-out & their effects, Introduction to power steering. **(7 Hrs)**

UNIT VI : **Suspensions :** Rigid axle and independent suspension system, shock absorbers. Auto lubrication :- Types of lubricants, their tests and ratings, multi viscosity oils. Engine lubrication:- types of lubricating systems, full pressure system, dry sump system, oil pump, crankcase ventilation. **(6 Hrs)**

Books Recommended

Text Books:-

1. Automobile Engineering- Vol. I & II; Kirpal Singh; Standard Publishers Distributors
2. Automobile Engineering; R.K. Rajput; Laxmi Publications, New Delhi

Reference Books:-

1. Automotive Mechanics; Crouse & Anglin; TMH.
2. Automotive Mechanics; J.Heitner; East West Press
3. Automotive Mechanics; S. Srinivasan; TMH.

6FEME05 FREE ELECTIVE-II
(2) NON-CONVENTIONAL ENERGY SYSTEMS

Section - A

UNIT I : **Introduction :-** Renewable & Nonrenewable sources. Solar **Radiation :** Solar constant, basic earth-sun angles. Spectral distribution of extra terrestrial radiations & its variation. Solar time, Direction of beam radiation, computation of radiation on inclined surfaces. **(7 Hrs)**

UNIT II: **Radiation Transmission through covers:-** Reflection and absorption of radiation, optical properties of cover systems transmittance effects of surface layers on transmittance, transmittance absorptance product. Solar Energy collections:- Heat transfer for solar energy utilization, flat plate collectors such as liquid & air collector. Introduction to various systems of concentrating collectors. **(7 Hrs)**

UNIT III : Solar energy Utilization:- Application of solar energy in heating, cooling, pumping, power production, distillation, drying, solar cookers, solar pond, solar furnace. Solar Energy Storage :- Methods of storage such as sensible, latent heat & thermo-chemical storage, selection of method of storage, properties of storage materials and different arrangements of storages. (No analytical treatment) **(7 Hrs)**

Section - B

UNIT IV: **Energy from Ocean:-** Tidal Power:- types of tidal plants such as single and two basin plants, power developed & operation of tidal power plant. Ocean thermal energy conversion system. Oceam temp. profile, OTE power plant development, controlled flash evaporation, indirect vapour cycle. Wind Power:- Wind speed data, power in the wind, wind power development, types of wind mills, application for pumping and power generation. (No numerical) **(7 Hrs)**

UNIT V: **Biomass Energy Resources:** Mechanism of green plant photosynthesis. efficiency of conversion, solar energy plantation, biogas – Types of biogas plants, factors affecting production rates. Pyrolysis, Gasifiess : Types & classification. Straight vegetable oils as a liquid fuels and their properties. Introduction to bio-diesel as a diesel engine fuel. **(7 Hrs)**

UNIT VI : Direct Energy Conversion:- Photo voltaic cells : Principle, concept of energy conversion, conversion efficiency, power output and performance, storage. Fuel Cells: Principles types of fuel cells, conversion efficiency. Geothermal Energy Resources, power generation methods like vapour dominated. water dominated, flash steam, binary fluid and total flow concept of power generation. **(7 Hrs)**

Books Recommended:

Text Books:-

1. Solar Energy; S.P. Sukhatme; TMH
2. Non-Conventional Energy Sources; G.D. Rai; Khanna Publications

Reference Books:-

1. Treatise on Solar Energy; H.P. Garg; John Wiley & Sons.
2. Renewable Energy Conversion, Transmission and Storage; Bent Sorensen; Elsevier Publication
3. Renewable Energy; Godfrey Boyle; Oxford University Press, Mumbai
4. Renewable Energy Sources and Emerging Technology; D.P. Kothari, K.C. Singal, Rakesh Ranjan; PHI

6FEME05 FREE ELECTIVE-II
(3) ENERGY MANAGEMENT
Section-A

UNIT-I: Introduction to energy, Sources of energy, Forms of energy, Energy reserves, renewable energy sources, Units of energy. Energy consumption and GDP. Need and importance of energy conservation and management (7 Hrs)

UNIT-II : Energy audit concepts, Mass and Energy balances, Energy Auditing-methodology, analysis and reporting, Evaluation of energy conserving opportunities, Economic analysis and life cycle costing. (7 Hrs)

UNIT-III : Energy conservation in steam generation and supply system. Boiler performance, Boiler efficiency (direct and indirect method), excess air, flue-gas monitoring. (7 Hrs)

Section - B

UNIT-IV : Energy conservation Energy conservation in compressed air systems, refrigeration and air-conditioning systems and water systems. Elementary coverage of energy conservation in pumps and fans. Opportunities in Process Industries for Energy conservation. (7 Hrs)

UNIT-V : Electrical energy conservation in building lighting, heating, ventilating and air conditioning, Energy efficient motor, power factor improvement in power systems. (9Hrs)

UNIT-VI : Energy environment interaction, Environmental issues, Global warning, Carbon dioxide emissions, Depletion of ozone layer, Government's regulations, Energy economy interaction. (7 Hrs)

Books Recommended

Text Books:

1. P.H. Henderson; India – The Energy Sector; Oxford University Press.
2. D. A. Ray; Industrial Energy Conservation; Pergamon Press.

Reference Books:

1. W.S. Turner; Energy Management Handbook (Wiley)..
2. Rajan; Optimizing Energy Efficiency in the Industry, Tata McGraw Hill Publishers.
3. C.L Capehart; Guide to Energy Management, Fairmont Press.

6ME06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage.
Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage, reading
Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.
Active and passive forms, negative and interrogative, punctuation and capitalization. Summary, Precise & abstract writing. **(10 Hours)**

Unit II: Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.
Non-verbal communication, types of graphics and pictorial devices. **(10 Hours)**

Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like writing applications, Resume, notices, minutes, quotations, orders, enquiries etc. Claim letter.

Oral communications - Important objectives of interpersonal skills, soft skills(listening, speaking strategy), (verbal and non-verbal), face to face communications, group discussion and personal interviews.

Methodology of conduction of meetings, seminars, symposia, conference and workshop. **(10 Hours)**

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) M.A. Rizvi: Effective Technical communication, Tata McGraw Hill.
3) Urmila Rai & S.M.Rai : Communication Skills ,Himalaya Publisher House.
4) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
5) Dr. Nageshwar Rao & Dr. Rajendra P. Das : Communication skills, Himalaya Publisher House.

5IT08 Communication Skills Lab:

Lab based on syllabus of 5IT08.

Objective: On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be accessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

TEXT BOOK: Norman Lewis: Word Power Made Easy

5IT09 Computer Lab- III (VC++) :

This laboratory shall be based on MFC using VC++. Minimum eight programs based on the following:

i) MFC application creation
ii) Using dialog boxes
iii) Windows common controls
iv) Document / View architecture
v) Printing with MFC

Reference :J. Prosise: Programming Windows with MFC (Microsoft Press).

6ME07 FLUID POWER –II-LAB.

Practical Term Work :

At least seven exercises based on the following.

1) Trial/study of Pelton turbine.
2) Trial/study of Francis turbine.
3) Trial/study of Kaplan Turbine.
4) Trial/study of centrifugal pump.
5) Trial/study of reciprocating pump.
6) Trial/study of Axial flow pump.
7) Study of multistage pump.
8) Trial/study of Hydraulic Ram.
9) Study of Hydrostatic components systems.
10) Study of Hydrostatic systems.
11) Study of Hydrokinetic systems.
12) Study of Cavitation phenomena.
13) Study of governing of Impulse Turbines.
14) Study of governing of reaction turbines.
15) Study of Special pumps (Air lift pump/jet pump)
16) Formulation of problem concerning the fluid flow in the vessel with any commercial code available like CFX, FLUENT, PHOENIX.

Practical examination shall consist of oral/and or experimentation based on above term work.

6ME08 COMPUTER SOFTWARE APPLICATIONS –II –LAB.

Practicals:

1. At least four practical's using SQL for mechanical applications.
2. Demonstration of simulation packages Practical examination shall consist of oral based on above term work and syllabus.

6ME09 THEORY OF MACHINES –II-LAB.

Practicals:-

At least eight practical from the following list

1) Determination of intertia of simple pendulum.
2) Determination of inertia of compound pendulum.
3) Determination of inertia of irregular bodies.
4) Experiment on state balancing of rotating masses.
5) Experiment on dynamic balancing of rotating masses.
6) Determination of gyroscopic couple.
7) Experiment on whirling speed of shaft.
8) Determining the interrtia force of connecting rod by
9) Dynamic force analysis of four bar mechanism
10) Experiment on free and damped vibration of systems with one degree of freedom.
11) Experiment on forced damped vibration of systems with one degree of freedom.

SYLLABUS PRESCRIBED FOR BACHELOR OF ENGINEERING
ELECTRICAL EGINEERING (ELECTRONICS & POWER) /
ELECTRICAL AND ELECTRONICS ENGINEERING/
ELECTRICAL ENGINEERING (ELECTRICAL & POWER)/
ELECTRICAL ENGINEERING
SEMESTER PATTERN
FIFTH & SIXTH SEMESTER

SEMESTER : FIFTH

5EX01 CONTROL SYSTEMS

SECTION-A

Unit I : Introduction to automatic control : open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functionis, block diagrams and signal flow graphs. Effect of feed back on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components : Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Unit III: Time response analysis : time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series.
Approximate methods for higher order system, proportional, derivative and integral control.

SECTION-B

Unit IV: Stability : stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability.
Root Locus : construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V : Frequency response methods : frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer function from the frequency response., Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis

Unit VI : State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation – Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response – SISO Systems. Concept - controllability and observability, Kalman & Gilbert test

TEXT BOOKS :

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. Modern Control System, Richard Dorf, Robert Bishop, 11th edition2008
3. Nagrath I.J., Gopal M. : Control System Engineering, Wiley Eastern.'
4. Ogata K. : Modern Control Systems, Prentice Hall of India.
5. Control System Engineering, R Anandanatarajan, P Ramesh Babu,SCITECH Publications, Chennai, 2nd edition,2010

PRACTICALS : Minimum 10 No. of experiments are to be performed, based on above syllabus.

5 EX02 DIGITAL ELECTRONICS

Unit-I : Definitions for Digital Signals, Digital Waveforms, Digital Logic, Moving and Storing Digital information, Digital Operations, The Basic Gates—NOT, OR, AND, Universal Logic Gates—NOR, NAND AND-OR-Invert GATES, Positive and Negative Logic.

Unit-II: Combinational Logic circuits: Boolean Laws And Theorems,Sum-of-products Method, Truth Table to Karnaugh Map,Pairs, Quads, and Octets, Karnaugh Simplifications Don't-care Conditions, Product-of-sums Method , Productof- sums Simplification, Simplification by Quine-McClusky Method, Hazards and Hazard Covers.

Unit-III: Data-processing circuits: Multiplexers, Demultiplexers, 1-of- 16 Decoder, BCD-to-decimal Decoders Seven-segment Decoders,Encoders, Exclusive-or GATES, Parity Generators and Checkers ,Magnitude comparator ,Read-only Memory .

Unit-IV: Number systems and codes: Binary Number System, Binaryto-decimal Conversion , Decimal-to-binary Conversion, Octal Numbers, Hexadecimal Numbers , The ASCII Code, The Excess-

3 Code, The Gray Code. Unsigned Binary Numbers, Sign-magnitude Numbers, 2'S Complement Representation.

Unit-V: Arithmetic circuits: Binary Addition, Binary Subtraction, 2'S Complement Arithmetic , Arithmetic Building Blocks, The Adder-subtracter , Fast Adder, Arithmetic Logic Unit , Binary Multiplication & Division.

Unit-VI: Clocks and Timers: Clock Waveforms, TTL Clock, Schmitt Trigger. Flip-Flops: RS Flip-flops, Gated Flip-flops, Edgetriggered RS Flip-flops , Edge-triggered *D* Flip-flops , Edgetriggered *JK* Flip-flops , Flip-flop Timing, *JK* Master-slave Flip-flops, Analysis of Sequential Circuits.

Text-Book :

Donald P Leach, Albert Paul Malvino,Goutam Saha, "Digital Principles & Applications" (6/e) (McGraw-Hill).

Reference books:

1. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).
2. Taub & Schilling " Digital Integrated Electronics" (TMH).
3. Jain R.P. "Modern Digital Electronics" (TMH).
4. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).
5. M.Morris Mano "Digtal Design" (2/e) (PHI).

5EP03/ 5EX03/ 5EL03 / 5EE03 ELECTRICAL MACHINES - II

SECTION-A

Unit I : Fundamentals of AC rotating machines. AC windings- integral slot, fractional slot and fractional pitch windings- distribution factor, pitch factor and winding factor-harmonic mmf of distributed windings, EMF equation.

Unit II : Synchronous Generators : constructional details, armature reaction-circuit models and phasor diagram of salient and non salient pole machines - determinations of parameters of the circuit models - methods of determining regulations and efficiency, transient and subtransient reactances.

Unit III :

A) Synchronous Motors : principle of operation - torque equation - circle diagrams- V-curves - hunting and damping starting applications.

B) Methods of synchronization - synchronous machine on infinite busbars - parallel operation of generators. Introduction to conducting and reporting the test on synchronous machine as per IS.

SECTION – B

Unit IV : Three phase induction motor : rotating magnetic fields, principles of operation-constructional details - circuit models and phasor diagram, performance equations direct and indirect testing-circle diagram.

Unit V : Methods of starting and speed control of 3 phase IM-double cage motor-methods of braking-single phasing, cogging and crawling, scharge motor.

Unit VI: A) Single phase IM : different types - starting methods - characteristics and applications.

B) AC commutator machines-series motors - characteristics and applications.

C) Small machines-principle of operation, construction characteristics and applications of Printed Circuit Motor (PCM), Syn, ind motor, reluctance motor and hysterisis. Introduction to conducting and reporting the test on single phase induction motor as per IS.

TEXT BOOKS :

1. Theory of AC Machines : A.S.Langsdorf (McGraw Hill)
2. Performance and Design of AC Commutator Motors - Openshov - Taylor (McGraw Hill)
3. Performance and Design of Alternating Current Machines : M.C.Say,
4. Electrical Machines - Nagrath, Kothari. (Tata McGraw Hill)
5. Latest Indian Standard guide for testing synchronous machine and single phase induction motor.

PRACTICALS : At least Ten experiments based on the above syllabus.

5EP04/5EL04/ 5EE04 SIGNALS AND SYSTEMS

SECTION - A

Unit I : Introduction to Signals and Systems: •Signals and Systems, Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Time Domain and Frequency Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit II : Fourier series and Its Properties Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter

Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III : Analysis of LTI Discrete-Time Systems: Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response

SECTION - B

Unit IV : Sampling: Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit V : The Z Transform: The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI : Discrete Fourier Transform and Fast Fourier Transform Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Books Recommended:

1) PRINCIPLES OF LINEAR SYSTEMS AND SIGNALS, 2E(international version) – Lathi B. P. Oxford University Press
2) Signals & Syatems, Smarajit Ghosh, PEARSON education, 2006
3) Signals & Syatems,D Ganesh rao, satish Tunga, PEARSON education 2010
4) PRINCIPLES OF SIGNAL PROCESSING & LINEAR SYSTEMS (international version) Lathi B P . Oxford University Press
5) Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999
6) Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005
7) Signals and systems, Oppenheim and Schafer Prentice Hall India Of India 2nd Edition 1997

5 EX04 ELECTRICAL POWER - I

SECTION-A

Unit I : Transmission line parameters : calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition,

G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on inductance and capacitance, interference with communication lines. (10)

Unit II : Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal TI and equivalent T representations, Ferranti effect, corona phenomenon, effect of corona and power loss due to corona.

Representation of power systems : per unit system and one-line reactance diagrams. (10)

Unit III : Voltage control and power factor improvement : receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers, analytical and graphical methods, automatic voltage control. (10)

SECTION-B

Unit IV : Load flow studies : load flow problem, classification of buses, network modeling, Y-bus and Z-bus matrices, load flow equation, Gs and NR methods, comparison of methods used. (10)

Unit V : Mechanical design : materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Introduction to insulator testing, line supports for LV, HV and EHV, Sag calculation, stringing charts.

Unit VI : Underground cables : material used for conductor & insulation : different types of cables and their manufacture, parameters of underground cable, grading of cable losses, break down and rating, testing of cables.

Text Books :-

1. Power System Engineering by D.P. Kothari, I.J. Nagrath TMH 2nd edition, 9th reprint 2010.
2. Power System Analysis, N.V.Ramana, Pearson education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4. I. J. Nagrath & D. P. Kothari – "Modern Power System Analysis", Tata- Mc-Graw Hill Publishing Company, New Delhi.
5. Power System Analysis by Hadi Saadat TMH, 1st edition 2011.
6. Electrical Power System, by Syed A. Nasar TMH, Revised 1st Edition 2011

Reference Books :-

1. S. Rao – "EHV A.C. and HVDC Transmission Engineering and Practice", Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi – "Unerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - "Flexible AC transmission Systems (FACTS), T and D reference book" Westing house.

FREE ELECTIVE - I
5FEEP05/ 5 FEEX05/ 5FEEL05 / 5FEEE05
(1) ENERGY AUDIT & MANAGEMENT

SECTION - A

Unit -I : Energy Scenario & Management:
Indian energy scenario, Energy needs of growing economy, Energy pricing in India Energy sector reforms, various forms of energy, Primary and secondary energy, commercial and non commercial energy, Global primary energy reserves, Energy and environment, Necessity of conserving energy, Energy strategy for the future, Electrical energy management, Concept of supply side management and demand side management, Methods of implementing Demand side management and advantages to consumer, utility and society.

Unit–II: Energy Audit: Definition, Need of energy audit, Preliminary and detailed energy audit. Procedure for carrying out energy audit, Instruments used for energy audit, Data Analysis-Energy–production relationship, specific energy consumption, Sankey diagram, CUSUM Technique, Bench marking energy performance, Recommendations for energy conservation, Action plan, Executive Summary.

UnitIII: **Economics of energy conservation:** Cost factors, Budgeting, Standard costing and Sources of capital, Cash flow diagram and activity chart, Simple Pay back period analysis, Time value of money, Net present value method, internal rate of return method, Profitability index for benefit cost ratio.

SECTION - B

Unit IV: Energy Conservation: Energy conservation in motive power, Illumination, Heating & cooling systems, Pumping systems ,Thermal power stations and Transmission & Distribution Sector. Cogeneration &Waste heat recovery systems.

Unit-V: Energy Audit Case Studies: Energy Intensive Industries, Commercial ,Industrial, Municipal and Agriculture Sector, IT industries, Hospitals.

UnitVI: **Fundamentals of Harmonics:** Harmonic distortion, voltage versus current distortion, Power systems quantities under non sinusoidal conditions- active reactive and apparent power, displacement and true power factor, harmonic phase sequences, triplen harmonics, harmonic indices- Total harmonic distortion(THD), Total demand distortion(TDD) , Harmonic sources from commercial and industrial load, Locating harmonic sources, Power quality monitoring.

Reference Books:

1. Electrical Energy Utilization & Conservation Dr. S.C. Tripathi, TMC
2. Energy Coservation and Audit Thumman
3. Energy Audit and Conservation TERI
4. Guide book for national certification examination for Bureau of Energy Efficiency energy managers and energy auditors.
5. Electrical power system quality systems Surya Santoso/ H. W. Beaty, TMH Publication.

FREE ELECTIVE - I
5FEEP05/ 5 FEEX05 / 5FEEL05 / 5FEEE05
(2) ELECTRICAL DRIVES

SECTION - A

Unit-I : Concept of Electrical Drives:
Electric Drives: Definition, Advantages, components, Selection. Latest trends in DC & AC Drives, Dynamics. Equivalent values of drive parameters. Load Torque: Components, Natures and classification. Steady state stability: Speed torque characteristics, criteria. Load equalization.

Unit-II: Electrical Braking:
Electrical braking methods, characteristics of DC Motors: Rheostatic, Plugging, and Regenerative. Electrical braking method of three phase induction motor: DC Dynamic Braking, Plugging, Regenerative Braking, AC Rheostatic braking.

Unit-III: Solid State Controlled D.C. Motors:
Fully controlled converter: Single phase, three phase and effect on performance of separately excited DC Motor. Chopper control converter: Close loop control of DC series motor in a drive.

SECTION B

Unit-IV: Solid State Controlled Induction Motors:
Steady State Analysis, Thyristorised stator voltage control, Transistorised stator frequency control: V/f control, voltage source inverter (VSI) control, current source inverter (CSI) control, Steady State Analysis, Relative merits and demerits of VSI and CSI for induction motor drive.

Unit-V: Energy Saving in starting of Induction Motor Drive: Types, rotor resistance, reduced voltage, use of magnetic amplifier. Energy Saving in running of induction motor driving pump and blower: Consideration of load torque characteristics and energy saving calculations. Power Rating: Load diagram, Heating and cooling, Thermal Resistance, Selection of motor power capacity, Derating of motor, effect of harmonic current, short time rating.

Unit-VI: Industrial Applications and Latest trends in Drives: Industrial Applications: Drives for Rolling mills (Four Quadrant Operation), Machine tools (Constant Torque Application), Textile mills (Synchronized operation of Drive in Tandom), Sugar Mills: Centrifuged Drive. Latest trends in Drives: Commutatorless DC Motor, Servo Drives, Stepper motors. **Energy Saving Techniques and Power Rating of Drive Motor:**

Reference Books :-

1. G. K. Dubey, "Fundamentals of Electric Drives", 2nd Edition, Narosa Publishing House
2. N. K. De, P. K. Sen, "Electric Drives", Prentice Hall of India Eastern Economy Edition
3. S. K. Pillai, "Analysis of Thyrister Power Conditioned Motors", University Press
4. V. Subrahmanyam, "Electric Drives: Concepts & Application", Tata Mc-Graw Hill
5. K. Bose, "Modern Power Electronics and AC Drives", Pearson Education
6. R. Krishanan, "Electric Motor Drives – Modeling Analysis and Control", PHI India

5EP06 /5 EX 06 / 5EL06/ 5EE06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage. Comprehension – A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :-Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could,would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II : Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings,

sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictoral devices.

Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for dayto-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED:

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Raman Sharma "Technical Communication", Oxford University Press..
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

5EX 07 CONTROL SYSTEM LAB.

Any TEN experiments based on contents of
5EX 01 CONTROL SYSTEM - I

5EX08 DIGITAL ELETRONICS LAB

Any TEN experiments based on contents of
5EXO2 DIGITAL ELECTRONICS

5EP09/ 5EXO9/ 5EL09/ 5EE09 ELECTRICAL MACHINES - II - LAB

Any TEN experiments based on contents of
5EP03 / 5EXO3/ 5EL03/ 5EE02 ELECTRICAL MACHINES - II

5EP10/ 5EX10 / 5EL10 / 5EE10 COMMUNICATION SKILLS LABORATORY

Objective : On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline

for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboretory experiments.

Text Books : i. Norman Lewis : Word Power Made Easy http://www.teachingenglish.org.uk ii. Ghosh: "Technical Communication", Oxford University Press.

SEMESTER : SIXTH

6 EX 01 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties, Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V: Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert

analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, 'Digital Signal Processing', PHI Publication
2. Oppenhavm & Scheffer, 'Discrete Time Processing', John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010
4. Mitra S.K, 'Digital Signal Processing', TMH Publication

6EP02/ 6 EX 02/ 6EL02 / 6EEO2
OPTIMISATION TECHNIQUES
SECTION-A

Unit I : Introduction, engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem, optimization techniques. Classical optimization techniques - single and multi variable optimization with and without constraints.

Unit II : Linear programming I - standard form, definitions and theorems, graphical method, solution of system of linear simultaneous equations, simplex method, two phase simplex method, revised simplex method.

Unit III: Linear programming II - duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis, balanced and unbalanced transportation problems.

SECTION-B

Unit IV: Non linear programming - unimodal function, unrestricted search, Fibonancci search method and Folden section method, unconstrained optimization, direct search methods - pattern search methods, simplex method, descent method - steepest descent method, conjugate gradient and variable metric method.

Unit V : CPM and PERT introduction - Network representation of project, critical path, optimum scheduling by CPM, crashing of project.

Unit VI: Dynamic programming : multistage decision processes, principle of optimality, sub optimization, calculus and tabular method of solution, conversion of final value problem into initial value

problem, solution of linear programming. Continuous dynamic programming.

BOOKS :

1) S.S.Rao : Optimization - Theory & Application, Wiley Eastern Ltd.
2) L.S.Srinath : PERT and CPM Principles & Application, Affiliated East West Pvt. Ltd., New Delhi.
3) Operation research by Richard Bronson,

REFERENCE BOOKS :

1) Fredrick S.Hiller Gerald J.L. Lieberman : Introduction Operations Research, Tata McGraw Hill Pub. Co., New Delhi.
2) H.A.Taha : Operations Research, PHI, New Delhi.
3) P.K.Gupta & D.S.Hira : Operations Research, S.Chand & Co. Ltd, New Delhi.
4) J.C.Pant : Introduction to Optimization, Jain Brothers, New Delhi.

6 EX 03 ELECTRICAL POWER - II

SECTION - A

Unit I : **Symmetrical components** Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/ star transformer bank- sequence voltages and currents relationship; power system elements – sequence impedance and sequence networks ; Various three phase transformer connections – zero sequence rules; Unbalanced load system – application.

Unit II : Symmetrical Fault Analysis
Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis
L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV :Over voltages
Causes – internal and external; Voltage surge, Basic insulation level, Protection – earthing screen, overhead ground wire, lightning arresters.

Unit V : HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters – reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI :Flexible AC Transmission Systems (FACTS)
FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

Text Books :-

1. Power System Engineering by D.P. Kothari, I.J. Nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4. I. J. Nagrath & D. P. Kothari – "Modern Power System Analysis", Tata- Mc-Graw Hill Publishing Company, New Delhi.
5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH, Revised 1st edition 2011.

Reference Books :-

1. S. Rao – "EHV A.C. and HVDC Transmission Engineering and Practice", Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi – "Unerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - "Flexible AC transmission Systems (FACTS), T and D reference book" Westing house.

Practicals : Minimum eight experiments based on above syllabus, preferably with uniform distribution.

6 EX 04 MICROPROCESSORS & MICROCONTROLLERS

SECTION-A

Unit I : 8085 : architecture, register structure, addressing modes, instruction set of 8085, timing diagrams.

Unit II : Assembly Language Programming of 8085, counters and time delays, stack and subroutines, Memory mapped I/O and I/O mapped I/O, address decoding techniques. Interrupt system of 8085 (software and hardware interrupts). Data transfer schemes, serial data transfer through SOD and SID line.

Unit III : Interfacing devices (I) : internal architecture and programming of PPI (8255), PIC (8259), USART (8251).

SECTION-B

Unit IV : Interfacing devices (II) : architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237). Introduction to architecture 8086.

Unit V : Microprocessors applications : hardware & software developments : signal conditioning & data acquisation system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc.
Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities (resistance, inductance, capacitance, phase angle, power factor).

Unit VI: Introduction to microcontroller: 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOKS :

1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Publication -2006
2) Introduction to Microprocessor L.Gibson, Prentice-Hall 2003
3) The 8051 Microcontroller Scott MacKenzie Prentice-Hall, Inc -2006

REFERENCE BOOKS :

1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

PRACTICALS : Uniformly distributed Minimum 10 practicals based on above syllabus.

FREE ELECTIVE - II
6FEEP05/ 6FEEX 05 / 6FEEL05/ 6FEEE05
(i) ELECTRICAL ESTIMATING & COSTING
SECTION - A

Unit I : Drawing and IE rules : Classification of Electrical Installation, General requirement of Electrical Installation. Reading and Interpretation of Electrical Engineering Drawings. Various diagrams, plans and layout, Important definitions related to Installation, IE rules related to Electrical Installation & Testing.
Service Connection : Concept of service connection.Types of service connection & their features. Methods of Installation of service connection.Estimates of under ground & overhead service connections.

Unit II : Residential Building Electrification : General rules guidelines for wiring of Residential Installation and positioning of equipments. Principles of circuit design in lighting and power circuits. Procedures for designing the circuits and deciding the number of circuits.
Method of drawing single line diagram.Selection of type of wiring and rating of wires & cables. Load calculations and selection of size of conductor.Selection of rating of main switch, distributions board,protective switchgear ELCB and MCB and wiring accessories. Earthing of Residential Installation. Sequence to be followed for preparing Estimate Preparation of detailed estimates and costing of Residential Installation.

Unit III: Electrification of commercial Installation : Concept of commercial Installation. Differentiate between electrification of Residential and commercial Installation. Fundamental considerations for planning of an electrical Installation system for commercial building. Design considerations of electrical Installation system for commercial building. Load calculations & selection of size of service connection and nature of supply. Deciding the size of cables, busbar and busbar chambers. Mounting arrangements and positioning of switchboards, distribution boards main switch etc. Earthing of the electrical Installation Selection of type wire, wiring system & layout.
Sequence to be followed to prepare estimate.Preparation of detailed estimate and costing of commercial Installation.

SECTION - B

Unit IV: Electrification of factory unit Installation : Concept of Industrial load.Concept of Motor wiring circuit and single line diagram. Important guidelines about power wiring and Motor wiring. Design consideration of Electrical Installation in small Industry/ Factory/ workshop. Motor current calculations. Selection and rating of wire, cable size & conduct. Deciding fuse rating, starter, distribution boards main switch etc.Deciding the cable route, determination of length of wire, cable, conduit, earth wire, and earthing. Sequence to be followed to prepare estimate. Preparations of detailed estimate and costing of small factory unit/ workshop.

Unit V: Design & estimate for feeders & distributors :- Different schemes for feeders & distributors, Design of feeders & distributors, Estimates for different feeders & distributors, Distribution transformer, Deciding Size & location, Estimate for outdoor & indoor type distribution substation.

Testing of Installation: Testing of wiring Installation for verification of current; earthing, insulation resistance and continuity as per IS

Unit VI: Contracts, Tenders and Execution : Concept of contracts and Tenders Contracts, types of contracts, contractors.Valid Contracts, Contract documents. Tender and tender notices. Procedure for submission and opening tenders. Comparative statements, criteria for selecting contractors, General conditions in order form. Principles of Execution of works Administrative approval, Technical sanctions. Billing of executed work.

Reference Books:

1. Electrical Design; Estimating and costing by K.B. Raina, S.K.Bhattacharya New Age International (p) Limited, New Delhi
2. Electrical Estimating and costing by Surjit Singh Dhanpat Rai and company, New Delhi
3. Electrical Estimating and costing by N. Alagappan S. Ekambaram, Tata Mc Graw Hill Publication New Delhi

FREE ELECTIVE - II
6FEEP05/ 6FEEX 05/ 6FEEL05/ 6FEEE05
(ii) POWER SUPPLY SYSTEMS

SECTION A

Unit I: Structure of Power System – Generation, transmission and distribution. Power generating stations – different types. Steam power stations: Main parts and working, types of boilers and their characteristics. Characteristics of steam turbines and alternators. Main flow circuits of steam power station. Power station auxiliaries, cooling system of alternators. Starting up and shut down procedures of thermal units.

Unit II: Gas-turbine power stations- Main parts, plant layout and Bryton cycle operation. Combined cycle generation & Cogeneration. Nuclear power stations- Layout of nuclear power station, types of power reactors, main parts and control of reactors, nuclear waste disposal, radioactivity and hazards.

Unit III: Hydroelectric stations: Arrangement and location of hydroelectric stations, principles of working, types of turbines and their characteristics, Pumped storage plants. Coordination of operation of different power stations .

SECTION - B

Unit IV: Substation - Classification of substations, Major equipments in Substation ,Selection & location of site for substation, Main

Electrical connections, Graphical symbols for various apparatus & circuit elements in substation, connection diagram, Key diagram for typical substation, Busbar layouts. Auxillary supply, substation earthing.

Unit V: Power distribution system: Primary and secondary distribution, types of conductors in istribution system, comparison of distribution systems. Distributor design, radial and ring main, current and voltage profiles along a distributor, economics of feeder design.

Unit VI: Electrical wiring and installation - Domestic, commercial and industrial wiring, estimation of main, submain and subcircuit wiring. Earthing practice. Testing of installation. Special lighting connections. Conductors, Fuse and disconnecting devices.

Reference Books:

1. Powerplant Technology by M.M.El-Wakil, McGraw Hill
2. Power Station Engineering & Economy by B.G.A. Skrotzki & W.A.Vopat, Tata McGraw Hill
3. A Course in Power Plant Engineering, by Arora & Domkundwar, Dhanpat Rai
4. Elements of Electrical Power Station Design, by M.V.Deshpande, Wheeler
5. Electrical Installation Estimating & Costing by J.B.Gupta
6. Transmission & Distribution ,by H.Cotton

6EP04/ 6EL04/ 6EE04 COMPUTER AIDED MACHINE DESIGN

SECTION-A

Unit I : Introduction : transformers and three phase induction motors - types, specifications, constructional features, magnetic and insulating materials used; design approaches - analysis, synthesis and hybrid methods; design - variables, constraints and objectives; magnetization, loss and carter's coefficient curves - applications, representation using Piecewise Lineariasation and Least Square Error methods.

Unit II : Transformer Design - Magnetic Circuit Specific electric and magnetic loadings selection, output equation, core and yoke cross sections, main dimensions design, core loss from design data.

Unit III: Transformer Design :

A) Electric circuit : Winding types and design, magnetizing current calculation, primary and secondary winding resistances and leakage reactances from design data; mechanical forces - types, causes and calculations.

B) Thermal circuit cooling methods, Tank wall dimensions design. Design of tank with radiators.

SECTION-B

Unit IV: Induction motor stator design : specific electric and magnetic loadings selection, output equation, main dimensions design, winding - types and design, slot numbers and dimensions design.

Unit V : **Induction motor rotor design :** Air gap length design, cage rotor winding design - slot numbers and shapes, bar and ring dimensions; slip ring rotor winding design - slot numbers and shapes, conductors per slot and its cross sections.

Unit VI: Induction motor parameters : core loss from design data, magneto motive force calculation - air gap, stator and rotor cores and teethl; no load current - magnetizing and core loss components, stator and rotor winding resistances and leakage reactances from design data, parameters effect on performance.

BOOKS RECOMMENDED :

1. M.G.Say - The Performance and Design of Alternating Current Machines, C.B.S. Pub. and Distri., Delhi.
2. S.K.Sen - Principles of Electrical Machine Design with Computer Programs, Oxford and I.B.H. Company Pvt. Ltd., New Delhi.
3. S.S.Sastry - Introductory Methods of Numerical Analysis, Prentice Hall of India Pvt. Ltd., New Delhi.
4. R.K.Agrawal : Principles of Electrical Machine Design, S.K.Kataria and Sons, Delhi.
5. Indrijit Dasgupta, Design of Transformers, TMh 1st Edition 2002
6. K.G.Upadhyay Design of Electrical Machines, New Age international Publishers,1st Edition 2008

6EP06/ 6EL06/ 6EE06 ELECTRICAL ENERGY UTILISATION

SECTION-A

Unit I : Concept of electrical drive, classification, advantages of electrical drive, selection criterion for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, general workshop, Textile mill, Paper mill, Cement mill, Coal mining, Sugar mill, Printing industry.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations. Introduction for conducting and reporting the test on induction motors as per Indian standard.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Quadrantal diagram of speed-torque characteristics of motors, starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

SECTION -B

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V : Traction motors, general features and types, characteristics, control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.

Unit VI: a) Nature of light-units, luminous efficiency, Glare production of light, Polar curves, control of light by reflection, refraction and diffusion. Lighting calculations, factory lighting, flood lighting, street lighting.

b) Methods of heating and welding furnaces

TEXT BOOKS :

1) E.O.Taylor : Utilization of Electric Energy in SI Units, published by Orient Longman Ltd.
2) S.K.Pillai : A First Course in Electrical Drives, published by New Age International.

REFERENCE BOOKS :

1) Vedam Subrahmanyam : Electric Drives, published by Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2) C.L.Wadhwa : Generation Distribution and Utilization of Electrical Energy, published by New Age International Pvt. Ltd.
3) Specification of Three Phase Induction Motors as per Indian Standard, published by Indian Standard Institute, New Delhi.
4) H.Pratap : Utilization of Electrical Energy.

6EX06 POWER ELECTRONICS - I

SECTION-A

Unit I : SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits, introduction to GTO, power transistor, power MOSFET & IGBT & their construction & characteristics.

Unit II : Series -parallel operation of SCRs, firing ckts. for series and parallel operation, static & dynamic equalising ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.

Unit III: Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.
Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

SECTION-B

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.

Unit V: Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper, step-down chopper and AC chopper. Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.

Unit VI: Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, speed control of three phase induction motor by stator voltage control, v/f control and slip power recovery scheme. Static ckt. braker, UPS, fan speed regulator, principle of soft start ckts. Zero Voltage Switch.

TEXT BOOKS :

1) Power Electronics - Principles & Applications by Joseph Vithayathil TMH Edition 2010.
2) M.H.Rashid : Power Electronics Circuits Devices and Application, PEARSON Education., 3rd edition 2004i.
3) Principles of Power Electronics, J.G.Kassakian, M.F.SchlechtG.C. Verghese, PEARSON Education 2010
4) M.D.Singh & K.B.Khanchandani : Power Electronics, Tata McGraw Hill, New Delhi.

Reference books :

1) Dr.P.S.Bimbhra : Power Electronics, Khanna Publisher, New Delhi.
2) P.C.Sen : Power Electronics, TMH Publication Co. Ltd., New Delhi.

3) H.C.Rai : Industrial and Power Electronics, Umesh Publication, New Delhi.
4) G.K.Dubey, S.R.Doradia, A.Joshi, R.M.Sinha : Thyristerised Power Controllers, New Age International, New Delhi.
5) Power Electronics, R.S.Ananda Murthyv. Natarasu, 2nd edition,2010

6EX07 ELECTRICAL POWER II LAB

Any TEN experiments based on contents of
6EX03 ELECTRICAL POWER II

6EX08 MICRO PROCESSER & MICRO CONTROLLER LAB

Any TEN experiments based on contents of
6EX04 MICRO PROCESSER & MICRO CONTROLLER

6EX09 POWER ELECTRONICS -I LAB

Any TEN experiments based on contents of
6EX06 POWER ELECTRONICS -I

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5EP01/ 5EL01/5EE01 CONTROL SYSTEM - I

SECTION-A

Unit I : Introduction to automatic control : open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functionis, block diagrams and signal flow graphs. Effect of feed back on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components : Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Unit III: Time response analysis : time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series. Approximate methods for higher order system, proportional, derivative and integral control.

SECTION-B

Unit IV: Stability : stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability.
Root Locus : construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V : Frequency response methods : frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer function from the frequency response.

Unit VI : Stability analysis from frequency response : Gain margin and phase margin; Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis. Effect of variation of gain, addition of plots and zeros. Relative stability. Stability from gain/ phase angle plots.

TEXT BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010, PEARSON
2. Modern Control System, Richard Dorf, Robert Bishop, 11th edition 2008 PEARSON
3. Nagrath I.J., Gopal M. : Control System Engineering, Wiley Eastern.'
4. Ogata K. : Modern Control Systems, Prentice Hall of India.
5. Control Systems by K.R.Varmah TMH edition 2010
6. Control System Engineering, R Anandanatarajan, P Ramesh Babu,SCITECH Publications, Chennai, 2nd edition,2010
7. Aotomatic Control Systems – Basic Analysis & Designby W.A.Wolovich Oxford University Press, 1st edition 2010

6 EP01/6EL01/6EE01 ELECTRICAL POWER - I

SECTION-A

Unit I : Transmission line parameters : calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on inductance and capacitance, interference with communication lines. (10)

Unit II : Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal TI and equivalent T representations, Ferranti effect, corona phenomenon, effect of corona and power loss due to corona.

Representation of power systems : per unit system and one-line reactance diagrams. (10)

Unit III : Voltage control and power factor improvement : receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers, analytical and graphical methods, automatic voltage control. (10)

SECTION-B

Unit IV : Load flow studies : load flow problem, classification of buses, network modeling, Y-bus and Z-bus matrices, load flow equation, Gs and NR methods, comparison of methods used. (10)

Unit V : Mechanical design : materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Introduction to insulator testing, line supports for LV, HV and EHV, Sag calculation, stringing charts.

Unit VI : Underground cables : material used for conductor & insulation : different types of cables and their manufacture, parameters of underground cable, grading of cable losses, break down and rating, testing of cables.

Text Books :-

1. Power System Engineering by D.P. Kothari, I.J. Nagrath TMH 2nd edition, 9th reprint 2010.
2. Power System Analysis, N.V.Ramana, Pearson education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4. I. J. Nagrath & D. P. Kothari – "Modern Power System Analysis", Tata- Mc-Graw Hill Publishing Company, New Delhi.
5. Power System Analysis by Hadi Saadat TMH, 1st edition 2011.
6. Electrical Power System, by Syed A. Nasar TMH, Revised 1st Edition 2011

Reference Books :-

1. S. Rao – "EHV A.C. and HVDC Transmission Engineering and Practice", Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi – "Unerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - "Flexible AC transmission Systems (FACTS), T and D reference book" Westing house.

5 EP02/5EL02/5EE02

MICROPROCESSORS & MICROCONTROLLERS

SECTION-A

Unit I : 8085 : architecture, register structure, addressing modes, instruction set of 8085, timing diagrams.

Unit II : Assembly Language Programming of 8085, counters and time delays, stack and subroutines, Memory mapped I/O and I/O mapped I/O, address decoding techniques. Interrupt system of

8085 (software and hardware interrupts). Data transfer schemes, serial data transfer through SOD and SID line.

Unit III : Interfacing devices (I) : internal architecture and programming of PPI (8255), PIC (8259), USART (8251).

SECTION-B

Unit IV : Interfacing devices (II) : architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237). Introduction to architecture 8086.

Unit V : Microprocessors applications : hardware & software developments : signal conditioning & data acquisation system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc.
Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities (resistance, inductance, capacitance, phase angle, power factor).

Unit VI: Introduction to microcontroller: 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOKS :

1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Publication -2006
2) Introduction to Microprocessor L.Gibson, Prentice-Hall 2003
3) The 8051 Microcontroller Scott MacKenzie Prentice-Hall, Inc -2006

REFERENCE BOOKS :

1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005
3. http://www.nptel.iitm.ac.in/
4. www.ocw.mit.edu

PRACTICALS : Uniformly distributed Minimum 10 practicals based on above syllabus.

6EP03 / 6EL03 / 6EE03 POWER ELECTRONICS

SECTION-A

Unit I : SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits, introduction to GTO,
power transistor, power MOSFET & IGBT & their construction & characteristics.

Unit II : Series -parallel operation of SCRs, firing ckts. for series and parallel operation, static & dynamic equalising ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.

Unit III: Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.
Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

SECTION-B

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.

Unit V: Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper, step-down chopper and AC chopper. Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.

Unit VI: Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, speed control of three phase induction motor by stator voltage control,
v/f control and slip power recovery scheme. Static ckt. braker, UPS, fan speed regulator, principle of soft start ckts. Zero Voltage Switch.

TEXT BOOKS :

1) Power Electronics - Principles & Applications by Joseph Vithayathil TMH Edition 2010.
2) M.H.Rashid : Power Electronics Circuits Devices and Application, PEARSON Education., 3rd edition 2004i.

3) Principles of Power Electronics, J.G.Kassakian, M.F.SchlechtG.C. Verghese, PEARSON Education 2010

4) M.D.Singh & K.B.Khanchandani : Power Electronics, Tata McGraw Hill, New Delhi.

Reference books :

1) Dr.P.S.Bimbhra : Power Electronics, Khanna Publisher, New Delhi.
2) P.C.Sen : Power Electronics, TMH Publication Co. Ltd., New Delhi.
3) H.C.Rai : Industrial and Power Electronics, Umesh Publication, New Delhi.
4) G.K.Dubey, S.R.Doradia, A.Joshi, R.M.Sinha : Thyristerised Power Controllers, New Age International, New Delhi.
5) Power Electronics, R.S.Ananda Murthyv. Natarasu, 2nd edition,2010

5EP 07 / 5EL07 / 5EE07 CONTROL SYSTEM - I - LAB.

Any TEN experiments based on contents of
5EP 01/ 5EL01 / 5EE01 CONTROL SYSTEM - I

6EP07 POWER ELETRONICS - I - LAB

Any TEN experiments based on contents of
6EP03 / 6EL03 / 6EE03 POWER ELECTRONICS

6EP08/ 6EL08/ 6EE08 COMPUTERAIDED MACHINE DESIGN - LAB

Any TEN experiments based on contents of
6EP04 / 6EL04/ 6EE04 ELECTRICAL MACHINES - II

6EP09 ELECTRICAL ENERGY UTILIZATION - LAB

Any TEN experiments based on contents of
6EP06 / 6EL06 / 6EE06 ELECTRICAL ENERGY UTILIZATION

DRAFT SYLLABUS PRESCRIBED FOR BACHELOR OF ENGINEERING (INFORMATION TECHNOLOGY)

5IT01 OPERATING SYSTEMS

Unit-I : **Introduction:** Operating System(OS) definition, OS Evolution,OS Components and Services.Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads.

Unit-II: CPU Scheduling Concepts, Scheduling Criteria and Algorithms. Process Synchronization:The Critical-Section Problem, Synchronization Hardware,Semaphores, Monitors. Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock.

Unit-III: Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation.Virtual Memory Management: Background, Demand Paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing.

Unit-IV: File-System Interface; Directory Structure, File-System Mounting, File Sharing & Protection. File- System Structure, File-System Implementation. Directory Implementation, Allocation Methods, Free-Space Management. File Recovery.

Unit-V: I/O Systems :Overview, I/O Hardware, Application I/O Interface, and Kernel I/O Subsystem. Transforming I/O to Hardware Operations. Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Unit-VI: The Linux System; History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output, Interprocess Communication, Network Structure & Security in Linux.

Text Book:

Avi Silberschatz , P.B.Galvin, G. Gagne: “Operating System Concepts” (Sixth Edition) John Wiley & Sons Publication.

Reference Books :

1. A.S Tanenbaum “Modern Operating Systems” Pearson Education.
2. William Stallings “Operating Systems” Prentice-Hall.
3. D M Dhamdhere “Operating Systems” Tata McGraw-Hill.
4. M Milankovic “Operating Systems” McGraw-Hill.”

5IT06 Operating Systems Lab:

Minimum 8 experiments based on the syllabus of 5IT01.

5 IT 02 DIGITAL INTEGRATED CIRCUITS

Unit-I: **Digital Integrated Circuits:** Special characteristics like fan-out, power dissipation, propagation delay & noise margin. Bipolar transistor characteristics. TTL and CMOS families. Simplification of Boolean functions: the K-Map method, two- & three-Variable maps, four-variable map, five-variable map. Tabulation method. Determination of prime implicants. Selection of Prime implicants.

Unit-II: **Combinational Logic:** introduction. design procedure. adders. sub tractors. code conversion. analysis procedure. Multilevel NAND circuits : universal gate, Boolean-function implementation. Multilevel NOR circuits: universal gate ,Boolean-function implementation. Exclusive-OR functions. Odd function. Parity generation & checking.

Unit-III: **MSI & PLD components:** introduction. Binary parallel adder, ,magnitude comparator,decoders & encoders.multiplexers. ROM.Various types of ROM.Programmable Logic Arrays. Programmable Array Logic – PAL,PLA & ROM

Unit-IV: **Synchronous Sequential circuits:** introduction, Flip-Flops: basic circuits,RS-,D-,JK- & T- Flip-Flops. Triggering of flip flops. Analysis of clocked sequential circuits.State reduction & assignment. Flip-flop excitation table. Design procedure. Design of counters: ripple counters, synchronous counters.

Unit-V: Design of Registers & shift registers. Random access memory (RAM).Memory decoding techniques.Hamming code.Algorithmic State Machines: introduction,ASM chart,timing considerations.Control implementation.Design with multiplexers.PLA control.

Unit-VI: **Fault detection and location in combinational circuits:** Path – Sensitizing method, Equivalent normal form method, Two level fault detection. Fault detection and location in sequential circuits: Circuit test approach, initial state identification, final state identification.

Text-Book :

1. Charles H.Roth, "Fundamentals of Logic Design" (JPH)
2. Samuel C. Lee, " Digital circuits and Logic Design(PHI)

Reference Books:

1. M.Morris Mano "Digital Design" (2/e) (PHI).

2. Taub & Schilling " Digital Integrated Electronics" (TMH).
3. Jain R.P. "Modern Digital Electronics" (TMH).
4. Fletcher W.I."An Engineering Approach to Digital Design" (PHI).

5 IT07 Digital Integrated Circuits Lab :

Minimum 08 experiments based on the 5IT02 syllabus, two experiments on each unit. Chapter 11 "Laboratory Experiments" of the text- book: M.Morris Mano "Digital Design" (2/ e) (PHI), may be referred for guidelines to setup laboratory sessions.

5 IT 03 COMPUTER ARCHITECTURE & ORGANIZATION

Unit-I: **Basic strucutre of computer:** Hardware & software. Addressing methods. Program sequencing. concept of memory locations & address.Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: **Processing Unit:** fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: **I/O organizatiion:** accessing I/O devices,interrupts,direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuits,standard I/O interfaces:SCSI bus,backplane bus standard.

Unit-IV: **Memory Unit:** basic concepts,semiconductor RAM memories, internal organization,static & dynamic RAMs,ROMs.speed, size & cost considerations.Cache memories: performance considerations.Virtual memories,address translation,memory management requirements.

Unit-V : Arithmetic; number representation.design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Booths' algorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: **Computer Peripherals:** Input-output devices like video displays,video terminals,graphics input devices,printers. Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems.Communication devies:Modems.

Text-Book:

V.Carl Hamacher & S.Zaky " Computer Organization" (4/e) McGraw-Hill(ISE).

Reference Books:

1. Stallings. W. " Computer Organization & Arcitecture" (5/e) (Pearson Education).
2. Tenanbaum A.S." Structured Computer Organization" (5/e) (Pearson Education).
3. Hayes J.P." computer Architecture & Organization' (4/e) (McGraw-Hill).
4. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).

5 IT 04 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage.
Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage, reading
Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.
Active and passive forms, negative and interrogative, punctuation and capitalization. Summary, Precise & abstract writing. (10 Hours)

Unit II: Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.
Non-verbal communication, types of graphics and pictorial devices. (10 Hours)

Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like writing applications, Resume, notices, minutes, quotations, orders, enquiries etc. Claim letter.
Oral communications - Important objectives of interpersonal skills, soft skills(listening, speaking strategy), (verbal and non-verbal), face to face communications, group discussion and personal interviews.

Methodology of conduction of meetings, seminars, symposia, conference and workshop. (10 Hours)

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) M.A. Rizvi: Effective Technical communication, Tata McGraw Hill.
3) Urmila Rai & S.M.Rai : Communication Skills ,Himalaya Publisher House.
4) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
5) Dr. Nageshwar Rao & Dr. Rajendra P. Das : Communication skills, Himalaya Publisher House.

FREE ELECTIVE - I

5FEIT05 (i) INTRODUTION TO COMPUTER NETWORKS

Unit -I : Introdution to Computer Networks, Network Topologiecs, Ethernet LAN, assembling a Home Network and office LAN, Analyzing Computer Networks, Physical Layer Calbling: Twisted Pair, Structural Cabling, UTP Cable, terminating CAT6/ 5E/5UTP cables.

Unit II : Computer Fundamentals, Computer Bus connection, Device Drivers, Computer Memory, Overview of FAT and NTFS, configuring the BIOS boot sequence.

Unit III : Interconnecting the LAN, OSI Model, network bridge, switch, Router, Interconnecting LANs with the Router. configuring the network interface-Auto-negogiation.

Unit IV : TCP/IP : Layers, number conversion, IPV4 Addressing, subnet masks, CIDR blocks, IPV6 Addresing, Analyzing computer networks-FTP data packets.

Unit V : Router Configuration,Introduction, Router fundamentals, the console port connection the routers useEXEC Mode, routers priveledged EXEC mode, troubleshooting the router interface

Unit VI : Routing protocals: Static routing, Dynamic routing protocals, RIP, IGRP, OSPF, EIGRP, TFTP, analysing OSPF "helo" packets.

Text Book :

Jreffredy S.Beasely, "Networking" second edition. Pearson

Reference Books :

1. Bhushan Trivedi,"Computer Networks" OXFORD.
2. Andrew S.Tanenbaum,"Computer Networks" IV edition Pearson
3. Youlu Zheng, Shakil Akhtar, "Networks for computer Scientiests and Engineers" OXFORD.

FREE ELECTIVE - I

5FEIT05 (ii) IT ETHICS & PRACTICES

Unit I : An overview of Ethics, Ethics inm business world, Ethics in IT, Ethics for IT professionals and IT users, IT professionals, Ethical behaviour, IT professional malpractices, IT users.

Unit II : Computer and Internet Crime : IT security incidents : Increasing Complexity INcreases Vulnerabliligy, Higher Computer user Expectations, Expanding and changing systems. INtroduces new risks,Increased Reliance on Comercial Software with known Vulnerabilites, Types of Attacks, Perpetrators, Reducing Vulnerabilites, Risk Assessment, Establishing a Security Policy, Educating Employees, contractors and part-time Workers, Prevention, Detection, Response.

Unit III : Privacy: The right of Privacy, Recent History of Privacy Protection, Key Privacy and Anonimity issues, Governmental Electronic Surveilance, Data Encription, Identity Theft, Consumer Profling, Treating Consumer Data Responsiblity, Workplace Monitoring, Spamming, Advancd surveylance Technology, First Amendment Rights, Obsence Speech, Defamation, Freedom of Exprssion : Key issues, Controlling Access to Information on the INternet, **Antronimity, National, Security Letters, Defamation and Hate Speech.**

Unit IV : Intellectual Property: Copyrights, Patents, Trade Secret Laws, Key Intelectual Property Issues, Plagiarism, Reverse Engineering, Open Source Code, Competitive Intelligence, Cybersquatting, Software Development, Strategies to Engineer Quality Software, The Importance of Software Quality, Software Development Process, Capability, maturity Model Integration for Software, Key isues in Software Development, Development of Safety-Critical Systems,Quality Management Standards.

Unit V : Employer/Employees Issues, Use of Nontraditional Woekrs, Contigent Workers H-IB Workrrs, Whistle-blowing, Prtotetion for Whistle-Blowers, Dealing with Whistle-Blowing Situation.

Unit VI : The impact of Information, Technology on the Quality of Life, The inmpact of IT on the standard of Living and productivity, theDigital Divide, The impact of ITon Health care costs, Electronic Health Records, Use of Mobile andWireless Technology, Telemedicine.

Medical INformation Wet Sites for lay people.

ACM, AITP Association of INformation Technology Code of Ethics and Professional Conduct, Profesionals Code of Ethics, Softwar Enginering Code of Ethics and Professional Practice, PMI Member Ethical Stnadards and Member code of Ethics.

Text Book :

Geroge Raynolds, “Ethics in information Technology” Cengage Learning

Reference Books :

1. Deborah G.Johnson,”Computer Ethics”,3/e Persiaon Education.
2. Sara Baase, “A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet,” PHI publications
3. Richard A.Spinello, “Case study in INformation Technology Ethics”, second Edition PHI
4. Duncan Lanford “ Intenet Ethics”.
5. D.Micah Hester and Paul J. Ford “Computer and Ethics in the Cyberage”.

5IT08 COMMUNICATION SKILLS LAB:

Lab based on syllabus of 5IT08.

Objective: On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be accessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

Test Book: Norman Lewis: Word Power Made Easy

5IT09 COMPUTER LAB- III (VC++)

This laboratory shall be based on MFC using VC++. Minimum eight programs based on the following:

i) MFC application creation

ii) Using dialog boxes

iii) Windows common controls

iv) Document / View architecture

v) Printing with MFC

Reference :J. Prosise: Programming Windows with MFC (Microsoft Press).

6IT01 PRINCIPLES OF MANAGEMENT

Unit I : **Introduction:** Definition and concepts of management, Importance of management. Various management functions & control, responsibilities. Human resources planning, Decision-making, Trade unions & collective bargaining.

Unit II : **Organization planning, design and development:** Production resources, Production planning, types of production system, production systems, production control.

Unit III : Product design & development: Introduction, design of the product, New product development; Material planning and control. Inventory control technique.

Unit IV: **Maintenance and system reliability:** Concepts and Objectives of maintenance. Failure analysis, Reliability Maintenance system & Classification. Maintenance planning, TQM ISO 9000 and Quality audit.

Unit V: **Marketing management:** Introduction, marketing planning. Consumer behavior, product management, Pricing & promotion decision. Financial planning. Source of finance.

Unit VI: Project Management: Concepts and importance of project, Project implementation, MIS.MIS meaning and objectives. Types of data, methods of data collection, analysis and presentation of data. Editing, reporting and presentation of data, Decision options.

Text Book:

A.K.Gupta, J.K. Sharma: Management of Systems (Macmillan)

Referance Books:

1. Appleby: Modern Business Administration, 6/e (Macmillan)
2. Tritaphy & Reddy: Principals of Management, 2/e (TMH)
3. Gupta, Sharma et : Principales of Practices of Management (Kalyani)

6IT02 DATABASE MANAGEMENT SYSTEMS

Unit I: Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, Transaction Management, Database System Structure, Application architectures, History of Database Systems. Entity-Relationship Model, Basic Concepts, Constraints, Keys, Design Issues, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables.

Unit II : **Relational Model:** Structure of Relational Databases, The Relational Algebra, Extended Relational-Algebra Operations, Modification of the Database, Views, The Tuple Relational Calculus, The Domain Relational Calculus, SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Views.

Unit-III: Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL, Encryption and Authentication, Relational-Database Design:, First Normal Form, Pitfalls in Relational-Database, Design, Functional Dependencies, Decomposition, BCNF, Third, Fourth and more Normal Forms, Overall Database Design Process.

Unit-IV: **Query Processing:** Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Optimization: Overview, Estimating Statistics of Expression Results, Transformation of Relational Expressions, Choice of Evaluation Plans, Materialized Views.

Unit-V: **Transaction Management :** Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability, Implementation of Isolation, Transaction Definition in SQL, Testing for Serializability.

Unit-VI: **Concurrency Control:** Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularities, Multiversion Schemes, Deadlock Handling, Insert and Delete Operations Weak Levels of Consistency, Concurrency in Index Structures. Recovery System, issues & solutions.

Text Book:

Korth, Sudarshan : Database System Concept , Mc Graw Hill, 4th Edition

Reference Books :

1. Raghu Ramkrishnan :Database system
2. C.J.Date : Database System, 7th ed.
3. Connolly & Begg, : Database System,Low Price Ed.

6IT 03 THEORY OF COMPUTATION

Unit I: Alphabet, Language, Operations, Finite state machine, definitions, Finite automation model, Acceptance of strings and languages. Non deterministic finite automation, deterministic finite automationi, equivalence between NFA and DFA. Conversion of NFA into DFA, minimisation of FSM, equivalence between two FSM's, Moore and Melay machines.

Unit II: Regular sets, regular expressions, identity rules. Manipulation of regular expressions, equivalence between RE and FA. Inter conversion, pumping lemma, Closure properties of regular sets (proofs not required), Regular grammers, right linear and left linear grammers, equivalence between regular linear grammer and F A inter conversion between RE and RG.

Unit III: Context free grammer, derivation trees, Chomsky normal form, Greibach normal form, push down automata, definition, model, acceptance of CFL, equivalence of CFL and PDA, interconversion, enumeration of properties of CFL (proofs omited)

Unit IV : Turing machine, definition, model, design of TM, computable functions, recursive ensumerable language, Church's hypothesis, counter machine, types of TM's.

Unit V: Chomshy hierarchy of languages, linear bounded automata and context sensitive language, introduction of DCFL and DPDA, LR (O), grammer, decidability of problems.

UnitVI: Undecidability : properties of recursive & non-recursive ensumarable languages, universal turing machine, postcorrespondance problem, introduction to recursive function theory.

Text Books :

1. Introduction to Automata Theory, Languages and Computation by Hopcraft H.E. & Ulllman J.
2. An Introduction to Formal Languages and Automata by Peter Linz (Chapter 1 to 12 except 6.3 & 7.4)

Reference books :

1. Introduction to Languages and the Theory of Automata by John C.Martin.
2. Elements of Thoery of Computation by Lewis H.P. and Papadimition C.H.
3. Theory of Computation by Mishra & Chandrashekharan.

6IT04 COMPUTER NETWORKS

Unit I : **Introduction to Computer network**, Uses, Hardware, Software, reference Model, standardization, Physical Layer,Theoretical Basis for DC, Guided transmission Media, Wireless Transmission, communication satellite, Public Switched Telephone Network, Mobile Telephone System, Cable Television.

Unit II : **Data Link Layers** : Design issues , , Error detection and correction, Elementary Data Link protocols, Sliding window Protocols, Protocol Verification, Example DL protocols.

Unit III : **MAC Sublayer** :Static and Dynamic channel allocation, Multiple Access protocols, ALHOA, CSMA, Collision Free Protocols, Ethernet, Wireless LANS, Broadband Wireless, Blue tooth, Data Link Layer Switching.

Unit IV : **Network Layer**: Design Issues, Routing methods: Shortest path,floding, Link state,
Distance vector routing and broadcast & multicast routing, Congestion control algorithms, quality of services ,internet working, network layer in the Internet .

Unit V : **The Transport Layer** : Service primitives, UDP: RPC,RTTP,TCP: TCP Services and Features, TCP segment format, TCP Connections, TCP Timers,performance isseu.

Unit VI : **The Application Layer**: DNS, Electronic Mail, WWW, Multimedia:Voice over IP,H.323,Video on demand,The M-Bone.

Textbook :

1: Andrew S. Tanenbaum : Computer Networks , Fourth Edition,– (Pearson)

Reference Books :

1. James F. Kurose & K W Ross: Computer Networking Pearson Education (LPE)
2. Douglas E. Comer: Computer Network & Internet Addison Wesley.
3. Leon Garcia & Widjaja: Communication Networks TMH
4. William Stallings: Data & Computer Communication Pearson Education

FREE ELECTIVE - II
6FEIT05 (i) E-COMMERCE

Unit I : E Commerce : The difference between E-commerce and E-business, Why study E-commerce? Eight unique features of E-Commerce Technology, Types of E-Commerce, Growth of the INternet and the WEb, Origins and Growth of E-commerce, E-Commerce - A brief History.

Unit II : E-commerce Business Models and Concepts : E-Commerce business Model-eigh Key elements of a Business Model, Major Business-to-Consumer (B2C) Business Models, Major Busiess to -Business (B2B) Business Models:Businss Models emerging inE-Commer areas, How the INternet and the WEB change Business; Strategy, Structure and Process.

Unit III : E-Commerce Infrastructure : The Internet: TEchnology Background, The Intenet Today, Intenet II; The future infrastructure,The World Wibe WEb, The Intenetand the Web Featurs.

UNIt IV : Building an E-Commerce Web Site : Building and E-Commerce Wet Site- A strategic approach, Choosing Server Software, Choosing the Hardware for an E-Commerce site, Ohter E-Commerce Site Tools.

Unit V : Online Security and payment systems :The E-Commerce Security Environment, Security threads in the E-commerce environment, Technology solutions,Management Policies, business procedures and public laws, payment systems.

Unit VI : E-Commerce Marketing Concepts : Cosumer online; The INternet Audience and Consumer behaviour, Basic Marketing Concepts, INtrernet Marketing Technologies, B2C and B2C E=Commerce marketing and Branding strategies.

Text Book :

KenethC. Laudon, Carol Gurcio Trave"e-commerce, business, technology, society" (Pearson)

References:

1. Dave Chaffley "E-Business and E-commerce management"(3rd Edition) Pearson.
2. Kalkakofa Whirttoton, "Frontiers of E-Commerce" Pearson.

FREE ELECTIVE - II
6FEIT05 (ii) KNOWLEDGE MANAGEMENT

Unit I : Importance and knowledge management, key assumptions, The knowledges society conkcept and critical evaluation, objectivist perspectives on knowledge, The knowledge-based theory of the firm, typolist of knowledge, an objectivist perspectivest on sharing nd management of knowledge, features of practice-based perspective, implications for nature of the organizational knowledge base, a practice-based perspective.

Unit II : KNowledge management, what is manaement, knowledge management and busines strategy, conceptulasing the divesity of knowledge management strategies, The rises and defining knowledge worker, knowledge work and ambiguity, knowledge process in knowledge, inensive frims contrasting, perspective, learing and knowledge management, the heterogeity of learing, dynamics of organizational learning, the learning organizaion.

Unit III : Characterising innovation, process, innovation as an interactive process, knowledge creation and Nonaka, the social dynamic

of innovation networking process, Conceptulizing organiztinal forgetting, barriers to unlearing.

Unit IV: The share/horad dinemma, the context of the employment relationship, the ubiquity of conflict in business organiztions and its impact, inter-personal trust, group identity, personality, communities of practice

Unit V : The significance and Characterilising cross community of knowledge process, identity, knowledge, trust and social relatins, a classlfication of boundary types, faciliting/managing knowledge between communities, to perspectives on power and the power/knowledge relationship,power and the resources nd the critical discourse on knowledge management,power/ knowledge and the dialogical discourse on knowlege management

Unit VI : linking knowledge management ICTs, objectives visit and practice-based perpsepcties on ICT, the importance of accounting for socio-cultural factors in ICT,debates regarding the role of ICTs in knowledge management process, why cultural management and HRM practice are importance to knowledge management, the knowledge management, HRM, staff retention, Leadership and knowledge management.

Text Book :

Donld Hislob-"Knowledge Management in Organizations"(Oxford)

Reference Book :

B.Muthukumaran-"Information Technology for Management" (Oxford)

6IT07 COMPUTER NETWORKS LAB:

Minimum 8 experiments/ Computer Programming based on the syllabus of 6IT04.

6IT08 Computer Lab-IV (UML): Sample practical's list :

Study of basic notations of all types of UML diagrams.

1) Design state diagram for telephone system?
2) Design the use-case diagram for bank management system, having deposit & withdraw is use case & clerk & customer is actor (assume other parameter).
3) Design an object & class diagram for company as class & various department & employee as an object.
4) Design the activity diagram for library system and prepare a plan.
5) Design a sequence diagram for online shopping & explain in details.

6) Design a component diagram for building a house.
7) Design a collaboration diagram for hospital management system

References Books :

1) The Unified Modelling Language User Guide:Grady Booch, James Rumbaugh, Ivar Jacobson
2) The Unified Modelling Language Reference Mannual:Grady Booch, James Rumbaugh, Ivar Jacobson

6IT06 DATABASE MANAGEMENT SYSTEMS LABORATORY

The sample list of programs based on ORACLE or MY SQL is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Consider the employee database, where the primary keys are underlined & Write the Queries using following clauses & also retrieve the data from the given database.
   Employee (employee-name,street,city)
   Works (employee-name,company-name,salary)
   Company (company-name,city)
   Manages(employee-name,manager-name)
   I) Order By II) Between III) Group By IV) Having
2. Consider the above database & perform the different Join Operations which are as follows.
   I) Inner Join II) Left Outer Join
   III) Right Outer Join IV) Full Outer Join
3. Consider the above database & Perform the different Set Operations Which are as follows.
   I) Union II) Intersect III) Except/Minus
4. Consider the above database & perform the all Aggregate Functions.
5. Write an assertion for the bank database to ensure that the assets value for the 'perryridge' branch is equal to the sum of all amounts lent by the 'perryridge' branch.
   Customer(customer-name, customer-street, customer-city)
   Branch(branch-name, branch-city, asstes)
   Loan(loan-number,branch-name,amount)
   Borrower(customer-name,loan-number)
   Depositor(customer-name, account-number)
   Account(account-number,branch-name,balance)
6. Write an SQL trigger to carry out the following action: On delete of an account, for each owner of the account, check if the owner has any remaining accounts, and if she does not, delete her from the depositor relation.

7. Consider the above Bank database & write the SQL queries for the following views:
   I) A view containing the account numbers the customer names for all accounts at the deer park branch.
   II) A view containing the names and addresses of all customers who have an account with the bank, but do not have a loan.
8. Mini Project Using Oracle 9i & VB6

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SYLLABUS PRESCRIBED FOR
FIVE YEAR DEGREE COURSE IN
ARCHITECURE
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
FIFTH & SIXTH SEMESTER

SEMESTER: FIFTH
05AR01 &05AR07
BUILDING MATERIALS & CONSTRUCTION-V

Objective : The course will enable the learning in progression , starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: Structural steel members with connections of girders, stanchions and grillage foundations.

Unit II: R.C.C frame structures and advantages over load bearing masonary constructions. Detailing of R.C.C. work with reinforcement for one way & two way slabs, R.C.C. beams , columns, footings and its types. Flat plate slab and its purpose.

Unit III: R.C.C. cantilevers and reinforcement details in chajjas, balcony, canopy, lofts,etc.R.C.C. staircases and its reinforcement details.

Unit IV: Shallow foundations and its types. Detail study of raft foundations , its types and uses.

Unit V: Appropriate cost effective construction techniques and materials to be useful to conserve energy.

Unit VI: Special concrete and concreting methods such as light weight, high density, fibre reinforced, polymer concrete- outline of manufacture, properties and uses. Ready mix concrete and current developments in concrete product.

Sessional work: Assignments, test,site visit and drawing on the above topics.

References:

1. S.C. Rangwala, Engineering Materials, Charotar Publishing House, Anand,1997
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.
3. W.B. Mckay Building Constrution, vol. 1,2,3, Longmans, U.K.1981.

4. Don A Watson, Construction Materials and Processes, McGraw Hill Co.,1972.
5. R. Chudley, Construction technology, Richard Clay (Chaucer Press) Ltd.,Suffolk,1978.
6. J.H.callender,Time saver standard for Architectural Design Data, McGraw-Hill,1994.

05AR02 BUILDING SERVICES AND EQUIPMENTS.

Objective: To impart knowledge of various aspects of water supply systems,drainage and solid waste disposal from building.

Unit I: General ideas of types of water impurities. Systems of water supply of low rise buildings and high rise buildings.

Unit II: Computing water demands for various uses - hot water supply system- solar water heater- geysers.

Unit III: Water supply pipes and fittings, material, size and classifications. Types of taps , toilet and kitchen fittings.

Unit IV: Water storage reservoir, their types and importance in water supply scheme.
Electrical wiring systems and electrical appliances.

Unit V: Drainage systems, conservancy and water carriage systems.Types of traps and sanitary fittings.

Unit VI: Sewage disposal systems from building.

Sessional work: Assignments, test,site visit and drawings on the above topics.

References:

1. Manual of Water supply and treatment , second edition, CPHEEO, Ministry of Works and housing, New Delhi, 1977.
2. Manual of Sewerage and sewage treatment, CPHEEO Ministry of Works and housing, New Delhi, 1980.
3. S.C.Rangwala, water supply and sanitary Engineering,Charotar publishing House , Anand 1989.

05AR03 ARCHITECTURAL STRUCTURE-IV.

Objective: Understanding of Basic Theory and principles of structural analysis and structural properties of elements.

Unit I: Concrete technology- types of cements, fine and coarse aggregates, water cement ratio, formwork (visit to construction sites).

Unit II: Mild steel and tor steel reinforcement , bending and fixing, placing of concrete and methods of compacting , expansions and constructions joints in concrete, durability of concrete with respect to honeycomb free, cold joint, role of admixtures in concrete.

Unit III: Use of I.S. Code for R.C.C. member, I.S.456, I.S.800, I.S.875.

Unit IV : R.C.C. theory - Introduction to limit state method.

Unit V : Column, beam and slab design in limit state method.

Unit VI: R.C.C. footing and staircases design by limit state method.

Sessional work: Assignments and tutorials on the above topics.

References:

1. P.C.Punmia, Strength of Materials and Theory of Structures; vol I, Laxmi Publications, Delhi 1994.
2. S.Ramanmurtham, Strength of Materials – Dhanpatrai & Sons, Delhi 1990
3. W.A.Nash, Strength of Materials – Schaums Series – McGraw Hill Book Company, 1989
4. R.K.Bansal – engineering Mechanics and Strength of Materials – Lakshmi Publications, Delhi, 1990

05AR04 SPECIFICATION

Objective: To impart knowledge of specification of materials and its importance.

Unit I: Art of writing specifications of material along with emphasis on the quality of the materials and proper sequence of construction works.

Unit II: Importance of specification in the building activities, method of writing correct order and sequence of use of materials. Use of Indian Standard specification and P.W.D. specification.

Unit III: Primary considerations for selections of materials for various operations .

Unit IV: Specifications of basic materials required in residential buildings such as bricks, concrete, r.c.c., plastering, various finishes, timber work, flooring materials, glazing, metals, etc.

Unit V: Specification of works for residential building- load bearing masonary type and R.C.C. framed type, steel structures,ceiling and partitions, paneling , insulation and waterproofing. Specification for services such as drainage, water supply, electrical installation.

Unit VI: Specifications for demolitions work , temporary constructions like sheds, exhibition stalls, gateways etc.Study of proprietary building materials along with manufactures specifications, trade name of such materials.

Sessional work: Assignments, tests, and tutorials on the above topics

References:

1. W.H.King and D.M.R.Esson,Specification and quantities for Civil Engineers, The English university Press Ltd.
2. P.W.D. Standard specifications, Govt. Publications.
3. Dutta, Estimating and Costing, S. Dutta and Co., Lucknow.

05FEAR05 FREE ELECTIVE
(1) FUNDAMENTALS OF ARCHITECTURAL DESIGN

Objective: The prime objective of this course is to introduce architectural design as a process and as a final product , to understand fundamentals of space, form and order through basic perception of architectural skills.

Unit I: Introduction to Architecture. Definition of Architecture, design art, fine art, visual art.

Unit II: Principles of two dimensional design elements, such as point, line, direction, shape, size, colour and texture, levels, light, fenestrations.

Unit III: Aesthetic components of design- proportions, scale, balance, rhythm, symmetry, asymmetry, hierarchy, pattern and axis with building examples.

Unit IV: Harmony and contrast in 2D and 3D design, interplay of light and shade on building blocks and their effects.

Unit V: Form and functions in Architecture, use of building materials, construction techniques and engineering services for different functions.

Unit VI: Architectural design process- an analysis- integration of aesthetic and functional utility of spaces.

Sessional work: Assignments, tests, and tutorials on the above topics

Suggested text books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)

3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book – Bitterworth, London, 1985.
4. Watson,D (editor) Time –saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., "Form defining strategis: experimental architectural design". Wasmuth, 2007.

05FEAR05 FREE ELECTIVE
(2) LANDSCAPE ARCHITECTURE

Objective: To expose students the role of landscape elements in the planning of parks, gardens, open fields, etc.

Unit I: Introduction to Landscape Architecture. Understanding man and nature , land and landscape, relationship of Architecture and Landscape Architecture.

Unit II : History of the art of garden design of India, China, Persia, Japan, Italy, France and England.

Unit III: Garden design of the modern world.

Unit IV: Ecological and environmental aspects of Landscape Design.

Unit V: Basic principles of landscape design , elements and its applications.

Sessional work :Assignments, tests, and tutorials on the above topics

References:

1. Sylvia Crowe Sheila Haywood, The Gardens of Mughal India , Vikas Publishing House, Pvt. Ltd, India, Delhi,1973.
2. Garrett Eckbo, The Art the Home Landscaping, McGraw-hill Book Co., London, 1956.
3. Testsuro Yoshida, Gardens of Japan, Jr. Marcus G. Sims, 1963.
4. Sir Banister Fletcher, A History of Architecture , University of London, The Antholone press, 1986.
5. Percy Brown, Indian Architecture (Islamic period), Taraporevala and Sons, Bombay, 1983tt
6. Satish Grover, The Architecture of India (Buddhist and Hindu Period), Vikas Publishing Housing Pvt. Ltd., New Delhi, 1981
7. Christopher Tadgelli, The History of Architecture in India from the Dawn of Civilization to the end of Raj, Longman group, U.K.Ltd., London, 1990

05AR06 : ARCHITECTURAL DESIGN STUDIO - V

Objective : To expose the students to the architectural design process of multifunctional building with emphasis on topography, climatic consideration, materials and techniques.

Basic contents:

1) Introduction to the designing of multifunctional community buildings on an intermediate scale.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Major design project may be based on commercial, institutional, Hotel, Luxurious apartment, Hospital etc. at appropriate level.
5) Architectural study tour relevant to design project.

Sessional work: One major design project and one time project with other task and assignments.

Viva Voce by external examiner at the end of Semester.

Suggested text books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)
3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book – Bitterworth, London, 1985.
4. Watson,D (editor) Time –saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., "Form defining strategis: experimental architectural design". Wasmuth, 2007.

05AR07 BUILDING MATERIALS & CONSTRUCTION STUDIO -V

Sessional work:

Assignments and drawing on the above topics given in the subject 05AR02 Building Materials & construction – V.

Viva Voce by external examiner at the end of Semester.

05AR08 INTERIOR DESIGN - I

Objective : To Impart the knowledge of interior design as an integral part of Architectural Design process and the study of latest interior materials.

Unit - I: History of interior design
Introduction to history of furniture and importance of styles related to furniture. Vernacular design in India with reference to interior design and decoration.

Unit – II: Introduction to Interior Design
Definition of interior design, Interior design process, introduction to the design spaces as related to function, themes, concept, study and design.

Unit - III: Interiors in residence
Space organization in interiors , surface treatment in interiors viz. on walls , floors, ceilings etc. Different type of materials that are available and their uses in interiors. Interior Design Project of any small residence.

Sessional work:
One major interior design project and one time project with other task and assignments

Viva Voce by external examiner at the end of Semester.

Suggested Books:

1. Chiara, J.D., Panero, J., Zelnik, M., "Time Saver Standards for Housing and Residential Development", 2nd Ed., McGraw-Hill.
2. Neufert, P., "Architects Data", 3rd Ed., Blackwell Science.
3. Watson, D.(Editor), "Time-saver Standards for Architectural Design: Technical Data for Professional Practice", McGraw-Hill
4. Ballard Bell, Victoria and Rand, P., "Materials for Architectural Design", Laurence King

05AR09 WORKING DRAWING - II

Objective : The students shall impart the knowledge of construction details for the execution of building from foundation to roof level.

Contains : Working drawing of RCC structure for design project done during fourth semester. The drawing should be in an appropriate scales.

The working drawing should include from foundation level to roof level as follows :

a) Study of building byelaws
b) Municipal drawing and detail of all level plans.

c) Details center line plan of columns
d) Working details of any interesting features in the plan, sections & elevation.
e) Site plan showing drainage layout, landscape layout, internal roads etc.
f) Working details of water supply & electrical layout plan's.

Sessional Work : Assignments and drawing plates on the above topics.

Viva Voce by external examiner at the end of Semester.

Suggested text books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)
3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book – Bitterworth, London, 1985.
4. Watson,D (editor) Time –saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., "Form defining strategis: experimental architectural design". Wasmuth, 2007.

SEMESTER : SIXTH

06AR01 ARCHITECTURAL DESIGN - VI

Objective : To expose the students to the architectural design process of multifunctional building with emphasis on topography, climatic consideration, materials and techniques.

Basic contents:

1) Introduction to the designing of multifunctional community buildings on an intermediate scale.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Major design project may be based on commercial, institutional Hetel, Luxurious apartment, Hospital etc. at appropriate level.
5) Architectural study tour relevant to design project.

Sessional work: One major design project and one time project with other task and assignments.

Suggested Text Books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)
3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book – Bitterworth, London, 1985.
4. Watson,D (editor) Time –saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., "Form defining strategis: experimental architectural design". Wasmuth, 2007.

06AR02 BUILDING MATERIALS & CONSTRUCTION-VI

Objective : The course will enable the learning in progression , starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I : Structural steel frame work & trusses for various spans , design consideration, advantages, connection of various members supported on R.C.C. column, brick piers , fixing, wind bracing etc.

Unit II: Steel north light roof trusses, connections Gutters, patented glazing etc.

Unit III: Patent glazing for skylights, lanterns, steel Monitor roofs, methods of fixing, fixtures and fastenings.

Unit IV : Introduction to precast building elements, comparative study with cast in situ constructions. Appropriate use of various types of precast building elements and its construction details.

Unit V : Study of Deep foundation. Details study of Pile foundation , types and its purpose.

Unit VI : Shoring, purposes and types . Underpinning its purposes and types.

Sessional work:
Assignments, test,site visit and drawing on the above topics.

References :

1. S.C. Rangwala, Engineering Materials, Charotar Publishing House, Anand,1997
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.

3. W.B. Mckay Building Constrution, vol. 1,2,3, Longmans, U.K.1981.
4. Don A Watson, Construction Materials and Processes, McGraw Hill Co.,1972.
5. R. Chudley, Construction technology, Richard Clay (Chaucer Press) Ltd.,Suffolk,1978.
6. J.H.callender,Time saver standard for Architectural Design Data, McGraw-Hill,1994.

06AR03 ARCHITECTURAL STRUCTURE-V

Objective: Understanding of Basic Theory and principles of structural analysis and structural properties of elements.

Unit I : Introduction to pre cost concrete.

Unit II : Application of thumb rules for beams, columns, slab for fixing & sectional properties.

Unit III : Water tanks resting on ground with flexible and rigid base by I. S. code method.

Unit IV : Understanding types of joints in steel structures, riveted, welded and bolted joints. Types of steel section and their properties.

Unit V: Simple welded and riveted connection (without moments) only axial loads.

Unit VI: Design of simple tension and compression member of trusses.

Sessional work:
Assignments , tutorials and site visit on the above topics.

References:

1. P.C.Punmia, Strength of Materials and Theory of Structures; vol I, Laxmi Publications, Delhi 1994.
2. S.Ramanmurtham, Strength of Materials – Dhanpatrai & Sons, Delhi 1990
3. W.A.Nash, Strength of Materials – Schaums Series – McGraw Hill Book Company, 1989
4. R.K.Bansal – engineering Mechanics and Strength of Materials – Lakshmi Publications, Delhi, 1990

06AR04 ESTIMATE AND COSTING

Objective: To impart knowledge of cost estimation of building construction work as per specification of materials and its importance.

Unit I : Types of estimates. Data required for framing estimate method of preparing estimates , method of preparation of estimate.

Unit II : Standard mode of measurement, schedule of rates and its use , Administrative approval, Technical sanction. Competent authority, issue rate , interest, indent of wish etc. .

Unit III: Method and procedure of working out abstract and bill of quantities.

Unit IV: Examples and exercise for working out quantities for items from excavation to the final finishing of load bearing and R.C.C. items viz. slab, beams , columns etc.

Unit V: Rate analysis, factors affecting the rate of an item , rate analysis of advance equipments use in buildings. Cost of materials and labour for various works, detailed rate analysis of important items of construction work. Measurement of work for interim and final certificate of payment.

Unit VI: Detail estimate of project given and use of computers for the same.

Sessional work: Assignments, tests, and tutorials on the above topics

References:

1. W.H.King and D.M.R.Esson,Specification and quantities for Civil Engineers, The English university Press Ltd.
2. P.W.D. Standard specifications, Govt. Publications.
3. Dutta, Estimating and Costing, S. Dutta and Co., Lucknow.
4. Singh, S.C. and Sofat, C.G., Ed., "Handbook on Building Economics and Productivity", Central Building Research Institute
5. Birdie, G.S., "Text Book of Estimating and Costing (Civil Engineering)", Dhanpat Rai Publishing Company (P) Ltd.

06FEAR05 FREE ELECTIVE .
(1) CLIMATE RESPONSIVE ARCHITECTURE.

Objective: The course aims to understand the various features to be considered for planning and designing of climate responsive built and un-built spaces.

UNIT-I : Introduction of Sun – Earth relationship and its impact on earth surfaces. Thermal balance of Earth, Tropical Zones on earth surfaces.

UNIT-II : Human comfort through body metabolisms, heat gain and heat loss , thermal balance of body, clothing pattern its effect on body.

UNIT-III : Climatic factors and climatic elements. Importance of climatic factors to create micro and macro climatic conditions.

UNIT-IV: Introduction of planning, designing, materials and techniques considered in traditional structures with respect to climate.

UNIT-V: Solar charts, types of shading devices, shadow angles and its use.

UNIT-VI: Planning and design of building in hot and dry climates.

Sessional work ; Assignments and test on the above topics.

References:

1. O.H.keonigsberger; T.G. Ingersoll and others; Manual of tropical housing and building- Part-I; Longmans,London-1980
2. M. Evans; Housing, climate and comfort; Architectural press London- 1980
3. B.G.Givoni; Man,climate,and architecture; Applied science, banking, Essex, 1982
4. N.K Bansal and others; Passive building design; Elsevier science- 1994.
5. S.Drake; The third skin architecture,technology and environment;UNSW –press-2007.

06FEAR05 FREE ELECTIVE
(2) SUSTAINABLE ARCHITECTURE.

Objective: To sensitize students about the importance and need for Sustainable Planning concept with respect to conservation of Environment.

UNIT-I : Introduction to the ideas, issues and concepts of Sustainable Architecture, global environment and the built environment, principles of environmentally and ecologically supportive architecture.

UNIT-II: Study of sustainable architecture in context with resource efficiency viz. Land , Water, Energy, Materials, Human resources,. Biodiversity , health and global environment related to constructions and operation of buildings.

UNIT-III: Appropriate materials and constructions to maintain sustainability. Eco friendly construction practices – sustainable campuses and case studies.

UNIT-IV: Sustainable and conservation practices, water conservation, sewerage treatment, solid waste treatments, economics and managements.

UNIT-V: Low energy design, hybrid system, modeling and simulation of energy system, integration of P.V. and wind system in the building, wind, solar and other non-conventional energy systems.

UNIT-VI: Climatic factors and sustainability.

Sessional work : Assignments and test on the above topics.

References:

1. O.H.keonigsberger; T.G. Ingersoll and others; Manual of tropical housing and building- Part-I; Longmans,London-1980
2. M. Evans; Housing, climate and comfort; Architectural press London- 1980
3. B.G.Givoni; Man,climate,and architecture; Applied science, banking, Essex, 1982
4. N.K Bansal and others; Passive building design; Elsevier science- 1994.
5. S.Drake; The third skin architecture,technology and environment;UNSW–press-2007.

06FEAR06 (1) ACOUSTICS AND ILLUMINATION

Objective: To enable the students understand the articulation of sound within and around building, fundamentals of sound propagation and lighting requirements in buildings.

UNIT-I : Fundamentals - sound waves , frequency, intensity , wave length, measure of sound, decibel scale, speech and music frequencies, human ear characteristics.

UNIT-II: Sound transmission and absorption – outdoor noise levels, acceptable indoor noise level, sonometer. Sound absorbing materials, absorption co-efficient and measurements, resonance reverberation time , sound levels and their calculations.

UNIT-III: Acoustical defects and remedies. Structure borne and air borne noise, their effects and control.

UNIT-IV: Site selection, shape, volume, treatments for interior surfaces, basic principles in designing open air theatres, cinemas , broadcasting studio, concert hall , theaters, lecture Halls.

UNIT-V: Principles of Illumination- Visual tasks - factors affecting visual task – Modern theory of light and colour - synthesis of light - luminous flux - candela – solid angle illumination – Utilizations factor- Depreciation factor – MSCP – MHCP Laws of illumination. Application of laws in lighting calculations using point by point method.

UNIT-VI: Lighting Design – Classification of lighting – Artificial light sources - spectral energy distribution – luminous efficiency. Design of modern lighting for stores, offices, schools, hospitals and houses lighting.

Sessional work : Assignments and test on the above topics.

References:

1. Indian Standard (732)– Electrical Wiring Installation
2. Indian Standard (3646)– Interior Illumination Part I, II, III
3. Indian Standard (3043)– Earthing
4. Taylor E. O., “Utilisation of Electric Energy (in SI units)”, Orient Longman, Revised in S.I. units by Rao, V.V.L
5. Dr. V. Narasimhan – An Introduction to Building Physics – Kabeer Printing Works, Chennai – 5 – 1974
6. Thomas D.Northwood–ArchitecturalAcoustics–Dowden, Hutchinson and Ross Inc.- 1977

06AR07 ARCHITECTURAL DESIGN STUDIO - VI

Objective : To expose the students to the architectural design process of multifunctional building with emphasis on various building services such as lighting , ventilation, movement, fire safety, security , water supply, sewage etc.

Basic contents:

1) Introduction to the designing of multifunctional community buildings on an intermediate scale.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning, etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Major design project may be based on commercial, institutional Hetel, Luxurious apartment, Hospital etc. at appropriate level.
5) Architectural study tour relevant to design project.

Sessional work: One major design project and one time project with the other task and assignments. on the above topics given in subject Assignment & drawing 06AR 01.

Viva Voce by external examiner at the end of Semester.

Suggested text books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)

3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book – Bitterworth, London, 1985.
4. Watson,D (editor) Time –saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., "Form defining strategis: experimental architectural design". Wasmuth, 2007.

06AR08- BUILDING MATERIALS & CONSTRUCTION STUDIO -VI

Sessional work:
Assignments and drawing on the above topics given in the subject 06AR02 Building Materials & construction – VI.

Viva Voce by external examiner at the end of Semester.

06AR09 INTERIOR DESIGN - II

Objective : To Impart the knowledge of interior design as an integral part of Architectural Design process and the study of latest interior materials.

Unit- I : Introduction to various elements in interiors like floors, ceilings, walls, staircase, openings, interiors services, incidental elements etc. and various methods of their treatment involving use of materials and methods of construction in order to obtain certain functional , aesthetic and psychological effects.

Unit - II: Visual perception of interiors spaces, functions, form, scale proportions , balance, harmony and rhythm. Market survey of recent Interior materials and their application, case studies of outstanding interior design examples. .

Unit - III: Ergonomics in interior Design with respect to human comfort, interior design of furniture for specific types of recreational, educational, office and commercial activities.

Sessional work: One major interior design project on the above topics with assignments.

Viva Voce by external examiner at the end of Semester.

Suggested Books :

1. Chiara, J.D., Panero, J., Zelnik, M., "Time Saver Standards for Housing and Residential Development", 2nd Ed., McGraw-Hill.
2. Neufert, P., "Architects Data", 3rd Ed., Blackwell Science.
3. Watson, D.(Editor), "Time-saver Standards for Architectural Design: Technical Data for Professional Practice", McGraw-Hill
4. Ballard Bell, Victoria and Rand, P., "Materials for Architectural Design", Laurence King

SYLLABUS PRESCRIBED FOR
FOUR YEAE DEGREE COURSE IN
INSTRUMENTATION ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
FIFTH & SIXTH SEMESTER

FIFTH SEMESTER

5 IE0 1 INTRODUCTION TO MICROPROCESSORS & MICROCONTROLLERS

Unit I : Introduction to Intel 8085, Architecture and operation, Pin Diagram, Data flow to/from Memory, Bus timings, T States, Machine Cycles, Timing Diagram, Address Decoding Schemes, Memory Mapping's, Comparison of Zilog 80 and Motorola 6800, Introduction to 8086.

Unit II : Addressing Modes of 8085, Instruction Set of 8085,Address space partitioning, Programming practice using 8085.

Unit III: Programming Practice using Time Delays, Looping, Counting, Indexing.Interrupt Structure of Intel 8085, Serial Data transfers using SID and SOD.

Unit IV : Concept of General purpose programmable devices like Intel 8155, 8255,Architecture,Interfacing & programming with Intel 8085. Architecture, Interfacing & programming of Intel 8253/54, 8279.

Unit V : Serial Data transfers using Intel 8251 (usart), Architecture, Interfacing & programming with Intel 8085.Concept of Bus Standards like RS 232C & IEEE 488. Concept of DMA , Architecture, Interfacing & programming of Intel 8237 with 8085.

Unit VI : Block diagram of microcomputer, block diagram of microcontroller, comparison between microprocessor and microcontroller, microcontroller survey (8-bit, 16-bit,32-bit), Features, pin out diagram, internal block diagram, CPU registers, flags, PSW, PC, Data Pointer, SFR, SP, Internal RAM/ROM, External memory, I/O ports.

Practical: Students are expected to perform minimum 8 experiments based on above syllabus.

TEXT BOOK:

1) Gibson G.A., Liu Y.C. : Microcomputer system the 8086/8088 family, Prentice Hall India Pvt. Ltd., New Delhi (Second edition), 1996.
2) Hall D.V. : Microprocessor and Interfacing Programming and Hardware, McGraw Hill Co., New York, 1986.

3) Gaonkar R.S. : Microprocessor Architecture Programming and Applications with the 8085, Penram International Pub. (Third Edition), 1997.
4) Data sheet of national semiconductors
5) "8051 Microcontroller: Architecture, Programming and applications" by Ayala K.J. 2nd Edn., Penram international

REFERENCE BOOK:

1. 8088 &8086 Microprocessor By Walter A. Triebel

5 IE0 2 POWER ELECTRONICS

Unit I : SCR, Triac, Diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, Thyristor firing circuits. Introduction to GTO,power transistor, power MOSFET & IGBT & their construction & characteristics.

Unit II : Series parallel operation of SCR's, static & dynamic equalizing ckts., equalisation of current in parallel connected SCR's,string efficiency, derating factor, Protection of SCR's against di/dt, dv/dt, radio freq., interference, over voltage, over current.

Unit III : Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.

Unit V : Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt.,Jones chopper, step-up chopper and AC chopper. Basic principle of cycloconverters, single phase to single phase cycloconverter.

Unit VI : Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers,speed control of three phase induction motor by stator voltage control, v/f control and slip power recovery scheme. Static ckt. braker, UPS, fan speed regulator, principle of soft start ckts. Zero Voltage Switch.

PRACTICALS: **Students are expected to perform minimum 8 experiments based on above syllabus.**

TEXT BOOKS:

1) P.C.Sen - Power Electronics.
2) M.D.Singh & K.B.Khanchandani - Power Electronics, Tata McGraw Hill

REFERENCES BOOKS :

1) M. Ramamoorthy - Thyristor and their application.
2) M.H.Rashid - Power Electronics Ckts., Devices and Application.
3) Dr.P.S. Dhimbra - Power Electronics.

5 IE03 CONTROL SYSTEMS

Unit I : Definition of control system , closed and open loop systems ; transfer function, derivation of transfer functions of physical systems, block diagrams reduction , signal flow graphs.

Unit II : Time response analysis: Analysis of first, second order systems, static and dynamic errors coefficients, errors criteria, stability of control system using Routh Hurwitz's stability criterion.

Unit III : Introduction of Root Locus method; Root Locus plots, Rules for constructing root loci, stability analysis of systems using Root locus, Root contour plots, effect of zeros & poles.

Unit IV : Introduction of frequency response, Bode plots, stability analysis of systems using Bode plots, polar plots, Nyquist stability criterion, relative stability.

Unit V : State space representation of systems, conversion of state variable models to transfer functions, conversion of transfer functions to state variable models, solution of state equations, concepts of controllability and observability.

Unit VI : Sample data control systems :representation of sampled data (Discrete) systems, review of Z-transforms, sampler and hold ckt., Z-transform analysis of sampled data of sampled data control systems (open & closed loop systems), Z transform of systems. Solution of difference equation by Z transform methods. Response of discrete systems. Digital controller & its transfer functions. Stability analysis of discrete time system using bilinear transformation.

TEXT BOOKS:

1) K. Ogata: Modern Control Engg. (PHI)
2) Anand Kumar: Fundamental of Control Systems (PHI)

REFERENCE BOOKS :

1) M. Gopal : Digital Control Systems Principles & Design (TMH)
2) I.J. Nagrath & M.Gopal : Control System Engg. (Wiley Eastern)

5 IE0 4 ELECTRONIC INSTRUMENTATION

Unit I : Study of logic family RTL, DCTL, DTL, TTL, MOS logic , CMOS logic, characteristics of digital ICS

Unit II : Study of Flip- flops, Shift Register, Counter.

Unit III : Semiconductor memories, sequential memories, CMOS register stages, BJT RAM cell, MOS RAM , A to D and D to A conversion techniques.

Unit I : Different types of signal generators, Design and use of regulated power supplies, Precision ohmmeter, RF power and Voltage measurement, automated voltmeter, RLC Meter, tan ä??Meter.

Unit V : Digital time measurement technique: venire technique for small time interval measurement, measurement of periodic time, measurement of phase, capacitance, And quality factors.

Unit VI : Digital frequency measurement technique: measurement of ratio , product and differences between two frequency , High freq. measurement , Peak freq. measurement , Fast low freq. measurement.

TEXT BOOKS:

1. Modern digital Electronic By R.P. Jain (TMH)
2. Digital Measurement Technique by Rathore T.S.
3. Modern electronic Instrumentation and measurement techniques by W.D. Cooper & A.D. Helfric

REFERENCE BOOK:

1. Digital design By Morries Mano

5FEIE05 FREE ELECTIVE –I
1) SENSORS & TRASDUCERS

Unit I : **Viscosity Measurement:** Terminology , Units , Types - Capillary , Efflux cup, Saybolt, Searle's rotating cylinder , Float type, Gyrating element, Vibrating Reed, Plastometers, Cone and plate , Falling and rolling ball , Covettee concentric cylinder, Rota meter

Unit II : **Density Measurement:**
Liquid : Chain-balanced float type , Electromagnetic suspension, Angular position, Hydrometer(Buoyancy type) , Gravitrolmeter

(U tube type) , Hydrostatic Head (Air bubbler , DP Cell) , Oscillating Coriolis , Radiation
Gas: Gow-Mac, Displacement type, Centrifugal gas, Gal column balance, Electromagnetic suspension, Displacement type, thermal conductivity bridge type.

Unit-III: **Chemical Measurements**
Consistency Measurement: Probe type, blade type, float type, Rotating type, Optical, Level consistency meter, Flow Bridge, CT and PT method.
Turbidity Measurement: Double Beam method, Laser type, Light Scattering, Back scattering analyser, Nephelometer, Suspended solids and sludge density sensor.

Unit-IV: **Analytical Measurements**
Composition Measurement
- **Colour Measurement :** Photo reflective, Photoelectric, through beam type
- **Radiation Measurement:** Chromatography,, flow through porous electrodes and detectors, on-line measurements
- **Moisture in Solids:** Nuclear moisture gauge, Infra Red Absorption or Reflection, Microwave solid moisture analyser, NMR, Conductance and capacitance probes.

Unit V: **Environnemental Measurements**
Microphones : Capacitive, Piezo electric, Electrodynamics, Carbon granule, Ribbon type SPL meter
Smoke Detector : Smoke detector
Dust_: Air Pollution standard**,** Air pollution sampling and Measurement
CO & CO2 : Measuring Techniques for CO, CO2, NOX and SOX
Fire, Flame, Leak Detection
Non Destructive Testing: Metal Detector, Non Metal Detector

Unit VI : **Moisture Measurement**
Moisture in Gases and Liquids: Electrolytic hygrometer, capacitance, Piezoelectric, Impedance, Head of Adsorption, Infra Red, Resistivity / Conductivity types.
Moisture in Solids: Nuclear moisture gauge, Infra Red Absorption or Reflection, Microwave solid moisture analyser, NMR, Conductance and capacitance probes.

TEXT BOOKS:

1. Rangan, Sharma,"Instrumentation Devices and Systems", Mani-Tata McGraw-Hill- Second Edition.

2. Nakra Chaudhary," Instrumentation Measurement and Analysis", Tata McGrawhill-21st Reprint.
3. D. Patranabis,"Principles of Industrial Instrumentation", Tata McGrawhill-7th Reprint,1986
4. A. K. Sawhney,Electrical and Electronic Measurements and Instrumentation",Dhanpat Rai and Sons , Delhi-2002print
5. R.K.Jain,"Mechanical and Industrial Measurement",Khanna Publications-9th print

REFERENCE BOOKS:

1. Andrew Williams, "Applied Instrumentation in Process Industries(Vol.I)",Gulf Publications Company- Second Edition
2. B. G. Liptak- Butterworth Heinemann, "Process Measurement and Analysis" Third Edition
3. B. E. Noltingk EL / BS ,"Jone's Instrument Technology (Vol. 1 and Vol. 2)", Fourth Edition
4. E. O. Doebelin, "Measurement System Application and Design", McGraw-Hill International- Fourth Edition

FREE ELECTIVE - I
5FEIE05 (2) ADVANCE SENSORS AND TRANSMITTERS

Unit I : Flow Transducers: Basic measurement principles, Differential pressure Type (Orifice, Ventury, Anubar Pitot tube),Variable area type, Positive displacement type ,Mass flow meter.

Unit II: Intelligent sensor: Introduction, Features , desirable on chip signal processing, present status.
MEMS Sensor: Introduction, MEMS sensor-Design challenges, MEMS sensor-generation & development.

Unit III : PH & Conductivity sensors: PH scale and standard principal of pH measurement ,different types of reference & measuring electrode .Principal of conductivity measurement, conductivity cells & bridges.

Unit IV: Density measurement: Introduction, various scale, hydrometer type, vibrating densitometer, gas Densitometer, ultrasonic sludge densitometer, centrifugal gas density sensor. Viscosity measurement: Definition, capillary type, cone plate.

Unit V : Biosensor Technology: Introduction, Nanosensor: Nanotechnology Introduction, nanosensor development, future of nanosensor.
Positioners : necessity, types and effect on performance of control valve, Actuators: pneumatic, hydraulic, electrical, electro-pneumatic, electro-hydraulic.

Unit VI: Transmitters: Buyancy ,differential pressure, temperature, electro hydraulics,2 wire transmitters, Converters: Resistance to current ,voltage to current, pneumatic to electrical & electrical to Pneumatic.

TEXT BOOKS :

1. Sensors and transducer by Dr. A.D. Shaligram First Edition
2. Sensors and Transducer by D. Pathanbis

REF. BOOKS :

1. Electronics Instrumentation and measurement by A.K. Sawhney
2. Process control By B.G. Liptak

5IE06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage.
Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage, reading
Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.
Active and passive forms, negative and interrogative, punctuation and capitalization. Summary, Precise & abstract writing. **(10 Hours)**

Unit II: Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.
Non-verbal communication, types of graphics and pictorial devices. **(10 Hours)**

Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like writing applications, Resume, notices, minutes, quotations, orders, enquiries etc. Claim letter.
Oral communications - Important objectives of interpersonal skills, soft skills(listening, speaking strategy), (verbal and non-

verbal), face to face communications, group discussion and personal interviews.

Methodology of conduction of meetings, seminars, symposia, conference and workshop. **(10 Hours)**

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) M.A. Rizvi: Effective Technical communication, Tata McGraw Hill.
3) Urmila Rai & S.M.Rai : Communication Skills ,Himalaya Publisher House.
4) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
5) Dr. Nageshwar Rao & Dr. Rajendra P. Das : Communication skills, Himalaya Publisher House.

5IE09 Communication Skills Lab:

Objective: On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be accessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

TEXT BOOK: Norman Lewis: Word Power Made Easy

SIXTH SEMESTER
6 IE01 CONTROL SYSTEM COMPONENTS

Unit I : Introduction to control system components - electrical, mechanical, hydraulic, pneumatic. Comparison of these systems ,Control actions : two point control (on/off) , proportional (P), integral (I), derivative (D), PI, PD, PID, offset in P action, reset windup, effect of PID on process characteristics, tuning of PID Controller.

Unit II : Control valve: terminology, types, characteristics, selection criteria, concept of Cv, Calculation of Cv and trim size. Control Valve design for (Gas, Vapor, and Liquid). Effect and remedies of cavitations, Flashing condition, Valve noise , Calculations , reduction methods.

Unit I : Hydraulic Components

Hydraulics: Principle, Block Diagram, Advantages, Disadvantages, Applications, Hydraulic Fluid.

Hydraulic components**:** Hydraulic Power Pack, Hydraulic Filters, Hydraulic Pumps, Actuator (cylinders & motors), Hydraulic valves.

Hydraulic Circuits: Development of hydraulic circuits using Standard Symbols. Hydraulic Circuits like Meter in, Meter out, Reciprocating, speed control, Sequencing of cylinders, Direction control, Deceleration, Regenerative circuit.

Unit IV : Pneumatic Component:

Pneumatics**:** Principle, Block Diagram, Advantages, Disadvantages, Applications.

Pneumatic components: Pneumatic Power Supply, Types of Pneumatic Relay, FRL unit, Pneumatic Actuator (cylinders and Air motors), Pneumatic valves.

Pneumatic Circuits: Development of Pneumatic circuits using Standard Symbols. Sequence diagram (step-displacement) for implementing pneumatic circuits. Different Pneumatic Circuits like Reciprocating, Sequencing, Anti-cycle repetition, Block transfer, Speed regulation, Job sorting, Electro-pneumatic circuits.

Unit V : Switches: Construction, symbolic representation, working, application of Toggle switch, Slide switch, DIP switch, Rotary switch, Thumbwheel switch, Selector switch, Push button, Drum switch, Limit switch, Emergency switch, Micro-switches, Review of process switches, Switch specifications.

Unit VI: Relays: Construction, working, specifications, selection criteria and applications of Electro-mechanical relay, Reed relay, Solid-state relays.

Contactors: Construction, working, specifications and applications of contactors. Comparison between relay and contactor. Development of wiring diagram (using switches, Relays, Contactors). Annunciator system.

Practicals: Students are expected to perform minimum 8 experiments based on above syllabus.

TEXT BOOKS:

1) C.D.Johson : Process Control and Instrument Technology
2) A.Anderson : Instrumentation for Process Measurement and Control
3) Process Control Principal and application by Surekha Bhanot , Oxford University Press
4) Industrial Hydraulics by Pipepinger
5) Control system component by M.B. Desai (PHI)

REFERENCE BOOKS:

1. Hand book Process control By B.G.Liptak Vol. II
2. P.Harriott : Process Control

6IE02 UNIT OPERATIONS

Unit I : Basic concept: Unit operation and unit process concept: Block diagram of Chemical process, Classification of unit operation, Material and Energy balance, Batch and Continuous Process, Endothermic and Exothermic reaction, Reversible and Irreversible Process, Humidification and Dehumidification. Extraction: Field of Application of liquid Extraction, Selection of solvent, Extraction Equipments (Mixer- settlers , spray column) Leaching Equipment.

Unit II : Transportation & Systems: Classification, Efficiency, and Characteristics of Pumps, Compressors, Fans, Blowers and NPSH of Centrifugal Pumps. Heat Exchangers: Types of Heat Exchangers.

Unit III : Distillation: Continuous Fractionating Columns, Plate efficiencies. Influencing plate efficiency, Flash Distillation and Batch distillation.
Drying: Principle of drying, Classification of dryers, Temperature patterns in dryers , Drying equipment, Selection of drying equipment.

Unit IV : Chemical reactors: Classification of chemical reactors, flow dia., effect of **Variables** such as temperature, Pressure, Reactor concentration, flow pattern & reaction kinetics.
Evaporation: Types of Evaporators, Single effect evaporators, multiple effect evaporators, forced Circulation evaporator.

Unit V : Introduction to Process Industries: Nitrogen Industries: Synthesis of Ammonia, Nitric Acid, And Urea.
Manufacturing Process of Cement Plant and Paper and Pulp Industries.

Unit VI : **Filtration:** Mechanism of filtration, Rotary drum filter, flow sheet for Continuous vacuum Filtration, suspended batch. Centrifuges, Clarifying filter, cyclone types of industrial filters, Bag filters.
Crystallization: Types
Separation: -Hydro clones, centrifugal decanters, Disk centrifuge.
Size reduction: Crushing law, crushing equipment, types of grinders.

TEXT BOOKS:

1) Unit Operation of Chemical Engg. By Maccabe Smith Harriott, Mc-Graw-Hill.
2) Chemical Engineer's Handbook by Perry, 6/c McGraw Hill ,1984
3) Outline of Chemical Technology by M. Gopala Rao, Marshall Sittig (3/e)

REFERENCE BOOKS:

1) Outline of Chemical Technology by M.G.Rao & Misting, 2/e, East west, 1973
2) Designing of Thermal System by Stoker, 3/e.

6 IE03 DIGITAL CIRCUITS DESIGN

Unit I : Combinational Logic Design: Function of binary variables, Boolean Algebraic theorems, standard form of logical functions, K-map up to five variables, Quine Mcclusky method, Don't care conditions and it's effects, Synthesis using AND - OR gates.

Unit II : Combinational logic design using 74/54 series MSI chip series concerning to multiplexers, demultiplexers, decoders, encoders, comparators, code converters, priority encodersparity generator/ checker & BCD-Seven segment decoder.

Unit III : Combinational logic design using ROM array, PLA, PAL preliminary design concepts using FPGA's N-bit binary adderusing 7480, Look-ahead carry adder construction.

Unit IV : Design of counter and sequential networks: Analysis of clocked sequential networks, General models of sequential machines, Equivalence and minimization networks, Deviation of state graph and tables, reduction of state assignments, S.M.Chart.

Unit V : Analysis of asynchronous sequential networks, derivation and reduction of primitive flow tables, state assignments and

realization of flow tables, hazards, asynchronous sequential network design.

Unit VI : Fault detection and location in combinational circuits: Path sensitizing method, Equivalent - Normal-Form (ENF) method, Two-level fault detection. Fault detection and location in sequential circuits using circuit test approach.

TEXT BOOKS :

1. Charles H. Roth : "Fundamental of Logic Design" , 4th ed. Jaico Publication.
2. Lee S.C. : "Digital Circuit and Logic Design", Prentice Hall of India Pvt. Ltd., New Delhi
3. Jain R.P. : "Modern Digital Electronics Circuits and Systems",Macmillan Press, London

REFERENCE BOOKS:

1. Fleatcher : An Engineering approach to Digital System Design ",PHI
2. Morris N.M. : "Digital Electronics Circuits & Systems", Mac millan Press, London
3. Digital IC reference data manual
4. Texas Instru. Incorporated : Designing with TTL IC's.
5. Parag K. Lala : Fault Tolerant and Fault Testable Hardware Design,B.S. Publication, Hydrabad.

6 IE04 ANALOG AND DIGITAL INTEGRATED CIRCUITS

Unit I: Differential amplifier: gain expressions using H parameters, transfer-characteristics, constant current source, block diagram of op-amp, frequency response, frequency compensation methods, study of ICs uA741, measurement of parameters of op-amp and off set nulling and their importance.

Unit II: Linear Applications of Op-Amp Inverting and non inverting amplifiers, voltage followers , integrator, differentiator, differential amplifier, bridge amplifier, instrumentation amplifiers, precision rectifiers, RMS to DC converter, voltage to current converter, sinusoidal RC oscillators, constant voltage sources, frequency to voltage and voltage to frequency convertor.

Unit III : Non Linear Applications of Op-Amp and Filter Circuits Clipping and clamping circuits, comparator, astable, monostable and bistable multivibrator, Schmitt trigger, voltage sweep generator, active filters : Butterworth, Chebyshev filters using op-amp, log and antilog amplifiers , Sample & hold circuit.

Unit IV : Voltage Regulator :Block schematic of regulator IC 723, regulated power supply using IC 723, short circuit protection, switch mode

power supply, dual tracking regulators, regulator using 78**, 79**,and LM 317.

Unit V: Timers: Block schematic of IC 555, application of timer 555 as astable, monostable and bistable multivibrators, delayed timer, sawtooth generator, FSK modulator.

Unit VI: PHASE LOCKED LOOPS: Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC-LM 565 and its applications as AM detector, FM detector and frequency translator.

Practicals: Students are expected to perform minimum 8 experiments based on above syllabus.

TEXT BOOKS :-

1) Gayakwad R.A. : OP-Amps and Linear Integrated Circuits, Prentice Hall of India Pvt. Ltd., New Delhi (Second Edition), 1980.
2) Milliman J. and Grabel A. : Microelectronics, McGraw Hill Book Co.New Delhi, 1985.
3) Herb Taub and Donald Schilling : Digital Integrated Circuits, McGraw Hill Pub.
4) Operational Amplifier and Linear ICs By David A. Bell , PHI

REFERENCE BOOKS:

1) Tobey J.E. and Grame J.E. : Operational Amplifier Design and Applications, International Student Edition, 1983.
2) Linear Application Handbook : National Semiconductors.
2) Application Node on IC : BEL India.

6IE05 FREE ELECTIVE – II
(i) CONTROL SYSTEM COMPONENTS

Unit I : Control valve: terminology, types, characteristics, selection criteria, concept of Cv, Calculation of Cv and trim size, Control valve Characteristics, cavitations and flashing, Valve noise.

Unit II : Hydraulic Components

Hydraulics: Principle, Block Diagram, Advantages, Disadvantages, Applications, Hydraulic Fluid. Hydraulic components: Hydraulic Power Pack, Hydraulic Filters, Hydraulic Pumps, Actuator (cylinders & motors), Hydraulic valves.

Unit III : Pneumatic Component:

Pneumatics: Principle, Block Diagram, Advantages, Disadvantages, Applications.

Pneumatic components: Pneumatic Power Supply, Types of Pneumatic Relay, FRL unit, Pneumatic Actuator (cylinders and Air motors), Pneumatic valves, Flapper nozzle system, Pneumatic Circuits: Development of Pneumatic circuits using Standard Symbols.

Unit IV : Switches: Construction, symbolic representation, working, application of Toggle switch, Slide switch, DIP switch, Rotary switch, Thumbwheel switch, Selector switch, Push button, Drum switch, Limit switch, Emergency switch, Micro-switches, Review of process switches, Switch specifications.

Unit V: Relays: Construction, working, specifications, selection criteria and applications of Electro-mechanical relay, Reed relay, Solid-state relays.

Contactors: Construction, working, specifications and applications of contactors. Comparison between relay and contactor. Development of wiring diagram (using switches,Relays,Contactors). Annunciator system.

Unit VI: **Pumps and Compressors**

Basics classification, Efficiency, and Characteristics of pumps and compressors, principle and working of compressor and pump, Surge and Antis surge of compressor Basics and multivariable instrumentation and control scheme including safety and performance consideration of pump and compressor.

Text Books:

1) C.D.Johson : Process Control and Instrument Technology
2) A.Anderson : Instrumentation for Process Measurement and Control
3) P.Harriott : Process Control
4) Industrial Hydraulics by Pipepinger
5) Control system component by M.B. Desai (PHI)

FREE ELECTIVE - II

(ii) INDUSTRIAL AUTOMATION & PROCESS CONTROL

Unit I : **Automation**: Fundamentals of Industrial Automation, Need and role of Automation, Evolution of Automation, Elements of process control loop, Current Trends, Automation Strategy evolution, Control system audit, Automation Tools and strategies and their location in plant.

Unit II : Introduction to Process control , Types of processes, process characteristics and controllability, time constant of a process , dead time in process, classification of process variables ,difficulties and requirement of process control implementation , self regulating and non-self regulating Processes, interacting & non-interacting processes.

Unit III : Introduction to control system components - electrical, mechanical, hydraulic, pneumatic. Comparison of these systems ,Control actions : two point control (on/off) , proportional (P), integral (I), derivative (D), PI, PD, PID, offset in P action.

Unit IV : Introduction to PLC , Types of PLC , Block diagram, processor section , Specification of advance PLC, Input modules & output module (Analog , Digital , Discrete). Communication modules, limit switches, scan time, Development of simple ladder diagrams.

Unit V : DCS Introduction, Location of DCS in Plant, functions, advantages and limitations, DCS as an automation tool to support Enterprise Resources Planning, Comparison of DCS with PLC,.DCS components/ block diagram, Architecture, Functional requirements at each level, DCS specifications, Latest trends and developments , Performance Criteria for DCS.

Unit VI : Introduction to supervisory control: Introduction, Block diagram, SCADA system integrated with PLC, Channel, Scanning, Interrupt Scanning, Data processing, Distributed SCADA system, RTU, Industrial application of SCADA.

Text-Books :

1. C. D. Johnson, “Process control and Instrument technology”, TMH.
2. N.A. Anderson, “Instrumentation for Process measurement and control”,
3. Considine, “Process measurement and control”,

Reference Books :

1. B.G. Liptak, “Process Control, Instrument Engineering Hand book”,
2. Tuning of industrial control systems, ISA
3. Control valve Handbook, ISA

6IE06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage.

Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage, reading

Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.

Active and passive forms, negative and interrogative, punctuation and capitalization. Summary, Precise & abstract writing. **(10 Hours)**

Unit II: Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for

its effectivity and subject content. Non-verbal communication, types of graphics and pictorial devices. **(10 Hours)**

Unit III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like writing applications, Resume, notices, minutes, quotations, orders, enquiries etc. Claim letter.

Oral communications - Important objectives of interpersonal skills, soft skills(listening, speaking strategy), (verbal and non-verbal), face to face communications, group discussion and personal interviews.

Methodology of conduction of meetings, seminars, symposia, conference and workshop. **(10 Hours)**

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) M.A. Rizvi: Effective Technical communication, Tata McGraw Hill.
3) Urmila Rai & S.M.Rai : Communication Skills ,Himalaya Publisher House.
4) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
5) Dr. Nageshwar Rao & Dr. Rajendra P. Das : Communication skills, Himalaya Publisher House.

6IE09 Communication Skills Lab:

Objective: On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be accessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

TEXT BOOK: Norman Lewis: Word Power Made Easy

DRAFT SYALLABUS
PRESCRIBED FOR
B.E.(BIOMEDICAL ENGINEERING)
SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER V & VI

FIFTH SEMESTER

5 BM 01 DATA STRUCTURES & ALGORITHMS

Unit I : Data structures basics, Mathematical/algorithmic notations & functions, Complexity of algorithms, Sub algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit II : Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures & their memory representation. Matrices & sprase matrices.

Unit III : Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two- way linked lists.

Unit IV : Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Dequeues. Priority queues.

Unit V : Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes: threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heap sort. Path length & Huffman's algorithm. General trees.

Unit VI : Graph the<j>ry, sequential representations of graphs, Warshalls' algorithm, Linked representation, operat~ons & traversing the graphs. Po sets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

Text book :

Seymour Lipchutz: "17heory & Problems of Data Structures"
Schaum's Outline series(TMH).

References:

I. Ellis Horowitz, Sartaj Sahni - Fundamentals of Data Structures (CBS Publications)
2. Trembley, Sorenson:- An Introduction to Data Structures with Applications.(TMH)

3. Aho Ullman: Analysis and Design of Algorithms.(Pearson)
4. Bhagat Singh, Naps: Introduction to Data Structures. (Galgotia)

5BM02 BIO CONTROL SYSTEM

Unit I : CONTROL SYSTEM MODELLING
System concept, Differential Equations, Transfer functions, Modelling of electrical systems, Translational and rotational mechanical systems, Electto-mechanical systems, physiological systems, block diagram modelling, signal flow graphs.

Unit II : TIME RESPONSE ANALYSIS
Time domain specifications, step and Impulse response analysis of first order and second order systems, steady state errors, stability, Routh-Hurwitz criteria, Root locus techniques, construction of root locus, stability, dominant poles, applications of Root locus diagram.

Unit III :FREQUENCY RESPONSE ANALYSIS
Frequency response, Bode plot-Nyquist plots, Nyquist stability criterion, Relative stability, Gain margin, phase margin, bandwidth magnitude plots, constant circles, Nichol's chart

Unit IV: PHYSIOLOGICAL CONTROL SYSTEMS
Introduction to physiological control systems, modelling of human movements, parameter estimation, linearizing

Unit V : STUDY OF BIOLOGICAL SYSTEMS
Human Thermal system, Neuro muscular system, Respiratory system, occulomotor system.

Unit VI: State space representation of systems, conversion of state variable models to transfer functions,conversion of transfer functions to state variable models, solution of state equations, concepts of controllability and absorbability.

Books:

1. M.Gopal, 'Control Systems', Principles and Design, Tata McGraw-Hili, 1997.
2. Benjamin. C.Kuo, ' Automatic Control Systems', Prentice Hall of India, 1995.
3. Manfreclyner and J.,hn H.Milsum, Bio Medical engineering system, McGraw-Hili and Co., Neo York, 1970.

5BM03 BIO MEDICAL INSTRUMENTATION

Unit I : Introduction to Biomedical Instrumentation Sources of biomedical potentials Electrical activity of excitable cells . Resting and action potential Bioelectric potentials. Origin of bioelectric signals like ECG, EEG, EMG.

Unit II : Biopotential electrodes Basic electrode theory Nerenst equation Electrical conductivity of electrode jellies and cream Skin contact impedance and its measurement Electrodes for ECG, EEG and EMG. Recording electrodes

Unit III: Cardiovascular systems Physiology of heart ECG lead configuration Blood Pressure Characteristics of blood flow Measurement of blood flow and cardiac output.

Unit IV : Nervous system Classification of Nervous system Anatomy of Nervous system Organisation of Brain Neuronal communication Neuronal receptors Sematic and Autonomic nervous system Spinal reflexes. Neuronal firing measurements EEG measurement

Unit V: Measurement of Respiratory system Modeling the respiratory system Measurement of Gas Flow rate Measurement of Pressure Respiratory Plethysmography Measurement of Gas concentration Measurement of Oxygen concentration

Unit VI: Physiological effects of Electricity Leakage current, Types of leakage current Macroshock Hazards Microshock Hazards Electrical safety analysis Basic approaches to protection against shock Protection : Power Distribution Protection : Equipment Design

BOOKS:

I) R.S.Khandpur : Biomedical Instrumentation
2) Cromwell : Biomedical Instrumentation
3) John G. Webstar. : Biomedical Equipments

5BM04 COMMNUNICATION ENGINEERING

Unit I : AM Transmitters : Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter. Generation of SSB-SC by phase-shift method.

Unit II : AM Receivers : TRF receiver, Superhetrodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, Practical Radio Receiver Circuit with AGC, Characteristics such as selectivity, sensitivity, fidility communication receiver.

Unit III : FM Transmitters : FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparision, Deemphasis and pre- emphasis. FM Transmitter & stereo FM Transmitter.

Unit IV : FM Receivers : Details of FM receiver, blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, Audio Ampl., AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster seeley and ratio detectors, Stereo FM receiver.

Unit V : Monochrome TV : Basic television system, simultaneous sound and picture transmission, scanning process, composite video signal, signal transmission and channel bandwith, camera tubes, TV receiver; Block diagram and functional requirements, Basic concept of colour TV.

Unit VI: Satellite Communication : Orbital satellites, Geostationary Satellites, Orbital patterns, Look angles, satellite system link models, Transponder, Up link, Down link, cross link, satellite system parameters, Radiated power.

BOOKS :

1) Kennedy G. : Electronics Communication System, Tata McGraw Hill Co.,New Delhi (Third Edition), 1985.
2) Young P.H. : Electronics Communication Techniques, Coloumbus, A Bell and Howell Co. (First Edition)
3) Martin James : Telecommunication and the Computer, Prentice Hall Inc. New Jersey (Third Edition), 1972.
4) Roddey D., Coolen S. : Electronics Communication, Prentice Hall India Pvt. Ltd. (Third Edition), 1983.

Free Elective- I

5FEBM05 (i) MEDICAL INSTRUMENTATION

Unit I : **PHYSIOLOGY AND TRANSDUCERS**
Cell and its structure – Action and resting – Potential propagation of action potential – Sodium pump – Nervous system – CNS – PNS – Nerve cell – Synapse – Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Transducers – Different types – Piezo-electric, ultrasonic, resistive, capacitive, inductive transducers – Selection criteria.

Unit II : **ELECTRO – PHYSIOLOGICAL MEASUREMENTS**
Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms.

Unit III: **NON-ELECTRICAL PARAMETER MEASUREMENTS**
Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of Co2, o2 in exhaust air - PH of blood, ESR, GSR measurements – Plethysmography.

Unit IV : MEDICAL IMAGING AND PMS
X-ray machine - Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

Unit V : **ASSISTING AND THERAPEUTIC EQUIPMENTS 9**
Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dializers.

Unit VI: BLOODFLOW AND BLOOD CELL COUNTING 9
Electromagnetic and ultrasonic blood flowmeter, indicator dilution method, thermodilution method, manual and automatic counting of RBC, WBC and platelets.

Text Books :

1. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II Edition, Pearson Education, 2002 / PHI.
2. R. S. Khandpur, 'Handbook of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.

Reference Books :

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995. 4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

Free Elective - I

5FEBM05 (ii) PRINCIPLES OF BIOMATERIALS AND BIOMECHANICS

Unit I : INTRODUCTION TO DIFFERENT TYPES OF BIOMATERIALS:

Polymers, Plastics, Metallic and Ceramic Materials, Carbon and Polymers, Absorbable and Porous Biomaterials. Surface chemistry of biomaterials, thermal and chemical phenomenon,

MECHANICAL PROPERTIES AND TESTS:

For elasticity, plasticity, inelasticity, desolation, deformation and fracture

Unit II : POLYMER AND PLASTICS :

Classification, thermal properties, factor influencing polymer properties. Polymer compatibility, polymer degradation, restorable polymers, tissue adhesives.

METALLIC AND CERAMIC BIOMATERIALS

Properties and use to titanium alloys stainlesssteel, cobalt based alloys, degradable ceramics Carbon and polymeric biomaterials: Carbon, polythene ,polypropylene, silicones rubber, acrylic implants, hydro gels.

Unit III : DENTAL IMPLANTS:

Alveolar bone replacements, orthopedic implants – types of orthopedicf unction devices, permanent joint replacements, hip joints, bone cement, biological testing of biomaterials

Unit IV : GENERAL PRINCIPLES OF BIOMECHANICS :

Analysis of biological sub system from the biomechanical point of views and rise modelling. Cardio- vascular and pulmonary mechanics. Rheologyof blood circulation System . Mechanics of heart values and heart assist devices Instrumentation .

TISSUE BIOMECHANICS:

Direct, shear, bending and torque actions, and the corresponding stresses and strains in biological tissues. Stress relaxation and torque actions, and the corresponding stresses and strains in biological tissues. Stress relaxation and creep, stability and instability.

Unit V : MOVEMENT BIOMECHANICS:

Gait Analysis, body and limb mass and motion characteristics, muscle actions, forces transmitted by joints. Joint forces results in the normal and disabled human body. Slow normal and fast gait on the level. Strain and ramp ascent and discent. Joint replacements.

Classification in Prosthetics and Orthetics Lower Extremity orthoses and pres theses Positions of anatomical axis and corresponding movements of the body part. Material Technology in Presthetics and Orthetics.

Unit VI :PRINCIPLES IN DESIGNING ORTHESIS AND PRESTHESES

Principles of three pointpressure, total contact, partial weight releaving etc. Positions of anatomical axis and correspondingmovements of the body part International conventions with respect to above. Purpose for provising prostheses and Orthoses.

BOOKS : Clinical biomechanics Zeevi Dvir Churchill Livingstone, 2000 - Medical Principles of biomechanics & motion analysis Iwan W. Griffiths Lippincott Williams & Wilkins, 2006 -

Biomechanical analysis of fundamental human movements Arthur E. Chapman Human Kinetics, 2008

1. Biomaterials An Introduction Park, Joon, Lakes, R. S. 3rd ed., 2007

5BM06 PATHOLOGY & MICROBIOLOGY

Unit I : NORMAL CELL $TRUCTURE :

Cell Degeneration and regeneration - Inflammations, apoptosis, Neoplasia. Classifi~ation, Difference between benign and malignant nn110f.§ Etiology of tumors - Spread of Tumors.

Unit II : FLUID AND HEAMODYNAMIC DERANGEMENT

Edema, Shock, Hemorrhage - Thrombus - Embolism – Disseminated intra vascular Coagulation - Hematological disorders. Bleeding Disorders - Leukemia - lymphoma.

Unit III :GENETIC DISORDERS, INFECTION AND IMMUNITY:

Autosomal and Sex linked disorders - Storage disorders - Types of hypersensitivity reactions - Immune deficiency Syndrome - Primary - HIV - Viral disease. Chlamydial –Bacterial - mycoplasma - Rickettsial disease - Fungal, protozolal. - Helminthic disease.

Unit IV: General Structural Organization of Bacterial, Viral Cell- Growth and Identification of Bacteria, Observation of culture. Microscopy: - Light Microscopy - Dark field Microscopy -Phase contrast microscopy -electron microscopy.

Unit V : Identification of disease producing organism, Simple Stain, Gram Stain, AFB Stain, Fluorescent techniques, Antigen-Antibody Technique

Unit VI: CARDIO VASCULAR DISEASES

Ischaemic Heart Disease Rheumatic heart Disease Valvular Heart Disease Hypertension Cardiomyopathy Infective Endocarditis. Congestive Cardiac Failure Diseases of Pericardium. - Cardiogenic Shock.

TEXT BOOKS :

1. Robbins S.L & Ramzi S.C, "Pathologic Basis of Diseases', W.B. Saunders Co. 1999
2. Anatha Narayanan.R & Jayaram Panicker C.R, 'Text Book of Microbiology, Orient Laongman' 1998.

5 BM 07 DATA STRUCTURES & ALGORITHMS- LABORATORY

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

I. Write an application to implement Tower of Hanoi Problem Algorithm.
2. Write an application to implement Abstract data type stack.
3. Write an program to evaluate Post fix expression using stack.
4. Write a program to implement Abstract data type queue.
5. Write a program to implement singly linked list that performs various operation such as insertion. deletion, searching a node in linear linked list.
6. Write a program to implement Preorder Traversal of a binary tree.
7. Write a program to search a given element using Binary Search.
8. Write a program to implement Selection Sort.
9. Write a program to implement Merge Sort.
10. Write a program to perform insertion or search in a specified level of a stack implemented tree-structured symbol table.

5BM08 BIOMEDICAL INSTRUMENTATION LAB

Practicals: Minimum Eight Practical's based on Syllabus.

5BM09 COMMNUNICATION ENGINEERING LAB

PRACTICALS: Minimum 8 practicals based on syllabus, preferably uniformly distributed.

SIXTH SEMESTER

6BM01 DIAGNOSTIC & THERAPEUTIC EQUIPMENTS

DIAGNOSTIC EQUIPMENT

Unit I : Introduction to Biomedical Recorder ECG recorder, Microprocessor based ECG machnies, Multichannel ECG machine Vector cardiograph, phono cardiograph, Heart sound EEG recorder, EMG recorder

Unit II : Medical Imaging System Instrumentation for diagnostic X-Ray Properties of X-Ray units, X-Ray machines and generation process Special emaging teclmiques for X-Rays Computed Radiography, Computed Tomography
Ultrasonic imaging system, Physics of ultrasound Basic modes of transmission Ultrasonic display modes - Ascan, Bscan, Mscan with applications, Ultrasonography

Unit III: Patient Monitoring system System concept Bedside patient monitors Central monitors Average reading heart monitor Intensive care monitoring Ambulatory monitory Biotelemetry: Single channel & multichannel telemetry, telephone & computer based telemetry .

THERAPEUTIC EQUIPMENTS

Unit IV: Cardiac Pacemaker, Types of Pacemaker External Pacemaker Implantable Pacemaker, Types & Implantable Pacemaker Leads & electrodes, pacing system analyser Ventricular synchronous demand Pacemaker Programmable Pacemaker Reliability aspects of cardiac Pacemaker Power sources of implantable Pacemaker

Unit V: Cardiac Defibrillator DC – defibrillator Defibrillator electrodes Defibrillator analyser Implantable Defibrillator Cardioverters Ventilators, High frequency ventilators Muscle stimulator Unit

Unit VI : Physiotherapy & Electrotherapy equipment Shortwave diathermy machine Microwave diathermy machine Ultrasonic therapy unit Therapeutic apparatus Surgical diathermy machine Electrodes used with surgical diathermy Infant incubators Therapeutic application of laser

Text Books:

I) R.S.Khandpur: Handbook of Biomedical Instrumentation, TMH Pub.
2) Cromwell L., Wibell F. w., Pfciffer E.A. : Biomedical Instrumentation & Measurements, PHI Pub.

3) Timpkins W.J. : Biomedical Digital Signal Processing.

Reference Books :

I) Carr & Brown: Introduction to Biomedical Equipment.

2) Webster J.G. : Medical Instrumentation, 3rd edition, John Wiley.

6BM02 MICROPROCESSORS AND APPLICATIONS

Unit I : 8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, mem(i)ry segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II : 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming : Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction,control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 I/O: Types of input output, isolated I/O interface. Input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. 8086 I/O programming using 8255.

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation. 8086 Interrupt-driven programming using 8259.

TEXT BOOKS:

I. W. A. Triebel & Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)

2. Liu & Gibson: The 8088/8086 Microprocessor (2/e) (PHI)

REFERENCE BOOKS:

I. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)

2. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH). 3. John P Utfenbeck, “8086/8088 Families: Designing, Programming and Interfacing”. Prentice Hall .

6BM03 RADIOLOGICAL EQUIPMENTS

Unit I : X-Rays: principles and production of soft and hard X-rays, selection of anodes, Heel pattern, scattered radiation. Porter Bucky system, Cooling system, Origin and nature of X-rays and nuclear medicine equipment, Types and uses of X-ray. Nature and types of Nuclear radiation. Block diagram and operation of X-ray machine

Unit II : Radio-diagnosis Radiography. Angiography, Fluoroscopy, Image intensifier, Multi section radiography, Instrumenation for the medical use of radioisotopes. Units for measuring radioactivity, Nuclear medicine machine, Computer system used in X-ray & Nuclear medicine equipment.

Unit III : Special Radiological Equipment: principle, plane of movement, multi section radiography, CAT, principle of NMR, MRI, Image reconstruction teclmiques, basic NMR components, applications, Advantages & isadvantages ofNMR, Imaging teclmiques, Biological effects ofNMR imaging computed tomography, computed radiography.

Unit IV : Application of Radioisotopes : Alpha, Beta and Gamma emission, principle of radiation detectors, dot scanners, Nuclear Angiogram, principles of radiation therapy, radiation thennometry, radiation sources, radiation sensors.

Unit V : Medical Ultrasonography: Ultrasound, Physics of sound and ultrasound waves, ultrasound transducer, scan modes and scanning systems, Biological effects of ultrasound. Flow meters, ultrasonic blood pressure measurement, ultrasonic scanner.

Unit VI : Radiation Safety: Hazardous effect of radiation. Radiation protection techniques, Safety limits radiation monitoring.

TEXT BOOKS:

I) R.S.Khandpur : Handbook of Biomedical Instrumentation

2) Carr and Brown : Biomedical Instrumentation (3) Steve Webb : The Physics of Medical Imaging.

6BM04 PHYSIOLOGICAL MODELLING & SIMULATION

Unit I : Introduction to physiological control systems, Art ofmodellling physiological systems, Linear models of physiological systems, distributed parameters versus lumped parameter models. Principle of superposition.

Unit II : Cardiovascular system modeling and simulation: Theoretical basis, model development, heart model, circulatory model. Computational flow diagrams of cardiac system. Software development.

Unit III : Pulmonary mechanics modeling & simulation: Theoretical basis, model development, lung tissue viscoelastance, chest wall, airways-full mode l of respiratory mechanics, Pulmonary system software development - computational flow diagram.

Unit IV: Interaction of Pulmonary and cardiovascular models, computational flow diagram for cardiopulmonary, software development, Eye movement system, Oculomotor muscle model and linear muscle model.

Unit V : Simple models of muscle stretch reflex action, Ventilatory control action, lung mechanics and their simulink implementation. Frequency domain analysIs oflinearize model ofIungs mechanics, circulator control model and glucose insulin regulation model by MATLAB Tool.

Unit VI: Study of steady state analysis ofmusc1e stretch reflex action. Ventilatory control action by MATLAB tools. Study of transient response analysis of neuromuscular reflex model action by MATLAB tools.

TEXT BOOKS:

1) Michael C.K.Khoo: Physiological Control System: Analysis Simulation & Estimation
2) Jon B. Olansen & Eric Rosow : Virtual Bioinstrumentation, Biomedical,
Clinical and Health Care Application.

Free Elective – II
6FEBM05 (i) MODELING AND SIMULATION

Unit I : Physiological Modeling :
Steps in Modeling, Purpose of Modeling, lumped parameter models, distributed parameter models, compartmental modeling, modeling of circulatory system, regulation of cardiac output and respiratory system.

Unit II : Model of Neurons :
Biophysics tools, Nernst Equation, Donnan Equilibrium, Active Transport (Pump) GHK equation, Action Potential, Voltage Clamp, Channel Characteristics, Hodgkin- Huxley Conductance Equations, Simulation of action potential, Electrical Equivalent model of a biological membrane, impulse propagation- core conductor model , cable equations.

Unit III : Neuromuscular System:
Modeling of skeletal muscle, mono and polysynaptic reflexes, stretch reflex, reciprocal innervations, two control mechanism, Golgi tendon, experimental validation, Parkinson's syndrome.

Unit IV : Eye Movement Model:
Four eye movements, quantitative eye movement models, validity criteria.

Unit V : Thermo regulatory systems:
Thermoregulatory mechanisms, model of thermoregulatory system, controller model, validation and application.

Unit VI : Modelling the immune response:
Behaviour of the immune system, linearized model of the immune response., Pharmacokinetics Drug delivery

Text Books:

1. Bioengineering, Biomedical, Medical and Clinical Engg.: A.Teri Bahil.
2. Signals and systems in Biomedical Engg.: Suresh R Devasahayam.
3. Bio-Electricity A quantitative approach by Barr and Ploncey

Reference Book:

1. Biomedical Engineering Handbook by Bronzino (CRC Press)

Free Elective – II
6FEBM05 (ii) BIOMEDICAL IMAGE PROCESSING

Unit I : Basics of Image processing: Image acquisition, Processing, communication, display, Electromagnetic Spectrum, Visual perception, structure of the human eye, image formation in the eye, uniform and Non-Uniform Sampling, Quantization, Image formats

Unit II : Image Enhancement: Spatial Domain-Point processing techniques, histogram processing, Neighbourhood processing, Frequency Domain techniques- 2D-DFT, Properties of 2 D-DFT, Low pass, High pass, Noise removal, Homomorphic filters, Basics of Colour image processing

Unit III :Image Segmentation: Detection of discontinuities, point line, edge detection, Edge linking, Hough transform, Region Based segmentation

Unit IV: Image transforms: DFT, FFT, DCT, DST, Hadamard, Walsh, Haar, Slant, K-L Transforms, Basis Functions and basis images

Unit V : Image Compression: Fundamentals of Image compression models, Lossless Compression- RLE, Huffman, LZW, Arithmetic coding techniques Lossy Compression- IGS coding, Transform coding, JPEG, Predictive Coding.

Unit VI: Representation and Description: Morphology-dilation, Erosion, open, close, Hit and miss, Boundary extraction, region filling, skeletonization, Feature extraction, Moments

Text Books:

1. Digital Image Processing, Gonzalez and Woods- Pearson Education
2. Fundamentals of Digital Image Processing, A.K. Jain .P.H.I.
3. Digital Image Processing and Analysis, Chanda Majumder- Printice Hall India.

Reference Books:

1. Digital Image Processing and Computer Vision, Sonka, Hlavac,Boyle- Cenage learning.
2. Digital Image Processing, William Pratt- John Wiley

6BM06 COMMNUNICATION SKILLS

Unit I : Comprehension over an unseen passage. Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage.

Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.

Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II : Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and

text difficulty). Evaluation of written communication for its effectivity and subject content.

Non-verbal communication, types of graphics and pictoral devices.

Unit III : Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for dayto-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews.

Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Curriculum Development Centre, TTTI WR, Bhopal : A Course in Technical English, Somaiya Publication Pvt. Ltd.
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.
5) Barunk Mitra, Effective Technical Communication, Oxford University Press
6) Meenakshi Raman & Sangeeta Sharma, Technical Communication Principles & Practice, Oxford University Press

6BM07 MICROPROCESSORS AND APPLICATIONS - LABORATORY

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

Write a program in TASM to manipulate the two given operands with general arithmetic operators +, -, *, *I* and store the result at the given location 2000H to 2003H respectively. . Write an instruction sequence that generates a byte size integer in the memory location defined as RESULT. The value of the integer is to be calculated from logical equation [RESULT] = [AL] * [NUM 1]+ [Nl,IM2] * AL + BL . Assume that all parameters are byte- sized. NUM I, NUM2 and RESUL T are the offset addresses of the memory location in the current data segment.

Given a number XY, write a program using T ASM to store OX in BX register and OY in ex register. . Write a T ASM program to sort the elements using Bubble Sort Algorithm. . Write a program in T ASM to search for a single item from a list of elements using Binary Search Algorithm. Show that if the element is found or not. . Write a program in TASM to convert the given binary number into decimal number. The unsigned eight-bit value is stored in variable BINV AL; the three-digit ASCII result is stored in three memory locations HUN, TEN & ONE. . Given 16-bit binary number in OX, write a program that converts it into its equivalent BCD number. If result is bigger than 16-bit, place aliI's in OX . Write a program using T ASM by using DOS INT 2 I H, function 09H to display string. The string to be displayed must have a '$' as its last character. The string address of the string must be loaded into register OX and the string must reside within current data segment. . Write a program using T ASM to echo command line text to the screen using INT 21 H, function 02H. . Write a program using T ASM to read the date maintained by the system and return the following information using DOS INT 2 I H, function 2AH.DH = Month DL = Day of month CX=Year AL=Day of the week Using DOS INT 21 H function 08H write a program in T ASM to obtain a secret Password from user. The password is not echoed to the screen. The password is stored in PWTXT and may be of any length, but must be terminated by a carriage return.

6BM08 PHYSIOLOGICAL MODELLING & SIMULATION - LAB

Practicals : Minimum Eight Practicals Based on syllabus.

6BM09 COMMUNICATION SKILLS - LABORATORY

Objective:

- On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation.
- The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter

6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

TEXT BOOK : Norman Lewis : Word Power Made Easy

http://www.teachingenglish.org.uk

6 BM 10 MEDICAL INSTRUMENTATION - LAB.

Lab. based on 6BM01 Diagnostic & Therapeutic Equipments and 6BM03 Radiological Equipments.

B.E. Sem-VII,VIII / **B.Arch.** Sem-VII-X **Prospectus No.** 141711

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

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Bachelor of Engineering Sem-VII,VIII / Bachelor of Architecture Sem-VII-X
(CREDIT GRADE SYSTEM)

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5) Electrical Engineering (Electrical & Power)
6) Electrical Engineering
7) Architecture
8) Information technology
10) Biomedical Engineering

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 5/2010	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011 Date : 10-06-2011

Subject :- Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology.

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No.39 accepted and recommended schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice Chancellor u/s Section 14(7) of M.U.Act, 1994 on behalf on Academic Council on 9th April, 2011,

AND

Whereas these schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as pere Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Enginering & Technology are to be sent for printing,

Now, therefore, I, Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994 hereby direct as under :-

1) This Direction shall be called ñSchemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Enginering & Technology, Direction, 2011".
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

	BRANCH	**Appendix No.**
1)	Civil Engineering	A
2)	Mechanical Enginering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Enginering (Electrical & Power)	F
7)	Electrical Enginering	G
8)	Electronics & Telecommunications Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology)	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

sd/-
Dr.Mohan K.Khedkar
Vice Chancellor

****

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH - CIVIL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - A

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7CE01	*Theory of Stuctures-II*	3	1	-	4	4	3	80	20	100	40	-	-	-	-
02	7CE02	*Geotechnical Engineering-II*	3	1	-	4	4	3	80	20	100	40	-	-	-	-
03	7CE03	*Structural Design-II*	4	-	-	4	4	4	80	20	100	40	-	-	-	-
04	7CE04	*Environmental Engineering-I*	4	-	-	4	4	3	80	20	100	40	-	-	-	-
05	7CE05	*Professional Elective-I*	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
06	7CE06	*Theory of Stuctures-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	7CE07	*Geotechnical Engineering-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	7CE08	*Structural Design-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	7CE09	*Project & Seminar*	-	-	2	2	4	-	-	-	-	-	-	50	50	25
		Total	18	2	8	28	27				500				200	
															GRAND TOTAL : 700	

Professional Elective-I (i) Advanced Water Treatment (ii) Advanced Geotechnical Engineering (iii) Water Power Engineering (iv) Prestressed Concrete (v) Artificial Neural Network & Fuzzy Logic (vi) Advanced Concrete Technology (vii) Environmental Pollution & Rural Sanitation (viii) Advanced Earthquake Engineernig

SEMESTER : EIGHTH

THEORY																
01	8CE01	*Water Resources Engineering-II*	3	-	-	3	3	3	80	20	100	40	-	-	-	-
02	8CE02	*Environmental Engineering-II*	3	-	-	3	3	3	80	20	100	40	-	-	-	-
03	8CE03	*Project Planning & Management*	3	-	-	3	3	3	80	20	100	40	-	-	-	-
04	8CE04	*Professional Elective-II*	4	-	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
05	8CE05	*Water Resources Engineering-II-Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
06	8CE06	*Environmental Engineering-II - Lab*	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	8CE07	*Project & Seminar*	-	-	6	6	12	-	-	-	-	-	75	75	150	75
		Total	13		10	23	27				400				250	
															GRAND TOTAL : 650	

*Professional Elective-II *(i) Advanced Design of Steel Structures (ii) Advanced Waste Water and Industrial Waste Treatment (iii) Finite Element Method (iv) Dam Engineering (v) Advanced Engineering Geology (vi) Matrix Computer Analysis of Structures (vii) Advanced Structural Analysis (viii) Rock Mechanics *(ix) Advanced Design of RCC Structures*
** PAPER 4 HOURS DURATION.*

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH - MECHANICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - B

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hrs.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7ME01	Machine Design & Drawing-II	3	-	-	3	3	4	80	20	100	40	-	-	-	-
02	7ME02	Energy Conversion-II	3	1	-	4	4	3	80	20	100	40	-	-	-	-
03	7ME03	Industrial Management and Costing	3	1	-	4	4	3	80	20	100	40	-	-	-	-
04	7ME04	Automation Engineering	3	1	-	4	4	3	80	20	100	40	-	-	-	-
05	7ME05	Professional Elective-I	3	1	-	4	4	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
06	7ME06	Project & Seminar	-	-	2	2	4	-	-	-	-	-	-	50	50	25
07	7ME07	Machine Design & Drawing-II-Lab.	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	7ME08	Energy Conversion-II-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
09	7ME09	Automation Engineering-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
10	7ME10	Professional Elective-I - Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
		Total	15	1	10	29	27				500				250	
															GRAND TOTAL : 750	

Professional Elective-I (1) Non Conventional Energy System (2) Tool Engineering (3) Artificial Intelligence & Expert Systems (4) Mechatronics

SEMESTER : EIGHTH

THEORY																
01	8ME01	Elective-II	3	-	-	3	3	3	80	20	100	40	-	-	-	-
02	8ME02	Elective-III	3	-	-	3	3	3	80	20	100	40	-	-	-	-
03	8ME03	I.C. Engines	3	-	-	3	3	3	80	20	100	40	-	-	-	-
04	8ME04	Opertaions Research Techniques	3	-	-	3	3	3	80	20	100	40	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
05	8ME05	Project & Seminar	-	-	6	6	12	-	-	-	-	-	75	75	150	75
06	8ME06	Professional Elective-III-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
07	8ME07	I.C. Engines-Lab	-	-	2	2	1	-	-	-	-	-	25	25	50	25
08	8ME08	Opertaions Research Techniques-Lab	-	-	2	2	2	-	-	-	-	-	25	25	50	25
		Total	12	-	12	24	27				400				300	
															GRAND TOTAL : 700	

Professional Elective-II (1) Automobile Engineering (2) Production Planning & Control (3) Management Information Systems (4) Advanced Manufacturing Systems
Professional Elective-III 1) Refrigeration & Air Conditioning 2) Machine Tool Design 3) Finite Element Methods 4) Robotics

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRICAL ENGINEERING (ELECTRONICS & POWER) - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - C

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D			DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7EP01	Control System II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EP02	Power System Operation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EP03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EP04	Switchgear & Protection	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EP05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EP06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	0	50	50	25
07	7EP07	Electrical Power - II- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EP08	Switchgear & Protection- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	26				500				150	
															TOTAL	650

* Professional Elective - I 1] Process Control System 2] Computer organisation 3] Computer Methods in Power System Analysis 4] Artificial Intelligence

SEMESTER - EIGHTH

THEORY																
01	8EP01	Power System Stability	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8EP02	High Voltage Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8EP03	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EP04	Professional Elective - II**	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EP05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EP06	Digital Signal Processing- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	0	8	22	27				400				200	
															TOTAL	600

** Professional Elective - II 1] Electric Drives & Control 2] Power Quality 3] Embedded Syatems 4] Generalised Machine Theory

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRICAL & ELECTRONICS ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - D

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7EX01	Utilisation of Electrical Energy	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EX02	Electronic Communication	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EX03	Computer Organisation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EX04	Power Electronics - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EX05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EX06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
07	7EX07	Utilisation of Electrical Energy-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EX08	Computer Organisation-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7EX09	Power Electronics - II-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	8	28	27				500				200	
															TOTAL	700

* Professional Elective - I 1] Process Control System 2] Power System Simulation 3] High Voltage Engineering 4] Wind Electrical Systems

SEMESTER : EIGHTH

THEORY																
01	8EX01	Power System Operation & Control	3			3	3	3	80	20	100	40				
02	8EX02	Switchgear & Protection	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8EX03	Embedded Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EX04	Professional Elective - II**	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EX05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EX06	Embedded Systems-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	_	8	22	27				400				200	
															TOTAL	600

***** Professional Elective - II 1]Power System Management 2] Fuzzy Logic & Control 3] RPC & Facts Controller 4] Power Quality***

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRICAL ENGINEERING (ELECTRICAL & POWER) - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendis - E

SEMESTER - SEVENTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7EL01	Control System II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EL02	Power System Operation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EL03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EL04	Switchgear & Protection	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EL05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EL06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	0	50	50	25
07	7EL07	Electrical Power - II-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EL08	Switchgear & Protection-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	26				500				150	
															TOTAL	650

**** Professional Elective - I 1] Process Control System 2] Wind Electric Systems 3] Computer Methods in Power System Analysis 4] Artificial Intelligence***

THEORY			Semester : Eighth													
01	8EL01	Power System Stability	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8EL02	High Voltage Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8EL03	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EL04	Professional Elective - II**	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EL05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EL06	Digital Signal Processing Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	_	8	22	27				400				200	
															TOTAL	600

***** Professional Elective - II 1]Electric Drives & Control 2] Power Quality 3] Power System Management 4] Generalised Machine Theory***

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : ELECTRICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - F

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7EE01	Control System II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7EE02	Power System Operation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7EE03	Electrical Power - II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7EE04	Switchgear & Protection	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7EE05	Professional Elective - I *	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7EE06	Project & Seminar	_	_	2	2	4	_	_	_	_	_	0	50	50	25
07	7EE07	Electrical Power - II -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7EE08	Switchgear & Protection -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	_	6	26	26				500				150	
															TOTAL	650

**** Professional Elective - I 1] Process Control System 2] Wind Electrical Systems 3] Computer Methods in Power System Analysis 4] Artificial Intelligence***

Semester : Eighth

THEORY																
01	8EE01	Power System Stability	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8EE02	High Voltage Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8EE03	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	8EE04	Professional Elective - II**	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8EE05	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	25
06	8EE06	Digital Signal Processing -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	14	_	8	22	27				400				200	
															TOTAL	600

***** Professional Elective - II 1] Electric Drives & Control 2] Power Quality 3] Power System Management 4] Generalised Machine Theory***

FIVE YEAR DEGREE COURSE IN BRANCH OF ARCHITECTURE

SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - G

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
1	07AR01	Advance Construction - I	2	_	_	2	2	4	80	20	100	40	_	_	_	_
2	07AR02	Environmental Services - I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
3	07AR03	Professional Practice	3	_	_	3	3	3	80	20	100	40	_	_	_	_
4	07AR04	Urban Planning	2	_	_	2	2	3	80	20	100	40	_	_	_	_
5	07AR05	Architectural Structure - VI	2	1	_	3	3	3	80	20	100	40	_	_	_	_
SESSIONAL / PRACTICAL																
6	07AR06	Architectural Design Studio - VII	_	_	8	8	8	_	_	_	_	_	100	100	200	100
7	07AR07	Advance Construction Studio - I	_	_	4	4	2	_	_	_	_	_	25	25	50	25
8	07AR08	Urban Planning Studio	_	_	4	4	2	_	_	_	_	_	25	25	50	25
		Total	12	1	16	29	25				***500***				***300***	
															TOTAL	***800***

Note: Consider one hour Lecture / Tutorial and P/D is equal to one credit for the subjects of Architectural Design and for all other subjects consider 1hour Lecture & Tutorial = 1credit & 2hour Practical /Design studio. = 1 credit .

Semester : Eighth																
THEORY																
1	08AR01	Architectural Design - VIII	2	_	_	2	2	24	200	_	200	80	_	_	_	_
2	08AR02	Advance Construction - II	2	_	_	2	2	4	80	20	100	40	_	_	_	_
3	08AR03	Environmental Services - II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
4	08AR04	Sustanaible Architecture	3	_	_	3	3	3	80	20	100	40	_	_	_	_
5	08AR05	Landscape Design	2	_	_	2	2	3	80	20	100	40	_	_	_	_
6	08AR06	Professional Elective - I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
SESSIONAL / PRACTICAL																
7	08AR07	Architectural Design Studio - VIII	_	_	6	6	6	_	_	_	_	_	100	100	200	100
8	08AR08	Advance Construction Studio - II	_	_	4	4	2	_	_	_	_	_	25	25	50	25
9	08AR09	Landscape Design Studio	_	_	4	4	2	_	_	_	_	_	25	25	50	25
		TOTAL	15	_	14	29	25				***700***				***300***	
															TOTAL	***1000***

Professional Elective-I 1) Housing 2) Environmental Planning 3) Construction Management

SEMESTER : NINETH

			TEACHING SCHEME						EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
SESSIONAL / PRACTICAL																
1	09AR01	Practical Training	_	_	_	_	26	_	_	_	_	_	***150***	***150***	***300***	***150***
		Total	_	_	_	_	26	_	_	_	_	_	_	_	***300***	_
Practical Training shall be for six month in architectural firms approved by the institutions															Total	300
SEMESTER: TENTH																
THEORY																
1	010AR01	Professional Elective – II	2	***1***	_	3	3	3	80	***20***	100	40	-	-	-	-
SESSIONAL / PRACTICAL																
2	010AR02	Architectural Project / Thesis	-	***6***	***12***	18	18	-	-	-	-	-	***200***	***100***	***300***	***150***
3	010AR03	Seminar	-	-	***6***	6	13	-	-	-	-	-	-	***100***	***100***	***50***
		Total	2	***7***	***18***	27	24				100	-	-	-	***400***	-
Professional Elective – II 1) Industrial Architecture 2) Climate Responsive Architecture 3) Vernacular Architecture															Total	500

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : INFORMATION TECHNOLOGY - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - H

SEMESTER - SEVENTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7IT01	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7IT02	Object Oriented System Analysis & Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7IT03	Web Technology	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7IT04	Real Time Embedded Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7IT05	Professional Elective I*	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7IT06	Digital Signal Processing-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7IT07	Web Technology-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7IT08	Real Time Embedded Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7IT09	Project & Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	20	_	8	28	27				500				200	
														TOTAL	700	

Professional Elective I* (i) Distributed DBMS (ii) Modelling & Simulation (iii)Artificial Intelligence & Expert Systems (iv) Multimedia Technologies

Semester :EIGHTH																
THEORY																
01	8IT01	Digital & Wireless Communication	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8IT02	Network Administration & Security	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8IT03	Software Engineering	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8IT04	Professional Elective II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8IT05	Network Administration & Security-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8IT06	Software Engineering-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8IT07	Computer Lab-V (Content Management System)	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	8IT08	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	12	_	12	24	27				400				300	
														TOTAL	700	

Professional Elective II* (i) Data Warehousing & Data Mining (ii) Web-Commerce (iii) Cloud Computing (iv) Neural Networks & Fuzzy Logics

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH : BIOMEDICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - I

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7BM01	Bio Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7BM02	Artificial Organs and Rehabilitation Engineering	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7BM03	Medical Expert Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7BM04	Hospital Engineering & Management	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7BM05	Professional Elective-I *	4	_	_	4	4	3	80	20	100	40				
PRACTICALS / DRAWING / DESIGN																
06	7BM06	Bio Signal Processing-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7BM07	Medical Expert Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7BM08	Hospital Engineering & Management-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7BM09	Project and Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	20	_	8	28	27				500				200	
															TOTAL	700

Professional Elective-I * (i) Tissue Engineering
(ii) Bio Informatics

Semester : Eighth

THEORY																
01	8BM01	Professional Ethics & Values	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8BM02	Bio Medical Imaging Systems	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8BM03	Professional Elective-II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8BM04	Bio Medical Embedded System Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8BM05	Bio Medical Imaging Systems-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8BM06	Bio Medical Embedded System Design-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8BM07	Project and Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	13	_	10	23	27				400				250	
															TOTAL	650

Professional Elective - II *i) Bio-Inspired Algorithm ii) Biofluids & Dynamics*

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
CIVIL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER SEVEN

7CE01 THEORY OF STRUCTURES – II

SECTION - A

Unit-I: 1. Moment distribution method, application to portal frames with sway. Multibay, multistoried, symmetrical frames subjected to symmetric loads only.
2. Slope deflection method: Application to portal frames with side sway.

Unit-II: 1. Kaniôs method: Continuous beams and single bay single storey portal frames with side sway.
2. Multi- bay, multi storeyed frames subjected to symmetric loads.

Unit-III: 1. Castiglianoôs second theorem, principle of least work, Analysis of redundant frames. (up to two degree redundancy).
2. Analysis of redundant trusses (up to second degree of redundancy), lack of fit, temperature effect.

SECTION - B

Unit-IV : 1. Maxwellôs reciprocal theorem, Bettyôs theorem, Muller - Breslauôs principle, Influence line diagrams for continuous beams, upto two span only.
2. Tension coefficient method & its applications to simple space trusses.

Unit-V: 1. Flexibility method, static redundancy, flexibility coefficients, compatibility condition application to beams.
2. Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, Redistribution of moment, upper and lower bound theorems, collapse loads for beams, single bay, single storey portals.

Unit-VI: Stiffness method, kinematic redundancy, stiffness coefficients, direct stiffness approach, application to continuous beams and single - bay, single - storey portal.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures

3. Reddy. C. S., Basic Structural Analysis, Tata McGraw Hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Analysis

7CE02 GEOTECHNICAL ENGINEERING – II

SECTION – A

Unit I: Exploratory Programme : Field exploration, objectives and methods of exploration planning of exploration programme soil boring , hand augers, percussion boring, rotary wash boring, collection of sample, split spoon sampler, area ratio, disturbed and undisturbed sample, SPT test, field vane shear test, geophysical methods, electrical resistivity and soil refraction methods. Soil log bore presentation and interpretation exploration data.

Unit II: Bearing Capacity of Shallow foundation :- Different theories: Terzaghiôs skemptonôs, Meyerhofôs, BIS method for bearing capacity , determination bearing capacity of granular soils based on SPT value. concept of raft foundation and floating foundation.
In situ methods of evaluation of bearing capacity, plate load test, static cone penetrometer, pressure meter test contact pressure distribution diagram below the base of footing.

Unit III: Earth pressure at rest, general & local Stages of plastic equilibrium, Rankineôs and coulombôs theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, wall friction, Rebhannôs and culmannôs simple graphical methods Ground Improvement : methods of soil stabilization use of admixture (lime, cement, flyash) in stabilization) Mechanism of reinforced soil, use of Geo synthetics material as a reinforcement, vibroflotation, sand drain installation and preloading.

SECTION – B

Unit IV: Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sandy and in clayey soil , dynamic pile formula Negative skin friction, factor affecting it, piles in groups and their capacity, group efficiency, factors affecting group efficiency, behavior of group of pile in sandy and in clayey soil, pile load test, effect of pile cap. Criteria for spacing and depth of piles. IS design criterion for undereamed Pile in clay and sands

UnitV: Settlement Evaluation of soils settlement : immediate, primary and secondary settlement for footing resting on homogenous isotropic, cohesive and cohesion less soils related to single footing, combined footing, raft foundation etc, standard for requirement of settlement,

total as well as differential settlement, concept of differential settlement, factors and causes for differential settlement, service loads, proportioning of footing for uniform settlement computation of total and differential settlement of a single pile and group of piles in sandy and clayey soil.

Unit VI : 1. Well foundation : Component & their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting

2. Design of cantilever retaining wall and counterfort retaining Bearing capacity of well as per IS. Cofferdam purpose, various types their suitability

BOOKS RECOMMENDED :

1) Craig : Soil Mechanics.
2) Bowles J.E. : Foundation Design Analysis.
3) Hanson : Theoretical Soil Mechanics.
4) Peck and Hanson : Foundation Engineering.
5) Tomlinson : Foundation Engineering.
6) Leoner : Foundation Engineering.
7) Bramha : Foundation Engineering.
8) Prakash S. : Analysis and Design of Foundation and Retaining Structure.
9) Kasmalkar : Foundation Engineering.
10) Arora K.R. : Foundation Engineering.
11) Venkataramiah : Soil Mechanics and Foundation Engineering.
12) Rao G.V. : Engineering with Geosynthetics.

7CE03 STRUCTURAL DESIGN – II

SECTION-A

(R.C.C. STRUCTURES BY LIMIT STATE METHOD)

Unit-I : 1. Design of interior panel of flat slab by direct design method. (Problem on square panel only)

2. Design of cantilever retaining wall and Counterfort retaining wall.

Unit II : 1. Design of combined footing.

2. Complete design of simple, small structures like Canopies & Parking shed.

SECTION - B
(PRESTRESSED CONCRETE)

Unit-III : 1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress

2. Analysis of beams for flexure, under working load for Rectangular and flanged sections.

Unit-IV : 1. Basic Design of rectangular sections for flexure by limit state method, Design of one way single span slabs.

2. Design of prestressed concrete circular water tanks by IS code method.

Students may be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Jain, A. K., Reinforced Concrete (Limit State Design)
2. Jaikrishna and Jain, Plain and Reinforced Concrete, Volume I and II
3. Sinham S. N., Reinforced Concrete (Limit State Design)
4. Edward G. Nawy ñPrestressed Concrete- A fundamental Approachò, Prentice Hall
5. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
6. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi)
7. Dr. Shah V.L. & Karve S.R.: Limit State Design.

7CE04 ENVIRONMENTAL ENGINEERING–I

SECTION - A

Unit-I : Quantity Estimation of water: Demand of water. Consumption for various purposes. Fire demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population, and design periods for water supply components.

Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.

Intake works: Intakes, type, location, requirement & features.

Unit-II : Water quality: Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works.

Unit-III : Aeration: Purpose, type of gravity, aerator & spray aerators. Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, coagulant, feeding and mixing devices. Flocculation, clarrifloculator. Design criteria for sedimentation tanks, surface loading, simple problems of design of sedimentation tanks.

SECTION - B

Unit-IV : **Filtration :-** Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters modifications of filters. (Dual media, multimedia, upflow, biflow, Diatomaceous earth).

Unit V : **Disinfection** :- Requirement of good disinfectant, methods of disinfection. Chlorination: Methods, prechlorination, post chlorination. Break point chlorination and super chlorination forms of chlorine. Use of bleaching powder - Simple problems. Introduction to tertiary treatments like Softening, Ion Exchange, Reverse Osmosis, Defloridation, Desalination.

Unit-VI : Distribution system: - Types of supply - Continuous, and intermittent, Types of system - Gravity; Pumping and combined gravity and pumping, Layouts of distributions system, Dead end, Grid iron, Circular system and Radial system. Maintenance of distribution system. Equalising storage, Type of storage reservoirs, capacity, Types of conduits, Relative merits, selection, joints, hydraulic design. Pipe laying and

BOOKS RECOMMENDED:

1. Steel E. W. , Water Supply and Sewerage, Mc-Graw Hill.
2. Kshirsagar S. R., Water Supply Engineering, Roorkee Pub house, Roorkee.
3. Birde G. S. , Water Supply and Sanitary Engineering, Dhanpat Rai and Sons, Delhi.
4. Punmia B. C. water Supply Engineering.

7CE05 PROFESSIONAL ELECTIVE – I
(i) ADVANCED WATER TREATMENT

SECTION-A

Unit - I : Requirements of water treatment facilities different unit operations and unit processes.
Coordination of unit operations. Common attributes of water affected by conventional unit operations and processes.
Aeration: rate of gas absorption and desorption, objectives of aeration, gravity aerators and spray aerators, governing factors, design of aerators, removal of methane, C02,H2S taste, design and odour.

Unit-II : Objectives of flocculation, chemical coagulation, concept of surface charge, coagulating effects of electrolytes, zeta potential, coagulants and coagulant aids, factors affecting coagulation.

Perikinetic and orthokinetic flocculation - mixing and stirring devices, flash mixing flocculators, construction and operation of flocculators, problems on design of flocculators. Pebbled bed flocculator.

Unit-III : Sedimentation: objectives, theory of sedimentation discrete settling and hindered settling, settling of floucculant suspension. Ideal settling basin and its efficiency. Design, construction and operation of sedimentation tanks.
Inlet and outlet hydraulics, sludge, removal and disposal, tube and plate settlers. Problems on design of sedimentation tanks.

SECTION-B

Unit-IV : Filtration: objectives, design, construction and operation of rapid and slow sand filters, filtering sand, grain size and size distribution, preparation of filter sand, hydraulics of filtration. Hydraulics of fluidized beds. Scour intensification, high rate, declined rate, upflow biflow, dual media, diatomaceous earth filters.

Unit-V : Disinfection : objectives, different disinfectants, chemical disinfection, theory, factors governing, and kinetics. Disinfection by Ozone. Disinfection by chlorine; free available and combined. available chlorine, break point chlorination, chemical technology and other uses of chlorine, manageable variables.

Unit-VI : Miscellaneous methods of treatment : Water softening: limesoda and zeolite process, split treatment problems on calculation of dose of lime and soda ash. Iron and Manganese Removal : Fluoridation and defluoridation. Desalination. Taste and Odour Removal.

BOOKS RECOMMENDED :

1) Fiar, Geyer & Okun : Water and Waste Water Engg., John Wiley & Sons.
2) Mark J. Hammer : Water and Waste Water Technology, John Wiley & Sons.
3) Steel E.W. & Ghee M.C. : Water Supply & Sewerage, McGraw Hill Co.

7CE05 PROFESSIONAL ELECTIVE – I
(ii) ADVANCED GEOTECHNICAL ENGINEERING

SECTION-A

Unit - I : Clay mineralogy : Introduction, atomic bonds, classification and nomenclature, structure of clay mineral, K lonite. Illite and Montmorillonite groups, physical properties, clay-water relations,

diffused double layer, thixotropy, base exchange capacity formation of different structure in soil deposites, electrical effects, electroosmosis, electrophoresis, stemming potential, zeta potential, clay mineral identification,DTA analysis, X ray diffraction method.

Unit II - Seepage : Flownet for anisotropic soil media, construction of flownet for hydraulic structure on non- homogenous soil, directional variation of permeability in aniosotropic medium. Numerical analysis of seepage in layered soil computation of seepage force, seepage through earthen dam resting on confined and unconfined medium entrance discharge and Transfer condition of line of seepage through earth dam.

Unit-III : Three dimensional consolidation. Equation, solution of 3dimensional consolidation equation, consolidation by vertical sand drain and its design aspect, free strain consolidation with no smear, effect of smear zone on radial consolidation. Calculation of the degree of consolidation with radial drains and solutions of problems based on this.

SECTION – B

Unit IV : Expansive soils: orgin of soil, intensification of expansive soil, swelling potential, factors affecting the swelling, different systems of classification, concept of swelling pressure and its measurements in the laboratory, special constructional measures adopted for the construction on expansive soils, special foundations adopted for the construction in expansive soils, concept of cohesive non-swelling techniques and its effect on expansive soil.

Unit V : Soil stabilization concept of mechanical stabilization, physical and chemical stabilization with organic and inorganic material like line, cement, lime, fly ash and mechanisms, various factors affecting stabilization, determination of bearing capacity of stabilized soil, laboratory and field methods of stabilization, On various properties of soil.

Unit VI : Geotextile: types, specifications, functions and various applications in the field of Geotechnical engineering. Reinforced earth, mechanism of reinforced earth, various constructional methods and its effect towards altering, the properties of soil, field situations for application of this techniques. Theory of Arching, effect of arching, design of yield strip, computation of vertical stresses.

BOOKS RECOMMENDED:

1) Scoth R.F. : Principles of Soil Mechanics.
2) Das B.M. : Advanced Soil Mechanics.
3) Terzaghi : Theoretical Soil Mechanics.
4) International Conference on Expansive Soils.
5) International Conference on Geotextiles.
6) Soil Mechanics for Road Engineers, AMSO Series.

7CE05 PROFESSIONAL ELECTIVE – I
(iii) WATER POWER ENGINEERING

SECTION - A

Unit I : Introduction, sources of energy, importance of water power, estimation of water power potential, primary and secondary power, load factor, pondage and pondage factor, load curve.
Type of hydropower plants:- low and high head, run of river, valley dam, diversion canal, high head diversion, pumped storage underground, general description, layout, topographical requirements of each of above.

Unit-II : Penstocks: general classification, design criteria, economical dia, anchorages and accessories.
Water hammer :- meaning, rigid and elastic water column theory, Allievi's charts.

Unit-III : Surge tanks: Necessity, types, function, location, effect of sudden load change, Hydraulic design of simple surge tanks, stability of surge tanks.

SECTION – B

Unit-IV : Intakes: types, locations, requirements, trashrack and other components, control gates, emergency gates.

Unit-V : Hydel channel:- power canal and forebay, general principles of alignment and capacity, balancing tank.
Turbines:-types, hydraulic features, size, general description of components and layout, specific speed, choice, approximate costs.

Unit-VI : Power house:- types, general layout and approximate dimensions.
Non conventional sources of energy: - tidal power, wind power, geothermal power, solar power, elementary principles and description, application of water power in drilling and blasting of rocks.

BOOKS RECOMMENDED :

1) Dandekar M.M. & Sharma : Water Power Engineering, Vikas Pub. House, Delhi.

2) Brown J.G., Blackie and Practice : Hydro Electric Engg., Vol. I, II & III, W. Sons, London.
3) Mosonyi E. : Water Power Development, Hungarian Academic Sciences, Budapest.
4) Deshmukh M.M. : Water Power Engineering.
5) Davin C. and Sorenson K.C. : Hand Book of Applied Hydraulics, McGraw Hill.

7CE05 PROFESSIONAL ELECTIVE – I
(iv) PRESTRESSED CONCRETE

SECTION-A

Unit I : a) Analysis and design of beams - Rectangular, flanged and I sections, for Limit State of flexure, ultimate flexural strength, recommendations of I.S. codes.
b) Analysis and design of end blocks in post tensional members -primary and secondary distribution zones, Bursting and spalling tensions.

Unit II : a) Shear strength of prestressed concrete beams - mode of failure in beams, recommendations of I.S. code, ultimate shear strength of concrete, Design of shear reinforcement.
b) Deflection and bond in prestressed concrete.

Unit III : Analysis and design of continuous (upto two spans) and fixed beams. Elastic analysis, secondary moments, concordant cable, linear transformations.

SECTION – B

Unit IV : Analysis and design of prestressed concrete structures such as concrete pipes, poles, sleepers, water tanks etc.

Unit V: Analysis and design of portal frames, single storey and limited to two bays (fixed and hinged)

Unit VI: Design of prestressed concrete bridges (simply supported) for I.R.C. loadings or equivalent uniformly distributed loads.

NOTE : Candidates should use the latest I.S. Codes.

BOOKS RECOMMENDED:

1. Guyon Y. : Prestressed Concrete, Vol. I & II, John Wiley and Sons, New York.
2 Krishna Raju, N. : Prestressed Concrete, Tata McGraw Hill Pub. Company, New Delhi.
3 Lin, T. Y. : Prestressed Concrete, Tata McGraw Hill, New Delhi.
4. Dayaratnam, P. : Prestressed Concrete Structures, Oxford and IBH Publishing Company Pvt. Ltd., New Delhi.

7CE05 PROFESSIONAL ELECTIVE – I
(v) ARTIFICIAL NEURAL NETWORK & FUZZY LOGIC

SECTION - A

Unit I : Artificial intelligence, introduction, classification of artificial intelligence, tools of artificial intelligence, applications of A. I. in Civil Engineering.

Unit-II: Expert systems, introduction, classification, tools, applications of expert system in Civil Engineering.

SECTION – B

Unit-III : Neural network, introduction, classification, tools, applications of neural network in Civil Engineering.

Unit-IV : Fuzzy logic, introduction, classification, tools, applications of expert system in Civil Engineering.

BOOKS RECOMMENDED:

1. Rolston D.W. :Principles of Artificial Intelligence and Expert System, McGraw Hill International Edition, 1988.
2. Waterman D.A. : A Guide to Expert Systems, Addision-Wesley Pub. Co., 1985.
3. Koestem C.N. and Maher : Expert System in Civil Engineering, ASCE, 1986.
4. ASCEôs Journal of Computing in Civil Engineering.

7CE05 PROFESSIONAL ELECTIVE – I
(vi) ADVANCED CONCRETE TECHNOLOGY

SECTION-A

Unit-I: Admixtures and construction chemicals: Introduction, admixtures, plasticizers (Water reducers), action of plasticizers, dispersion, retarding effect, superplasticizers (High range water reducers), site problems in the use of plasticizers, retarders, accelerators, air-entraining admixtures, pozzolanic or mineral admixtures, fly ash, silica fume, rice husk ash, metakaolin, ground granulated blast furnace slag (GGBFS), damp and water proofing admixtures, IS code provisions for admixtures.

Unit-II : Durability of concrete: Introduction, strength and durability relationship, volume change in concrete, significance of durability, impact of water cement ratio on durability, factors affecting durability, methods of predicting durability, IS code provisions for durability of concrete.

Unit-III : Deformation in concrete: Introduction, deformation of concrete in Indian climate, permeability, factors contributing cracks in concrete, sulphate attack, alkali aggregate reaction, corrosion of embedded steel, controlling measures.

SECTION – B

Unit-IV: Special concrete and concreting techniques: Introduction to special concrete, Lightweight, aerated, no-fines, high density, fibre reinforced, polymer, prepacked, self-compacted (self leveled), and high volume fly ash (HVFA) concrete.
Introduction to special concreting techniques, Gunite or shotcrete, ferrocement, roller compacted concrete, and ready mix concrete casting and applications.

Unit-V: Repairs and rehabilitations: Introduction, need for repairs, crack width, interaction between permeability, volume change and cracking, polymer modified mortar, bond aid for plasters, guniting aid, silicon based water repellent materials, protective and decorative coatings, injection grout for cracks, coatings to embedded reinforcement, concrete repair systems, stages of repair works.

Unit-VI: Non-destructive testing of concrete: Introduction, rebound hammer, limitations, rebound number and strength of concrete, penetration technique, pullout test, resonant frequency, pulse velocity method, corrosion analyser, rebar locators.
Students must be shown video CD, slides, transparencies and photograph of actual structures.

BOOKS RECOMMENDED:

1. Lea, F. M.: The Chemistry of Cement and Concrete, Edward Arnold (Publishers) Ltd.
2. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks : Concrete Technology, ELBS
4. Orchard, D. F. : Concrete Technology, Applied Science Pub Ltd.
5. Shetty, M. S. : Concrete Technology, S. Chand
6. Varshney, R. S. : Concrete Technology, Oxford Pub. House.
7. Krishna Raju : Design of Concrete Mixes, McGraw Hill.
8. Shah and Kale : Reinforced Cement Concrete Design,
9. Sushil Kumar :Treasure of Reinforced Cement Concrete

7CE05 PROFESSIONAL ELECTIVE – I

(vii) ENVIRONMENTAL POLLUTION & RURAL SANITATION

SECTION - A

Unit I : General components of environment. Nature and scope of Environmental pollution, population growth, Degradation due to human activity. Episodes of Environmental pollution.

Unit-II: Water pollution-sources of water pollution, effects on water bodies, D.O. sag curve, pollution control measures, water pollution act
Noise pollution: sources of noise pollution, human tolerance levels, levels of exposure due to various sources, preventive and curative methods.

Unit-III : Report of field visit to municipal waste water treatment plant/ Industrial Effluent treatment plant.

SECTION-B

Unit-IV: Land pollution: solids its effect on the environment, various methods of collection, treatment and disposal of solid waste, Hazardous waste and risk analysis.

Unit V : Environmental Impact assessment : Need for EIA, elements of EIA, Environmental attributes, Nature of Impact -Primary, Secondary, Tertiary, Short Term & Long terms, Local & Regional.

Unit-VI: 1) Rural Sanitation ï Collection & disposal of night soil, Sanitary Latrines.
2) Biogas plant - Capacity & Design.

BOOKS RECOMMENDED :

1) Mishra P.C. : Fundamentals of Air & Water Pollution.
2) Mohan I. : Environmental Pollution & Management, Ashish Pub. House, New Delhi-110026
3) Gilbert M. Masters : Introduction to Environmental Engg. & Science.

7CE05 PROFESSIONAL ELECTIVE – I

(viii) ADVANCED EARTHQUAKE ENGINEERING

SECTION-A

Unit I : Behaviour of structures in past earthquakes : lessons learnt with regards to weak / strong aspects of structural systems.
Ground motion characteristics : choice of ground motion for a major project site.

Unit II: Detailed study of IS : 1893 - 2002 : seismic analysis of buildings using codal previsions, design considerations.

Unit III: Introduction to seismic design : Considerations for bridges, dams, chimneys.

SECTION-B

Unit IV : Vulnerability of buildings : use of Vulnerability Atlas and understanding techno legal issues with regard to buildings.

Unit V : Concepts in repair, restoration and seismic strengthening: retrofitting weakness in existing buildings, aging, weathering, development of cracks, material and equipment for repairs of masonry and concrete structures, study of IS : 13935.

Unit VI : Methodologies for repairs : for walls, roofs, slabs, columns and foundations of buildings in stone, brick or reinforced concrete.

BOOKS RECOMMENDED :

1) Anil K. Chopra : Dynamics of Structures, Prentice Hall of India Pvt. Ltd.
2) James L. Stratta : Manual of Seismic Design, Pearson Education.
3) Jaikrishna, Chandrashekhar, Brajesh Chandra : Element of Earthquake Engineering, Sarita Pub., Meerat.

7CE06 THEORY OF STRUCTURES- II – Lab

PRACTICALS:

The laboratory work will be based on the following experiments (Any five experiments):

1. Influence line diagram for continuous beams.
2. Horizontal reaction of two hinge arch.
3. Forces and displacements in redundant trusses and frames.
4. Minimum two exercise based on theoretical course work.
5. Verification of Betty theorem
6. Verification of Maxwell Reciprocal Theorem.
7. Basic exposure to software for analysis.
8. Computer aided design of structures

Software: Anyone of the following software STAAD, SAP, NASTRAN, ANSYS, BUILD MASTER, SCADDS & STRUDS and any other reputed software (Any TWO)

1. Analysis and design of minimum three storied building
2. Cantilever or counterfort retaining wall
3. Analysis and design of steel structure

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE07 GEOTECHNICAL ENGINEERING- II – Lab

LIST OF EXPERIMENTS: (Any six)

1. To determine the shear strength by conducting Field Vane shear test.
2. To identify the subsoil strata by conducting soil resistivity / seismic refractivity method
3. To determine the bearing capacity of soil by conducting standard penetration test
4. To determine the soil characteristic by conducting standard penetration test
5. To determine the soil properties by conducting the static cone penetration test.
6. Computation of bearing capacity by analytical approach to verity with field test
7. To determine the C- characteristic with respect to soil log bore presentation and interpretation of exploration
8. To examine the soil characteristic with respect to soil log bore presentation and interpretation of exploration

Compulsory: Introduction to Geotechnical Software, determination of bearing capacity , earth pressure etc. using this software.

7CE08 STRUCTURAL DESIGN- II – Lab

PRACTICALS:

1. Candidates are required to prepare at least two designs based on theoretical course detailed workings are necessary.
   A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

7CE09 PROJECT & SEMINAR

Seminar based on Project shall be delivered in Seventh Semester only. 50 marks shall be given through the internal evaluation done by three member committee one of them will be guide.

Seminar shall be delivered with POWER POINT presentation.

SEMESTER: EIGHT

8CE 01 WATER RESOURCES ENGINEERING - II

SECTION-A

Unit-I: Reservoir Planning : Investigation, selection of site, control levels, Reservoir Sedimmentation, Reservoir Capacity, Calculation of life Reservoir.

Dams : Different types and their suitability-factors governing the selection of types of dam for project

Earth Dams : Types of dams, causes of failure seepage and drainage arrangement, phreatic line, stability analysis, seepage control measures

Unit II : Gravity Dams: Types of dams forces acting, modes of failure; principles of design of straight gravity dams, Elementary and practical profile, Galleries, Earthquake and its effect on dams.

Unit-III: Diversion Head Works :- Selection of site and layout, components of diversion head works, design of weirs on permeable foundation, construction details of Kolhapur type weirs.

Spillways: Types of spillway, spillway capacity, Flood routing through spillways, types of crest gates. Energy dissipaters: meaning, objectives, location. Types hydraulic jump, jet diffusion and Bucket type,

SECTION-B

Unit-IV : Canal Irrigation: Types of canals, Parts of Canal irrigation system, Canal alignment, Design of unlined and lined Canals, Balancing depth, cross section of canal, propose and types of canal lining

Unit-V : Canal Masonry Works: Types and only design principles and description of

1. Regulation works: Canal fallôs, Head Regulator, Cross regulator, Canal escapes and canal outlets.
2. Cross drainage works: Aqueduct, Syphon aqueducts, super passage, canal siphon, level crossing

Unit-VI : Well Irrigation : open wells and tube wells, types of tube walls, duty of tube well water.

Water Management : Water management and distribution, co-operative water userôs organization, warabandi, conjunctive use of water. Water shed Management : Need of watershed management, importance of soil conservation measures, techniques ground water harvesting.

River Training Works : Need and types of river training works.

BOOKS RECOMMENDED :

1) Dr. Modi P.N. : Irrigation, Water Resources & Water Power Engg.

2) Punmia : Irrigation & Water Power Engg.

3) Garg S.K. : Irrigation & Water Power Engg.

4) Dahigaonkar J.G. : T.B. of Irrigation Engg., Wheeler & Co.

5) Varshaney R.S. : Theory of Irrigation Structures, Vol. I & II, Nemchand, Roorkee.

6) Birdie G.S., Das R.C. : Irrigation Engg., Dhanpatrai & Sons.

7) Michael A. M. : Irrigation (Theory & Practice)

8CEO2 ENVIRONMENTAL ENGINEERING–II

SECTION–A

Unit-I: Quantity of storm water, DWF, variation of sewage, flow systems of sewerage - separate combined and partially combined, layouts of sewerage system, capacity of sewers design of sewers Laying out of circular sewers-Boning rod and sight rail method, Testing & maintenance of sewers

Unit-II: Waste water characteristic, sampling of sewage, physical chemical and biological examinations, B.O.D. and C.O.D.,B.O.D. equation, problems on B.O.D Pollution due to domestic and industrial waste. Treatment of sewage - purpose of treatment, preliminary treatment, primary treatment and secondary treatment. Flow diagram for conventional sewage treatment plant. Preliminary Treatment:- Screening, Grit chamber, detritus tank. Primary Treatment:- Sedimentation of sewage

Unit-III: Biological treatment: Trickling filters, low rate & high rate tricking filters, construction details, Re- circulation Modification of trickling filters Activated sludge process - Process description, Methods of aeration, loading rates, Different modified forms of A.S.P.,MLSS & SVI,F/M.

SECTION–B

Unit-IV : Low cost waste treatments - Oxidation ponds, Aerated Lagoon, Treatment and Disposal of sludge - Digestion of sludge, sludge disposal Septic tank, working and design, Disposal of septic tank effluent Disposal of sewage on land and in stream. Effluent standards for disposal on land, into stream and into sewers. MINAS. Self purification capacity of stream

Unit-V: Characteristics of solid waste:- Physical, chemical, biological Analysis

Collection of solid waste:- Types of collection system and services, frequency of collection, methodology involved in setting up collection bins Disposal of solid wastes:- Different methods, sanitary land fill, composting, incineration

Unit-VI : Air pollution: Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources, introduction to control devices electrostatic precipitator & cyclones only human tolerance level Introduction to EIA and Environmental Audit.

BOOKS RECOMMENDED :

1) Kshirsagar S.R. : Sewerage and Sewage Treatment, Roorkee Pub House, Roorkee.
2) Steel E.W. Steel : Water Supply & Sewerage, McGraw Hill Book Co.
3) Birdie G.S. : Water Supply and Sanitary Engineering, Dhanpat Rai & Sonõs.
4) Garg S.K. : Waste Water Engineering.
5) Dr. Bhide A.D., Sunderson B.B. : Solid Waste Management in Developing Countries.
6) Rao H.V.N. : Air Pollution.
7) Stern, Wohlers, Boobel, Lowry : Fundamentals of Air Pollution, Academic Press, 1973.

8CE03 PROJECT PLANNING & MANAGEMENT

SECTION-A

Unit-I : Project, Project Stakeholders, Project life cycle - Conceptual Phase, Planning Phase, Execution Phase, Termination phase.
Conceptual Phase - Concept of feasibility study, Budgeting, Cash Flow, Risk assessment plan.
Project planning- Steps, work break down structure, Scheduling, Project Monitoring & Controlling- Concept of Tracking, Reviewing and Rescheduling.
Planning Tools: Basic concept of Gantt Chart, Bar Chart, Mile stone chart ,their advantage , limitations and overcoming measures ,

Unit II : Networking ï Activity ,Event, dummy Activity, Fulersonõs numbering rule, Geometrical consideration.
Critical Path Method: Concept, technique , Critical path , Numerical on Time and Floats computation , concept of Updating Network and its numerical for computation.

Unit III: PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, S.D, Variance, Probability factor, , crash programe , normal and crash cost, normal and crash time, cost slope, Numerical on Probability computation, crashing .

SECTION – B

Unit –IV: Concept of resource smoothening and leveling ,Cost Cuves, Numerical of it.

Introduction to MicroSoft Project Planner software .Various stages and process for Work Breakdown structure, planning, scheduling and resource allocation for project in MSP. One Compulsory assignment for planning, scheduling and resource allocation for construction project using Microsoft Project Planner.

Unit-V: Management- Feyolõs Principal of Management, Functions of management, organization definition, type line, line and staff, functional organization ,quality control, ISO.
Safety management ,construction hazards in multistage building, method of prevention of accident, injury rate, injury severity rate, injury index, National safety council, its role, recommendation, Material management , Objective ,Functions, Inventory, Need for inventory, ABC,EOQ analysis.

Unit VI: Equipment Management :

a) Power shovel: Construction, working, Output, factors affecting, cycle time , Problem n Output.
b) Dragline: Construction, working, output, factor affect ting output, cycle time ,Problem on output .
c) Concrete mixer, Tilting and non-tilting type construction working.

BOOKS RECOMMENDED:

1) Peurifoy R.L. : Construction Planning, Equipment & Method.
2) Srinath L.S. : PERT & CPM.
3) Punmia & Khandelwal : PERT & CPM.
4) Khanna S.K. : Industrial Organization & Management.
5) Satyanarayan : Operations Reserach.

8CE04 PROFESSIONAL ELECTIVE – II
(i) ADVANCED DESIGN OF STEEL STRUCTURES

SECTION - A

Unit-I : (a) Design of foot bridge(N-Truss or Pratt)
(b) Analysis and design for transmission tower lines

Unit-II : (a) Design of self supporting steel chimney and its foundation.
(b) Design of through type truss bridge member for dead load and equivalent live load including top, bottom bracings and portal bracing.

SECTION - B

Unit-III: Design of industrial buildings including gantry grider, gantry column, Design of knee braces.

Unit-IV: a) Design of north light trusses and lattic girder.
b) Design of elevated rectangular, square pressed steel tanks and staging

BOOKS RECOMMENDED:

1. Ramchandra, Design of Steel Structure, Volume ï I and II
2. Arya, Ajmani, Design of Steel Structures
3. Duggal, Design of Steel Structures
4. N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.

8CE04 PROFESSIONAL ELECTIVE – II

(ii) ADVANCED WASTE WATER & INDUSTRIAL WASTE TREATMENT

SECTION - A

Unit-I : 1. Physical unit process: screening, mixing, flocculation, sedimentation, floatation.
2. Design of Grit Chambers and Screens.
3. Chemical Unit Processes: precipitation, gas transfer, adsorption

Unit-II : Biological Unit Process: fundamentals of biological treatment. Design of trickling filter & activated sludge process.

Unit-III: 1. Low cost waste water treatment: design of oxidation pond and aerated lagoon
2. Oxidation ditch. Design of Secondary Settling Tank.
3. Methods of disposal of industrial wastes. Equalization tank, Neutralization.

SECTION – B

Unit-IV : General : Effect of discharge of industrial wastewaters on streams, land and environment. Importance and scope. Problems involved in treatment. Variation in quality and quantity of industrial wastewaters. Standards & Criteria
Indian standards for discharge of treated waste water on land, into municipal sewers and natural water courses.
Sampling of Waste Water : Representative sampling. Grab and composite samples.

Unit-V : General Approaches to Planning of Industrial Wastewater Treatment and disposal. Equalization and proportioning Neutralization.
Treating different effluent streams separately. Including/ excluding domestic wastewater along wish the industrial waste. Treating industrial wastewater along with town waste.

Unit-VI : Process flow diagram, characteristics and treatment of various industrial wastes.
Industrial wastes of pulp and paper, textiles, tannery, food, canning, sugar mills, distillery, dairy, Pharmaceutical, Electroplating etc. Case study of any one industry.

BOOKS RECOMMENDED :

1) Matcalf and Eddy : Waste Water Treatment, Disposal and Reuse, McGraw Hill Pub. Co., New Delhi.
2) Rao and Datta : Waste Water Treatment, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.

8CE04 PROFESSIONAL ELECTIVE – II

(iii) FINITE ELEMENT METHOD

SECTION - A

Unit- I : Continuum structures, discretisation, finite elements, nodes, variational principle, minimum potential theorem, relation to Rayleigh-Ritz method.

Unit-II : Interpolation, Lagrangian, Hermition shape functions, natural coordinates, area and volume coordinates, coordinate and derivative transformations.

Unit-III : 2-D plane stress and plane strain analysis, constant strain triangle, rectangle. 3D analysis, tetrahedron & parallelepiped elements.

SECTION - B

Unit-IV : Isoparametric elements, plane stress, plane strain and solids, numerical integration.

Unit-V : Beam straight with C and C continuity, numerical integration to cater for membranes, bending and torsion combination.

Unit-VI: Programming aspects, geometry, connectivity, code numbers alternate data types, half band data preparation, flow charts, typical subroutine for assembly, shape functions, soluti6n of equations, stiffness matrix.

BOOKS RECOMMENDED:

1. Desai, C. S., Abel, Introduction to Finite Element Method
2. Cook, Concept and application of Finite Element Method
3. Patwardhan, N. R. Illustrated Finite Element Method
4. Krishnamurthi, C. S., Finite Element Analysis ï Theory and Programmingn

8CE04 PROFESSIONAL ELECTIVE – II
(iv) DAM ENGINEERING
SECTION - A

Unit- I : Introduction to Dam Engineering : Different classification for dams, relative advantages and disadvantages of various dam selection or types of dam, Investigation of dam sites, Engineering surveys, geological investigation, subsurface exploration programme, economic height of dam, Construction machinary, material, money, inventory.

Unit-II : Rockfill dam : Introduction, general characteristics, materials and testing of rockfill material, foundation of rockfill dam, design, rockfill placement, examples.

Unit-III : Arch dam :- components, types, methods for design.
Buttress dam : components, types, forces acting, Buttress spacing, Master curve for economic spacing, preliminary design
Solid Gravity dams : Analysis & Design of gravity dam.

SECTION – B

Unit-IV: Spillways: choice of types, crest gates, hydraulic design, comparison, approach and tail channel, J.H.C. & tail water rating curve Energy Dissipaters: types, components, design of hydraulic jump type, basins, ski-bucket type, roller bucket.

Unit- V: Head Regulators : requirements, types, foundation treatment including uplift consideration, Bank connection, energy dissipation, hydraulic design of opening and barrel, ventilation, types of gates.
Approach Channel, case study for one on rock foundation and one on permeable foundation.
Model Studies: scales design principles, materials, scale effects for model of dams spillways.

Unit-VI : Instrumentation : In earth dam and solid gravity dams, piezo meters, settlement, gauges, (surface monuments, base plate, cross arm) strain meters joint meters, thermometers, stress meters, pore pressure cells, plumb-bob Seismograph. Water level gauges (description, object, location, working, installation of each, design not expected)
Special problems: increasing height of masonry and concrete dams, strengthening, repairs and maintenance, leakage, evaporation controls. evaporation controls.

BOOKS RECOMMENDED :

1) Sharma H.D : Concrete Dams, Metropolitan Book Co, Delhi.
2) Varshney R.S. : Concrete Dam, Ox IBH, Mumbai.

3) Sherard et al : Earth and Rockfill Dam, John Wiley, New York.
4) USBR : Design of Small Dams.
5) USBR : Design of Large Dams.
6) Peurifoy R.L. : Construction, Planning and Equipments, McGraw Hill Book Co.
7) Satyanarayanan : Construction, Planning & Equipment, Standard Pub.
8) USBR : Design of Gravity Dam.

8CE04 PROFESSIONAL ELECTIVE – II
(v) ADVANCED ENGINEERING GEOLOGY

SECTION - A

Unit I : A) Geology & engineering characters of Basalts & other rock formations : study of rock formations of Maharashtra older than Deccantrap from Civil engineering point of view, field characters of basalt flows and older formations which are significant from dam foundation, tunnelling work, watershed development including percolation tanks and construction material.

(B) Geology of dam & reservoirôs : bearing capacity & water tightness of different types of rocks occruing in Maharashtra from construction of gravity dam with important case histories of different dam sites in Maharashtra whose geological problems were encountered and remedial measures were adopted. Set of geological conditions which lead to tail channel erosion with case histories of different dam sites.

(C) Geology of tunnel alignment : geological factors responsible for overbreaks & percolation of water, various geological structures which affects the tunnelling works. Case histories of tunnels & hydro-electric projects, roads, railways & canals driven through different types of Basalts & other rocks occur in Maharashtra.

Unit II: (A) Seismological studies : factors to be to safeguard gravity dams. Detailed studies of active & dead faults. Type & design aspect of the dam to be constructed in seismic zone with cace histories.

(B) Percolation tanks : importance of geological studies for the selection of sites for percolation tanks, geological studies of watershed development projects in Maharashtra including Raleganshindi & Vidarbha region.

(C) Ground water studies : water bearing characters of different types of Basalts. Soil & water preservation techniques of civil engineering significance and under ground bandhara. Exploration of tubewells n alluvium and sandy ï alluvium substrata for drinking water oses procedures and need thereof. Deciding acquifers for tubewell exploration & development of tubewells conducting yield tests of tubewell.

Unit III: (A) eology of soil formation : geological factors which govern the engineering characters of soils. Soil derived from different types of rocks which can be used for casing & hearting of earthen dams. Nature of river alluvium in Maharashtra. Problem water logging & its remedial measures.

(B) Construction material : properties of different types of rocks that can be used as rubble for masonry, road metal, railway ballast, concrete aggregates etc. Problem of alkali aggregate reaction. Scaricity of sand in Deccan trap region, suitability of compact & gdaloidal basalt as a substitute of sand after crushing.

(C) Geology of cut-off trench : geological logging and mapping of cut off trench of irrigation projects. Applicability of grouting in irrigation projects & different grouting techniques.

SECTION - B

Unit IV : (A) Drilling and logging : different methods of drilling. Precautions to be taken during drilling, preservation of cores. Recording of drilling data. Geological logging of the drill & its interpretation. Methods of water intake tests.

(B) Aerial photo interpretation : interpretation of aerial photos from the point of view of rock types, geological structures, selection of dam sites and alignment of roads, railways & ghat interpretation of lineaments for groundwater.

(C) Town planning : role of geology in town planning. Important case histories of the old town planning.

Unit V: **Geophysical** principle of electrical resistivity survey, its utility in determining the depth of overburden, foundation grade rocks, gullies & other geological structures by having case histories of dams & tunnels, significance of electrical resistivity survey in ground water studies, brief introductory ideas regarding seismic, magnetic and gravity surveys and their applications in various fields.

Unit VI: (A) Rock Mechanics : Engineering properties of rocks, general properties, strength of rocks, elasticity of rocks. Residual stresses in rock masses, classification system in rock engineering - Terzaghiõs load classification, Lauffer-Pacher classification. Rock quality gnation (RQD), rock structure rating (RSR), concept of Wickham et.al (1972)

(B) Environmental Geology : role of geology in environmental engineering, geo-environmental : soils as resources, wind erosion, erosion by moving water, predicting & controlling erosion, soil erosion & land use decisions, problem soils. Reactivation of pre faults, earthquakes in Peninsular India, intensity & magnitude, assessment, Himalayan earthquakes, landslides - characterisation, landslide analysis, dimensions of landslide hazard, landslide potential, case histories, subsidence, response to subsidence prediction, costs of subsidence, case histories.

BOOKS RECOMMENDED :

1) P.W.D. Hand Book, Chapter No. 6.
2) Geological Survey of India - Engineering Geology Case Histories, Parts I & II.
3) Auden J.B. : Indian Society of Engineering Geology, Commemoration Volume.
4) Wahlstrom E.E. : Tunnelling in Rocks.
5) Wahlstrom E.E. : Dams, Dam Foundations and Reservoir Sites.
6) Goodman R.E. : Introduction to Rock Mechanics.
7) Bieniawski Z.T. : Rock Mechanics Design in Minning and Tunnelling.
8) Lama R.D. & Vutukuri V.S. : Hand Book of Mechanical Properties.
9) Gupte R.B. : AText Book of Engineernig Geology, Pune Griha Prakashan.
10) Miller : Principles of Remote Sensing.
11) Pandey S.N. : Text Book of Photo Geology.
12) Lundgren L. : Environmental Geology, Prentice Hall Pvt. Ltd.
13) Patwardhan A.M. : The Dynamic Earth System, Prentice Hall Pvt. Ltd.

8CE04 PROFESSIONAL ELECTIVE – II
(vi) MATRIX COMPUTER ANALYSIS OF STRUCTURES

SECTION - A

Unit- I : Solution of simultaneous algebraic equations, Gaussian elimination method, Half-band matrices, computer programme.

Unit-II : Finite difference method, application to plate deflection problems for fixed and simply support conditions.

Unit-III : Flexibility method, static redundancy, flexibility coefficients, compatibility conditions, application to continuous beams, single-bay single story portals, pin joined plane trusses.

SECTION-B

Unit-IV: Stiffness method, kinematic redundancy, equilibrium equations, member stiffness matrix and structure stiffness matrix, assembly procedure, application to continuous beams, pin jointed plane truss, numerical examples upto three unknowns.

Unit- V : Stiffness matrix of plane frame member with axial deformation (6x6), Grid member (6x6), transformation of forces and displacements, member and global coordinate system.

Unit-VI : Data and program organization for stiffness method, various coding systems, member-joint and joint-coordinate relations, member-displacement relations, code number approach, methods of introducing boundary conditions for restrained displacements.

BOOKS RECOMMENDED:

1. Gere, Weaver, Analysis of framed structures
2. Rubinstein, M. F., Matrix computer analysis of structures
3. Matrin, M. C., Introduction to matrix methods of structural analysis

8CE04 PROFESSIONAL ELECTIVE – II
(vii) ADVANCED STRUCTURAL ANALYSIS

SECTION – A

Unit – I: 1. Approximate methods of analysis of multi-bay multi-storey Frames by– (a) Cantilever method, (b) Portal method & (c) Factor method.
2. Shear centre for thin walled beam section.

Unit – II : 1. Infinite & semi-infinite beams resting on elastic foundations.
2. Analysis of beams circular in plan.

Unit –III: 1. Cantilever moment distribution method, application to rigid jointed plane frames.
2. Vierndeel girders - analysis for vertical sway cases only.

SECTION - B

Unit–IV : 1. Finite difference method, application to beam deflection problems
2. Minimum potential principle, Rayleigh & Rayligh-Ritz approach to continuous problems, application to simply

supported and cantilever beams using power series and trigonometric series.

Unit – V: Introduction to theory of elasticity - (treatment in Cartesian co-ordinates), state of stress at a point, stress – equilibrium equations, strain-components, stress -strain relations, generalized Hookeûs law, strain plane stress and plane conditions, stress and compatibility for 2D.

Unit–VI: 1. Analysis of columns loaded laterally.
2. Structural response to earthquake, analysis of multistoried frames by I.S. code provisions.

BOOKS RECOMMENDED:

1. Norris, Wilbur, Elementary Structural Analysis
2. Timoshenko & Goodier, Theory of Elasticity
3. Jaikrishna, Chandrashekharan, Element of Earthquake Engineering, Sarita Publication, Meerut (U.P.)
4. Vazirani & Ratwani : Advanced Theory of Structures.
5. Ross C.T.F.: Advanced Stress Analysis.

8CE04 PROFESSIONAL ELECTIVE – II
(viii) ROCK MECHANICS

SECTION - A

Unit I : Introduction, properties and testing. Introduction to Rock Mechanics and its field applications, identification of common rocks, physical & mechanical characteristics of rock material. Field & Laboratory testing of rocks. Classification of rock masses for engineering purpose.

Unit II: Rock excavation : Blasting - objectives, blasting materials, blasting methods, open cut blasting. control blasting operation, precautions. Drilling, braking & cutting. Machines used for rock excavation.

Unit III: Rock reinforcement & Grouting : Rock bolting – bolting methods & materials.
High capacity of rock anchors - types of rock anchors, anchor grouting, civil engineering applications. Bolted & anchor supports. Rock grouting - objectives, types of treatment, grouting material, grouting methods, quality control & monitoring of grouting.

SECTION-B

Unit IV: Rock strength & deformability : modes of rock failure, stress-strain behaviour in compression, Mohr- Coloumb failure criteria, Griffths crack theory, empirical criteria for failure, effect of size

on strength. Plane of weakness in rocks, joint orientation & roughness. Deformability of rocks - elastic & non- elastic behaviour, influence of time on rock deformation, viscous behaviour & creep.

Unit V: Rock foundation & slope stability : rock foundation ï allowable bearing pressures, stress & deflection in rock under footing, failure mechanisms, subsiding & swelling rocks, base heave & remedies, foundation anchoring. Rock slopes - modes of failure, factors affecting, analysis of slopes.

Unit VI: Underground opening : types of boring machine, cutting tools, muck handling. Opening in competant rock, horizontally layered rocks & rock with inclined layers, plastic behavior around tunnels, time dependent behaviour of tunnels, underground opening in blocky rocks - Block theory. Review of design methods of tunnels - Empirical & semi-empirical methods. Support & stabilisation.

BOOKS RECOMMENDED:

1) Goodman R.E. : Introduction to Rock Mecanics.
2) Franklin J.A., Dusseault M.B. : Rock Engineering.
3) Franklin J.A., Dusseault M.B. : Rock Engineering Applications.
4) Stagg K.G., Zienkiewicz O.C. : Rock Mechanics in Engineering Practice.

8CE04 PROFESSIONAL ELECTIVE – II
(ix) ADVANCED DESIGN OF R. C. C. STRUCTURES

SECTION - A

[BY LIMIT STATE METHOD]

Unit-I : 1) Design of Portal frame up to two bay two storied symmetrical frame for symmetrical loading.
2) Design of circular slab for uniformly distributed load only, Introduction to grid floor slab.

Unit-II : 1) Design of a footbridge and simply supported slab deck bridge for I.R.C.class A loading.
2) Design of RCC girder (T beam) bridge for I.R.C.class A loading.

SECTION – B

Unit-III : 1) Structural response to earth quake, Analysis of multistoried frame by seismic coefficient method.
2) Design of square bunkers using Rankine theory. Design of Silos.

Unit-IV: 1) Design of R.C.C. Intze tanks.
2) Design of staging for Intze tanks with raft foundation.

BOOKS RECOMMENDED:

1. Suhil Kumar, Treasure of R. C. C. Design
2. Jain, A. K., Reinforced Concrete (Limit State Method)
3. Shah, Karve, Design of R. C. C. Structures
4. N. Krishna Raju, Advanced R. C. C. Design
5. Rajgopalan, K., Storage Structures.

8CE 05 WATER RESOURCES ENGINEERING – II – Lab

TERM WORK : Five problems from the following to be worked out by the students whenever necessary scale drawing on half empirical size must be drawn : Practical examination shall consist of viva ï voce.

1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components; details of drainage of downstream casing.
3. Design and Drawing of elementary and practical profile of gravity dam.
4. Design and drawing of diversion weir on permeable foundation.
5. Design and Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any Four canal structure (No design)
8. Field visit

8CE06 ENVIRONMENTAL ENGINEERING – II - Lab

1) Analysis of waste water (any four) ï BOD (for domestics waste), COD (for industrial waste), Solids (Volatile), SVI, Nitrogen, Chlorides
2) Air sampling & Analysis of SPM.
3) Physical characteristic of solid waste
4) Sketches of sewers appurtenances ï Manholes ï different types storm water inlets, overflows, inverted siphons, automatic flushing tanks, ventilation in sewers.
5) Report of Field visit to Municipal wastewater treatment plant/Industrial Effluent treatment

8CE07 PROJECT & SEMINAR

Complete Project Report in a group of Maximum 9 students shall be submitted.

Out of 75 internal marks, 25 marks shall be given through the internal viva by three member committee one of them will be guide.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVEN

7ME01 MACHINE DESIGN AND DRAWING – II

Unit I : a) Design of Shaft: Material, Design on the basis of strength considering shaft subjected to
- Twisting moment only
- Bending moment only
- Combine twisting and bending moment
- Design on the basis of rigidity.

b) **Design of Key** ï types, strength of key

c) **Design of Coupling** ï types, requirments of good couplings, design of sleeve coupling, clamp or compression coupling, rigit flange coupling, flexible flange coupling.

d) **Design of fly-wheel :** Puction, coefficients of fluctuation of speed and energy, energy stored in fly wheel, constrution, stresses in fly wheel arms and rim, Design of fly wheel based on T-M diagram, fly wheel for Otto cycle engines and punching machines. (12 Hrs)

Unit II: a) **Antifriction Bearings** : Types of bearing, construction, desingations, standard load ratings by AFBMA for static and dynamic loads, life of bearings, selection of bearings, lubrication, mounting and enclosure,

b) **Journal bearings :** lubrication of bearings, stable lubrication, Thick film lubrication, pressure distribution , minimum film thikckness, relations of variables-viscocity, coefficient of friction, speed, pressure, length and diameter, bearing modules, viscocity-Temperature chart, sommerfeld number, selection of lubricant, design procedure and numericals.

c) **Design of belts :-**
Flat belts ï types, material and construction of belt, type of drives, slip, creep, Design of belt.
V-Belts- Consruction and types, design of V Belts.

d) **Wire Rope-** Selection, Construction, classifiction, designations, stresses in wire rope, selection of wire rope for given loads.

Unit III :- Design of Gear Classification, law of gearing, forms and system of teeth, interferemce. beam strengthof teech, dynamic tooth load, wear tooth lead, tooth failure.

a) Spur gear - Design of gear

b) Helical gear ï Classification face width, formative teeth number, strength of gear Design of gear

c) Bevel gear ï Classification, pitch angles, strength of gear, Design of gear

d) Worm gear ï Types, efficiency of gear, Design of gear.

Unit IV : a) Design of I.C. Engine parts : Design of Cylinder, Pistion, Piston rings, Piston pin, connecting rod and crank .

b) Design and drawing of Governor (Parts and Assembly) Types of Governors, Design procedure and problems, Hartnellôs Governor (including design of Spring, spindle, lever and bails).

BOOKS RECOMMENDED :

TEXT BOOKS -

1) Machine Design fundamentals- Mechaincal designer workbook, J.E. Shigley, published by Mc graw Hill .
2) Machine Design, R.S.Khurmi and Gupta J.K. published by Eurasia Publishers- New Delhi.
3) Machine Drawing, N.D.Bhat,Charotar Publication

REFERENCE BOOKS :

1) Machine Design, Maleev nd Hartman, published by C.B.S. Publication New Delhi.
2) Machine Component Design, Willian Orhwein, published by Jaico Publishing House- N.Delhi
3) Machine Elements in Mechanical M.F. Spotts
4) Machine Design, Black P.H. Published by Mc Graw Hill,
5) CAD CAM Conepts & applications, Chenna Kesava, PHI Publications
6) Design Data Book by- P.S.G. Koimbatore
7) Design Data Book by Mahadevan
(Use of any data book from the above will be permitted during the examination).

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7ME02 ENERGY CONVERSION – II

SECTION – A

UNIT I: Reciprocating, Air Compressions :- Industrial uses of compressed air , Methods of compression and efficiencies of compression, Methods of reducing losses during compression

single and multistaging of compressions, clerance volume and its effect on work done and volumetric efficiency, condition for minimum work in tow stage compression, intercooling and its effects, Overall, isothermal and adiabatic efficiencies, IHP, BHP, requirements and after cooler. (7 Hours)

UNIT II: Rotary Compressors :- Comparison between reciprocating and rotary compressors, difference between fans, blowers and compressors, general equations for rotary machines, Vane, Roots blower, construction, working and velocity diagrams of centrifugal and axial flow compressors, performance characteristics of blowers and compressors. (8 Hours)

UNIT III: Definitions, classifications of refrigeration systems : Air refrigeration, Bell-column cycle, reversed cannot cycle, revered Brytion cycle, vapour compression refrigeration, vapour asorption refrigeration based on solar and waste gear recovery. Analysis of simple saturated vapour compression cycle, representation on T-s, Ph diagrams, Problem on simple saturation cycle, Need for CFC free refrigerants.
Air conditioning :- Definitions, classification and applications. Phychromatic properties, phychrometriccharts. (8 Hours)

SECTION – B

UNIT IV: Classification of gas turbines, construction and working Gas turbine ideal and actual cycles constant volume, constant pressure, (Open and Closed) cycle analysis, Inter coolong, Regeneration and reheating application, optimum and maximum pressure ratios,work rations, Performance characteristics. Fields of application of gas turbine power plant,Introduction to Jet Propulsion, Ram jet, turbo jet. (No numerical treatment for Jet Propulsion). (8 Hours)

UNIT V: NUCLEAR POWER:- Fussion, fission, Chain reaction, conversion and breeding in nuclear fission, components of water, gas cooled, liquidized metal cooled thermal reactors.

UNIT VI: Introduction to renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, basic requirmenets, Advantages, Disadvantages and applications. (7 Hours)

RECOMMENDED BOOKS :-

TEXT BOOKS :

1. Steam and gas turbines R, Yadav; Central Publication Allahabad.
2. Thernal Engineering, Domkundwar, Kothandarawar, Dhanpat Rai & Co.
3. Power Plant Engineering; R.K.Rajput; Laxmi publication

4. Solar Energy by S.P.Sukhatme; Tata Mcgraw-HIll in New Delhi

REFERENCE BOOKS :

1. Thermal engineering by Mahesh M.Rathore; Tata Mcgraw-Hill in New Delhi
2. Gas Turbines Theory- By Cohen and C.F.Rogers, P.H.I.H. Saravanamuttoo Heritage Publishers,
3. Gas Turbines and Rotary compressors, Khajuria and Dubey, Dhanpat Rai & Co.
4. Thermal Engineerinng : R.K.Rajput, Laxmi Publication.
5. Renewable Energy; Godbfrey Boyle, Oxford University Press.

7ME03 INDUSTRIAL MANAGEMENT & COSTING

UNIT I: Concept, Principles and Techniques of Management; Evolution of management thoughts, functions of management, organization structure & relationship.

UNIT II: Marketing and Management : Marketing stretegy market research, buying, motives, types of market, new product development, Product life cycle, Sales Organization, advertising, methods of selling, consumer behaviour.

UNITIII: a) Functions of personnel management, Human resource planning, Recruitment, training and development , workers participation in management, joint culsultation, collective bargaining.

b) Materials management, classes of materials, scope of material control, scope and function of purchasing department, purchasing procedure, inventory control, ordering procedure, material identification, store function.

SECTION - B

UNIT IV : Objectives, functions, principle factors of estimating and estimating procedure, Estimation of weights & materials, Estimation of machining time, estimation of fabrication cost, forging cost, foundry cost.

UNIT V : a) Introduction to costing and costing Techniques: Definitions, objectives, elements of costs, components of cost, job costing, simple process costing, normal and subnormal losses in process, waste, scrap. (8 Hours)

UNIT VI: a) Financing of business :- Basis of business finance, need of finance, Kinds of capital, sources of fixed & working capital.

b) Financial statements :- Profit and loss statement, balance sheet

c) Depreciation Analysis :- Causes and significance, meethods of calculation of deprecdiation. (7 Hrs)

TEXT BOOKS:

1. Management-principles, processes and practicals, Anil Bhat, Aryakumar; Oxford University Press
2. Management Accounting; Paresh Shah; Oxford University Press
3. Estimating and costing; TTTI Madras.

REFERENCE BOOKS:

1. Essentials of Management; Koontz, Harold; Mcgraw-Hill Education(India)
2. Cost Accounting; Jawahar Lal; Tata Mcgraw Hill Publishing
3. Cost Accounting by Bhar.

7ME04 AUTOMATION ENGINEERING

SECTION - A

UNIT I: Automation &Types, Aucomation for mass manufacturing and assembly, Automation of continuous processing systems, Detroit type automation, Automated flow lines. Methods of work part transport, transfer mechanisms, control function . General terminology and anaylsis of automated flow line,partial automation, assembly, systems and Line balancing.

UNIT II: NC/CNC :- Basic concept, N.C. controls- point to point , straight-cut and continuous path control, machine control units, closed system, NC machine components, tooling, CNC & DNCs, Manual part programming formats, programming languages,- APT,ADAPT, EXAPT etc. NC/CNC Programming- Various Programming codes, Manual part programming for drilling, Milling and turning operations, Examples of APT, Sensors and adaptive control in machining, Applications and economics of CNC. (12 Hrs.)

UNITIII: ROBOTICS :- Introduction to cybernetics, Evolution of industrial robots, Robots anatomy, Arm geometry, drive system and end efforts, sensors, Evolution of geometrical configurations for robots Programming techniques of Robots.

Applicaion of Robots in manufacturing, casting, welding, painting, m/c loading, handling, heat treatment, assemly, inspection, etc. Technicql Specifications of a Robot, Robot economics. (9 Hrs)

SECTION - B

UNIT IV : GROUP TECHNOLOGY AND PROCESS PLANNING : Introduction-Part families, part classification and coding systems, Group technology machine cells, advantage of group technology

The planning function, retrieval type process planning system, Generative process planning systems Benefits of CAPP, Expert systems and expert system approach to CAPP. (09 Hrs)

UNIT V: FMS : Introduction, schematic of FMS, FMs cells, Componenets of FMS, Relation of Group Technology, with FMS, Planning, Simulation and analysis of FMS, Applications of FMS.

Material handling : Automated storage and Retrieval system (ASRS), aomagted Guided Vehicle (AGV)etc. (08 Hrs)

UNIT VI: Computer INtegrated Manufacturing; Introduction, Sequence of functins in CIM,elements of CIM system, CIM Wheel, structure of CIM database system. Guidelines for CIM development, benefits of CIM shop floor control and process monitoring.

Automated inspection and testing : Introduction to automated inspection, Advantages over traditional method. On-line & off-line inspection, CMM construction, types & working. (09 Hrs)

TEXT BOOKS:

1. Production system, Automation and CIM, Mikhal Groover, Pearson Publications.
2. CNC Machines; M.Adithan & B.S.Pabla; New Age International.

REFERENCE BOOKS:

1. Robotics; Yarem Koren, Mcgraw Hill.
2. Computer aided Manufacturing; P.N.Rao, N.K.Tiwari and & T.K.Kundra; Tata Mcgraw Hill.
3. Machine Tool Design; N.K.Mehta, Tata Mcgraw Hill.
4. Computer Control of Manufacturing; Yarem Koren, Tata Mcgraw Hill.
5. CAD/CAM/CIM ; Radhakrishnan & Subramanium; New age International.

PROFESSIONAL ELECTIVE – I

7ME05 (1) NON-CONVENTIONAL ENERGY SYSTEMS

SECTION – A

Unit I :- Introduction :- Renewable & Non-renewable resourses. Solar Radiaton- Solar Constant basic earth-sun angles spectrum distribution of extra terrestrial radiations and its variation, Solar time, Direction of beam radiation, comportation of radiation inclined surfaces, solar charts, measurements of diffiuse & global & direct radiations, duration of sunshine hours,computation of radiation data, Alteration of solar radiation by the atmosphere.

Unit II : Radiation transmission through covers :- Reflection and absorption of radiation, optical properties of cover systems in trnsmittance effects of surface layers on transmittance,

transmittance absorptace product. Solar Energy collections;- Heat transfer for solar energy utilization, flat plate eollections such as liquid & air collector, collector overall heat transfer coefficient, temperature distribution between the tubes & the collector effiencney factor useful heat gain , heat removal and flow factor, Testing of collectors & effects of various parameters on the performance. INtroduction to various systems of concentrating collectors

Unit III: Solar energy Utilisation :- Application of solar energy in heating, cooling, pumping, power production, distillation, drying,solar cookers, solar pond, solar fuanaces, Solar Energy Storage:- Methods of storage such as sensible, latent heat & thermochemical storage,selection of method of storage, properties of storage materials and different arrangements of storages. (No alphabetical treatment)

SECTION - B

Unit IV: Energy from Ocean : Tidal Power :- Types of tidal plants such as single and two basin plants, power developed and operation of tidal power plant. Occean thrmal energy conversion system. Ocean temp. profile, OTE Power plant development, controlled flassh evaporation, indirect vapour cycle, Salinity differences conversion of salinity grandient resources, cosmotic pump, dylitic battery, etc.

Wind power :- Wind speed data, power in the wind, wind power development, types of wind miles, application for pumping and power generation. (8 Hours)

Unit V: Biomass Energy Resourses; Mechanism of green plant photosynthesis, effiency of conversion, solar energy plantation, Biogas- Types of Biogas plants, factors affecting production rates, Pyrolysis, Gasifess Types & Classification of vegetable oils a a liquid fuel and their properties, esterification process, formation of Biodiesel, Biodiesel & its properties, suitable species for Biodiesel formation and its cultivation, byproduct formation during esterification, Biodiesel economics. (8 Hours)

Unit VI : Directy Energy Conversion :- Photo voltage cells: Principle, concept of energy conversion, conversion efficiency, powr output and performance, sotrage, FuelCells : Principles types of fuel cells, convrsion efficiency, Geothermal energy resources, power genration methods like vapour dominated, water dominated, flash steam, binary fluid and total flow concept of power generation. (7 Hours)

TEXT BOOKS :-

1. Solar Energy, S.P.Sukhatme,TMH
2. Non-Conventional Energy Sources,G.D.Rai,Khanna Publications

REFERENCE BOOKS :-

1. Treatise on Solar Energy : H.P. Garg; John Wiley & Sons
2. Renewable Energy Conversion, Trnsmission and Storage, Bent Siresen; Elsevier Publication
3. Renewalle Energy; GodfreyBoyle, Oxford University Press, Mumbai.

7ME05 PROFESSIONAL ELECTIVE – I
(2) TOOL ENGINEERING

SECTION – A

Unit I : Theory of metal cutting : Chip formation, shear angle, shear strain-velocity relatios, undeformed chig thickness, Force relations, Merchant circle, energy consideration in metal cutting, Tool wear tool life, tool life criterion, mach inability, tool materials, properties & types, Newly invented tool material and their types, cutting fluids. (08 Hours)

Unit II : Single point cutting tools-classification and nomenclature, various systems of nomenclature,single point cutting tool design, recommended speed, feed and tool angles determination, clamping arrangements and form tools. Twist drills & Reamers ï Geometry types, cutting forces, Numerical on Power & torque. (09 Hours)

Unit III :
i) Broaches ï Geometric elements of broach teeth, classification of broaches, design of broaches, cutting forces.
ii) Miling cutters- Geometry elements of broach teeth, classificatio of broaches, design of broaches, cutting forces.
iii) Thread cutting tools:- Geometry of taps and dies.
iv) Gear cutting tools :- Geometry of gear shaper cutter, gear hobs. (09 Hours)

SECTION - B

Unit IV : Jigs & Fixtures : Design economics, principles of locations, types of locations,prevention of jamming, problmes of chip & dust in location, use of dowle, Reducant location, Principles of clamping, types of clamps, power clamping, Tool guiding & tool setting, types of drill bushes, types of drill jigs & their designs, Turning, Milling, Grinding, Broaching and Assembly fixtures, Indexing devices in jigs & fixtures . (10 Hours)

Unit V : Press tools, Classification of presses,Theory of sheet metal cutting, clearance, cutting force calculations, Methods of reducing cutting forces, centre of pressure & its significance, classification of press working operations, Theory of bending, spring back action in metals, drawing fundamentals, calculation of drawing & bending forces, planning for cupping operation, stock layout. (09 Hours)

Unit VI : Design of press working tools, Types of die construction, function & nomenclature of die components Cutting Dies-Blanking & Punching, Forming Dies-Forming, Drawing and Bending etc. Design of Compount, Combination and progressive dies. Miscellaneous dies- Horn die, cam-action die, rubber & bulding die, sub-press die. (9 Hours)

TEXT BOOKS :

1. Fundamentals of Tool Design, -A.Kumar (Dhanpatrai & Sons)
2. A text book of Production Engineering -P.C.sharma (S.Chand Publication)

REFERENCE BOOKS :

1. Tool Design - Cyril Donaldson (Tata Mcgram Hill)
2. Jigs & Fixtures - P.H.Joshi (Tata Mcgram Hill)
3. Metal Cutting Theory & Cutting Tool Design- Arshinov (Mir Publications)
4. Tool Design - ASTME (ASTME)
5. Fundamentals ofMetal Cutting & M/c Tools - Juneja (Age Internatinoal) .

PROFESSINAL ELECTIVE - I

7ME05 (3) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS

SECTION – A

Unit-I : Introduction toArtificial Intelligence (AI) – Overview of AI, definition and importance of knowledge based systems, representation of knowledge, knowledge organization, knowledge manipulation, acquisition of knowledge. (6 Hours)

Unit II: Introduction to Expert Systems - Features of expert systems, knowledge enginering, basis expert system terminology, human experts and artificial experts, algorithmic nd heuristic methods, difference between conventional programms and expert systems, Architecture of expert systems. (8)

Unit III : Knowledge Representation ï Rule based methods, rule execution, forward chaining and backward chaning, knowledge representation using semantic nets, structure of semantic nets, Frame-based methods . (8 Hours)

SECTION – B

Unit IV : Expert system Tools – Types of tools for expert system building, system building aids, support facilities, debugging aids, I/O faciliteis, explantation facilities, knowledge base editors, stages in the development of expert system tools, procedure oriented methods, object-oriented methods, logic-based methods, access-oriented methods. (7)

Unit V : Building an expert system ï Development phased in expert system building, development constraints, reliability, maintainibitlity, examples of expert systems, diffiulties in development of exprt systems (7)

Unit VI: Fuzzy Engineerig- Fuzzy logic, fuzzy expert systems, fuzzy setts, membership functions, fuzzy rules for approximate reasoning, fuzzy inference generation, deffufication, development of rules matrix, applications of fuzzy expert systems for design of industrial controllers,

RECOMMENDED BOOKS :

TEXT BOOKS :

1. A guide to Expert Systems by Donald a.Waterman, Pearson
2. INtroduction to Artificial intelligence & Expert Systems by Dan W.Peterson, PHI
3. Fuzzy Logic by John Yen, Reza Langari, Pearson

REFERENCE BOOKS :

1) Expert Systems ï Theory & Practice, By Ermine, Jean Louis,PHI
2) Expert systems in Engineering , By D.T.Pham.JFS Pub.
3) Expert system application bySumit Vadera,Sigma press
4) Artificial Intelligence by Winston P.H.,Pearson

7ME05 PROFESSIONAL ELECTIVE – I

(4) MECHATRONCS

SECTION - A

Unit I : Introduction to Mechatronics –
Definition, Block diagram & Example, Basics of Sensors, Position & Speed Sensors, Proximity Sensors & Switches, LVDT, Digital optical encoder, Temperature Sensors Actuators-Functions, Electromagtic Principles, Solenoids and Relays, working of DC motors and stepper motors, hydralic and pneumatic actuators, (6 Hrs.)

Unit II: Data Acquisition: Analog signal processing using operational amplifier- Indroduction, types of amplifiers, sample and hold circuts, introduction to data acaquisiton, sampling thermo, Quantizing theory, Analog to digital conversion, Analog to digital convertor, Digital to analog conversion, Multiplexer. (6)

Unit III: Mechatronic Systems – control architecture Introduction, Control architecture, Analog circuuits, digital circuits, Design of logic networks, sequntial logic, flip-flops, application of flip-flops, micro-controlrs, Programmable logic controller. (6 Hrs)

SECTION - B

Unit IV: Control Valves –
Study of different control components and pneumatic & Hydraulic system- Construction, worling and function of Directional control valve, Flow control valves, Pressure relief valve, pressure reducing valve, sequence valve with symbols.

Unit V : Pneumatic System –
Design and analysis of pneumatic circuits, Synchronizing, Power chucking operations, controlling the rate of speed of piston, circuit to move with piece around a corner, circuit to move a work piece at a constant speed . (6 Hrs)

Unit VI : Hydraulic System –
Design nd analysis of Hydraulic systems-Sequencing, pneumohydralic, regeneration circuit, circuit to control tool movement on lathers, grinders, etc.

TEXT BOOKS :

1. Introduction to Mechatronics and Measurement systems- 2/e by Aciatore and M.B.Histant, Tata Mcgraw Hill edition.
2. Pneumatics and Hydrautics by H.L.Stewart.

REFERENCE BOOKS :

1) Introduction to Mechatronics by Appus Kuttan K.K.- Oxford Univesity Press.
2) Mechatronics ï A multidisciplinary approach 4/e by W.Bolton- Pearson Publication,
3) Automation, Production systms and CIM by M.PGroover- Pearson Publication.

7ME 06 PROJECT & SEMINAR

7MEO7 MACHINE DESIGN AND DRAWING - II – LAB.

List of Exercises for Term Work :

1) Sheet 1 : Design of shaft
2) Sheet 2 : Design of coupling or any one type of gears.
3) Sheet 3 : Design of I.C. Engine Part (any one based on sysllabus)
4) Sheet 4 : Preparation of detail drawing of simple machine assembly (Pedestal bearing, Plumer block, simple eccentric, stuffing box, Cross head, Tail stock, Tool post, C-clamp, Screw jack, Boiler sfety valve ï Any1 of these)
5) Sheet 5 : Preparation of assembly drawing of simple machine assembly (Any 1 machine from Practical 4)

Note :- Any one from the above list should be done using Computer Programming/software.

7MEO8 ENERGY CONVERSION II – LAB.

List of Experiments :

Any six of the following :-

1. Trial on reciprocating compressor.
2. Trial on centrifugal blower.
3. Studies of domestic refrigerator.
4. COP calculation of vapour compression system.
5. Study of room air conditioner.
6. Study of gas turbine with the help of models.
7. Study of Pyrheliometer and measurement of dirct radiation.
8. Study of testing of a flat plate controler
9. Study of Solar still and trial on it.
10. Study of a photovoltac system.

Practical Examination shall consist of viva voce based on above term work.

7MEO9 AUTOMATION ENGINERING – LAB.

PRACTICALS :-

At least six practicals will be based on the following topics.

1. Preparation of Manual part program for Point-to-Point control. Ex; Drilling Operation.
2. Preparation of Manufal part program for two-axis CNC turning operatio.
3. studyof working & Progrmming of XY plotter.
4. Programming Examples on APT.
5. Study of performance of Robots.
6. Simullation of CNC Machining.
7. Case study of CAPP.
8. Case study on GT.
9. Performance on NC and CNC m/c.
10. Study of computer aided quantity control (CAQC).

PRACTICAL EXAMINATION :-

Practical Examination shall consist of viva voce based on above term work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I

(1) NON-CONVENTIONAL ENERGY SYSTEMS – LAB.

List of practicals :

Any six practicals will be based on the following topics :-

1. Study of Pyrhlimeter and measurement of direct radiatoin.
2. Study of pyranometer and measurement of global and difuse radiation.
3. Study of sunshine recorder and measurement of sunshine hours.
4. Study and testing of a flat plate recorder.

5. Study of various concentrating collectors..
6. Study of a solar absorption of refregerating system.
7. Study of a solar dryer.
8. Study of wind mill and trial on it.
9. Study of a bio-gas plant.
10. Study of sterling cycle engine and a trial on it.
11. Study of a Solar Still and trial on it.
12. Study of a gasifier and trial on it.
13. Study of a Photovoltaic system & trial on it.

Practical Examination :
Practical Examination shall consist of viva voce based on the term ï work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I
TOOL ENGINEERING – LAB.

TERM WORK : ANY EIGHT OF THE FOLLOWING .

1. Design & drawing of single point cutting tool.
2. Design & drawing of form tools.
3. Design & drawing of drill.
4. Design & drawing of broach.
5. Design & drawing of milling cutter.
6. Study of geometry of reamer.
7. Study of gear cutting tools.
8. Measurement of forces inOrthogonal cutting by Dynamometer.
9. Study of Geometry of taps and dies.
10. Design & Drawing of press tools.
11. Design & drawing of jigs.
12. Design & drawing of fixtures.

Practical Examination :
Practical Examination shall consist of viva voce based on the term ï work and syllabus.

7ME10 PROFESSIONAL ELECTIVE – I
(1) ARTIFICIAL INTELLIGENCE & EXPERT SYSTEMS - LAB

Practical : The students are expected to perform five practicals based on the above syllabus.

7ME10 PROFESSIONAL ELECTIVE – I
(2) MECHATRONICS – LAB.

PRACTICALS : At least six practicals will be based on the above syllabus.
Practical Examination :
Practical Examination shall consist of viva voce based on the term ï work and syllabus.

SEMESTER: EIGHTH

8ME 01 PROFESSIONAL ELECTIVE – II
(1) AUTOMOBILE ENGINEERNIG

SECTION – A

Unit I :- Classification ofautomobiles, chasis types, Power Unit-Functions and locations power for propulsion, engine mounting, engine parts- types, construction and functions, Multiple cylinder engines, General considerations of engine balancing, firing order..
(7 Hrs)

Unit II : Fuel feed systems - fuel fees systems for petrol engines. Fuel pumps, fuel filtrs, Air filters, Basic principles of MPFI and CRDI.Multipoint fuel injection Systems (MPFI) Common Rail Diesel Injection Systems (CRDI) Controlling system : purpose, types of cooling systems, liquid cooling system-water jacket ports, water pump and radiators, by pass rectractulator system, temeprature indicator, antifreeze, mixtures, troubles and remedies of cooling system.

Unit III: The electrical system, Battery Capacity, standard capacity ratings, starter motor drive-Bendix drive, over running clutch, solenoid switch and shitf, Ignition system;- Battery coil ignition system, Ignition timing and its effect on engine performance, Ignition advance mechanisms, Electronic Ignition system.

SECTION – B

Unit IV : Transmission system : Layout, types of clutches, single plate friction clutch and multiple clutch, clutch adjustments, clutch troubles an remedies, Gear Boxes :- Sliding mesh, constant mesh and synchromesh gear box, function of over drive, trouble shooting and remedies, torque convertor, automatic transmisson, Propelier shaft, hotckiss drive, torque tube drive, differential.
(8 Hrs)

Unit V: Breaking system:- Mechanical, hydraulic brakes, power brakes, and vaccum brakes Fault finding and maintance of brakes, Steering system :- Fuction, types of linkages. steering gears, steering gear ratio, wheel balancing, wheel alighment castor, king pin inclination, toe-in & toe-out & their effect, introduction to powe steering.

Unit VI : Suspensions:- Rigid axle and independent syspension system, shock absorbers. Auto lubrication :- Types of lubrication, their tests and ratings, multi-viscocity oils, chasis lubrication, Engine lubrication :- types of lubricaing system, full premier system, dry sump system, oil pump, oil filters system- by pass system, full

flow system, oil breather, crankcase ventimeter, Engine lubrication troubles and remedies.

TEXT BOOKS :

1. Automobile Engineering- Vol.I & II, Kirpal Singh, Standard Publishers Distributors
2. Automobile Engineering ï R.K.Rajput; Laxmi publications, New Delhi.

REFERENCE BOOKS :

1. Automotive Mechanics; Crouse & Anglin, TMH.
2. Automotive Mechanics ; J Heitner; East West Press
3. Automotive Mechanics ; S.Srinivisan; TMH.

8ME01 PROFESSIONAL ELECTIVE – II
(2) PRODUCTION PLANNING AND CONTROL

SECTION – A

Unit I :- INTRODUCTION

Objectives and Advantages of PPC, Production procedure, functions of PPC, production consumptions cycle, centralised & decentralised PPC, Pre-requisite of PPC.

Unit II :- PRODUCTION FORCASTING :-

Introduction, definition and importance of forecasts, Qualitative model: Delphi techniques, Quantitative models :- Simple moving average, weighted moving average, simple experimental smoothing.

Forecasing error and selection of forecasting model. Types of forecaste: Constant,linear cycle forecaster,Verification and conrolling, The moving range chart, Average MR, out of control conditions.

UNIT III: PRODUCTION PLANNING : - The production order, Procedure for formulating Production order, masier Program, Basic problems in production planning, Quantities in batch production, criteria for batch, size determination, minimum cost batch size, production range, Maximum profit Batch size, Maximum return, Rate of return, Economic Batch size.

SECTION – B

Unit IV : MACHINE OUTPUT :

Machine output, multi machine supervision by one operator, Machine interforcence, Ashcroft lalbles, average number of consecutive servicing task, the Ashcraft Number.

Unit V: ANALYTICAL STRUCTURE OF INVENTORY : - Definition of inventory, Types of inventory and the classification, structure of inventory problems and its analysis, the relevent cost, objectives of carrying inventories, selective inventory analysis. Static Model :- General characteristic, incremental analysis, opportunity cost, cost of risk, decision criteria under uncertaincy.

Unit VI: A) DYNAMIC MODEL :- CERTAINITY CASE ;- General characteristic, optimum lot size model win constant demand, quntity discounts.
Risk Case :- General characteritics, P-system and Q-system.

B) Material Requirment planning (MRP) :- Introduction to MRP, Manufacturing Resource Planning (MRP-IT), just in time (JIT), comparasion of MRP, MRP-II, Enterprenureship Resource Planning (ERP) (8 Hrs.)

TEXT BOOKS :

1. Elements of Production Planning and Control by Simuel Eilon ï Universal Publishing Corporation ltd.Mumbai
2. Production Control ï John E.Biegal- Prentice Hall of India.
3. Inventory control, Theory & Practice- Start & Miller

REFERENCE BOOKS :

1. Production Planning and control and Management:- K.C.Jain & L.N.Agrawal.
2. Production & Operation Mgmt.;- E.E.Adam, Jr.R.J.Ether, Prentics Hall of India.
3. Industrial Engineering and Production Management- M.Mahajan-Dhanpat Rai.

8ME01 PROFESSIONAL ELECTIVE – II
(3) MANAGEMENT INFORMATION SYSTEM

SECTION - A

Unit I : Basis of MIS :

What is a system, what is information and data, necessity of prompt, accurate & relevent information for effective decision making, decision tables, Types of information, organisational structure and types of information within them, Fact gathering techniques. (8 Hrs.)

Unit II : System of Anaylsis & Design :

Phases of system development procedure, project request form system proposal, cost/benefit analysis functional specifications, detailed system descriptio, system acceptance criteria, audit and control requirments, structured system development, data flow diagram, context analysis diagram, exploding a process,

structured analysis, structured design,structure charts, coding schemes, input form design, system protection . (8 Hrs.)

Unit III : A) **Development of MIS**
Long Range plans of MIS, Class of Information, information requirment, implementation of MIS, Management of Quality in the MIS, Orgaisation for the development of MIS,Factors of success & failure of MIS.

B) **Choice of Information Technology** :
Nature of IT decision, Strategic decision, Configuration decision, Evaluation, IT implementation plan. (8 Hrs.)

SECTION – B

Unit IV : Introduction of MIS :
Priliminaries of Information System Technology Data base Management System **:** Concepets, Models, design, Performance monitoring & Turning, Security in the database environment MIS & RDBMS. DBMS Software ORACLE (8 Hrs)

Unit V : a) Decision Support Systems (DSS) :
Concept & Philosophy AI, Knowledge based expert system, MIS & Role of DSS.

b) Enterprise Management System (EMS) :
Introduction to ERP, basic feature, benefits, selection and implementation EMS & MIS.

c) Business preoces Re-inenginering (BPR) ; Introduction, Business process,Processl Models of Organisation and value stream model of organization, MIS& BPR. (8 Hrs)

Unit VI ; Application of MIS

A) Application in Manufacturing Sector:- Personal Management, Materials Management, Marketing Management.

B) Application in Service Sector like Hospitals, Airlines, Hotels, Banks, Insurance. (8 Hrs)

TEXT BOOKS :

1) Management Information System - W.S.Jawadekar (TMH, 2010)
2) Information Systems for operation & Mgmt.-Voichdan, Homer.
3) Management Information Systems - Ross.

8ME01 PROFESSIONAL ELECTIVE – II
(4) ADVANCED MANUFACTURING SYSTEMS

SECTION – A

Unit I : Total Quality Management(TQM) : Understanding quality, commitment & ledership Customer satisfaction involment

Performance measures- Case Study IMplementation of TQm Case Study (10)

Unit II : Total Producive Maintanance (TPM) Introduction outline of TPM Concepts of ñKobetsu-Kaizenò, ñJishu-Hozenò Planned Maintenance Systems Operation & Maintenance skill upgrade training initial control, ñHInshitu-Hozenò concept. (10)

Unit III : Business Process Re-Engineering (BPR) : Introduction, Reengg.Rethinking The new world of work who will Re-Engineer? Succeeding at Re-Engg.-case study. (10)

SECTION – B

Unit IV : Value Engineering (VE) Introduction Value Orientation The variouis phases ofVE like orientation phase INformation phase, function phase .... etc.How to manage the VE progrmme case study **(10)**

Unit V : Concurrent Engineering (CE) Introduction to CE & need of CE CE tools ADvances in design & manufacturing Engineering Design for manufacture, design for assembly Rapid phototyping Concurent approaches in design, manufacturing and aspects of engg.

Unit VI : Just in Time (JIT) Introduction to JIT What is Toyota Production Systems Design, Development & Management of JIT Manufacturing systems, Implementation of JIT.

BOOKS RECOMMENDED:

TEXT BOOKS :

1) Besterfield D.H. etal ñTotal Quality Management,ò PHI New Jersy , 1995.
2) Johan S.Okland,òTQMò: Text with Cases, Butterworth einemamn, Oxford, 1995.
3) ñTPM edited notesò by Japan Institute of Plant Management.
4) Michel Hammer & Jones Champy, ñRe-Engineering the Corporation, Nicholas Brealey, London, 1994.
5) G.Joganathan, ñGetting MOre at Less Cost : The Value Engineering Wayò, Tata Mcgraw Hill, 1992.

REFERENCE BOOKS:

1) Andrew Kausik, :Concurrent Engineering : Automation, Tools & Techniquesò, John Willey & Sons.
2) Chanan S. Syan & Unny Menon, ñConcurrent Engineering: Concept, Implementation & Practice, Champman & Hall.
3) M.G.Korgaonkar, ñJust in Time Manufacturingò, Macmillan India Ltd. New Delhi, 1992.

8ME02 PROFESSIONAL ELECTIVE – III
(1) REFRIGERATION & AIR CONDITIOING

SECTION – A

Unit I : Introduction to automotive air conditioning- Vapour compression system:- Analysis of simple vapour compression system. Use of pressure enthalpy. Temperature entropy charts. Effect of operating conditions such as evaporation and condesion pressure, superheating and sub cooling Actual vapour compression system, Refrigerants :- classification: primary & secondary refrigerants, desirable properties of refrigerants; merits & demerits of commonly used refrigerants such as Ammonia R-12, R-22 and their selections and eco friendly refrigeration 134 a, HFC.

Unit II: Multi stage pressure systems;- multistage compression: choice of intermediate pressure, complete multi-stage compressions. Multi evaporator systems; single compression individual expansion value, single compression multi expansion valve, individual compressor multi expansion valves, cascade systems, its applications to cryogenics Air liquefaction processes- Linde-Hampson (No numerical treatment to air liquefaction system) (10 Hours)

Unit III : Refrigeration systems components & controls:- brief study of refrigerants compressor, condensers, evaporators, expansion valves, drier, fillers, selection criteria for the components of vapours compression systems Flow controls, temperature controls, pressure controls and safety devices. Defrosting systems, testing & charging of refrigeration systems, leak detection. (No analytical treatment is expected) (8 Hours)

SECTION – B

Unit IV : Psychromeric properties of moisair psychrometric chart, concept of thermodynamic wet ï bulb temperature, representations of Psychromeric process on Psychromeric charts, mixing of air, evaporating cooling, air washers. Human comfort:- metabolism of human body, factors influencing comfort, concept of effective temperature, optimum effective temperature & comfort charts. (7 Hours)

Unit V : Classification of air conditioning systems & applications. Unitary system package, window type & split type air conditioning. Central system:-System components, types:- direct expansion system, all water system & all air system. Water, summers & year

round air conditioning. Transmission & distribution. Types of supply air ducts, consideration for selection & location of outlet, distribution partners of outlet, location of return air opening & introduction to duct design.
(No numerical treatment is expected) (9 Hours)

Unit VI : Load calculation & applied Psychromety-basic consideration at heat gains/losses sensible & latent , heat due to occupancy lightening, appliances, products, process, air conditioning systems, safety factor cooling load estimates, heating load estimates. Sensible heat factor by pass factor, apparatus dew point, effective sensible heat factor (8 Hours)

BOOKS RECOMMENDED :
TEXT BOOKS :

1. Refrigeration & air conditioning; C.P.Arora; Tata Mcgraw Hill Publication.
2. Refrigeration & air conditioning; Arora, Domkundwar;Dhanpat Rai Publication.

REFERENCE BOOKS:

1. Principles of Refrigeration; J.Dossat; Pearson Education, Asia publication
2. Refrigeration & air conditioning- P.L.Balaney
3. Refrigeration & air conditioning- Manohar Prasad.

8ME02 PROFESSIONAL ELECTIVE – III
(2) MACHINE TOOL DESIGN

SECTION – A

Unit I : General requirement of machine tool design kinematics of m/c tool :- Various driving systems used in machine tools, basic design consideration in the design of variable speed range in the machine tools, layout of speed in geometric, logarithmic & earthmatic progression saw diagrams, range ratio, graphical represenation of speed on structural and ray diagrams, design of speed & feed boxes and their classification. (8 Hours)

Unit II : a) Mechanical, electrical, Hydraulic stepless regulation of speeds.\
b) Machine tool structure (bed,column, cross-rail) functions & their requirements design criteria for machine tool structure design procedure factors effecting stiffness for machine tool structure & their profile. (8 Hours)

Unit III : Static & dynamic rigidity, methods of increasing rigidity of structure, machine tool clasfic system, procedure for assessing dynamic stability, dynamic charactorstics, single degree &

multidegree of ferrdom systems, Experimental determination of dynamic charactorstics of m/c tool, dynamic characteristics of cutting process, statrility analysis, single degree, multidegree (8 Hrs)

SECTION – B

Unit IV: Vibrations of machine tools :- Effects vibration on m/c tool on cutting condns, workpiece, Sources of cibrations, types of vibrations (forced, chatter, stickup vibrations) and its minimization.

Shock absorberm,isolated tool bioder, chatter in milling lathe, grinding, reduction of chatter in design & production stages. (8 Hrs)

Unit V : a) Machine tool guideways & slideways :- Fuctions, shapes of guideway, materials, methods of adjusting clearance inguideways, design of slideways for wear resistence, determination of maximum and average pressure, on slide way, Hydraulic guideway, antifriction guidway, protecting devices for slideway. (8 Hrs)

Unit VI: machine tool spindle and bearings :- Fuctions, requirment, types and materials of spindle, machines tool compliance, design of spindle, antifriction bearing, performance indices, Hydrostatic journal bearing, hydrodynamic bearing. (8 Hrs)

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Principles of Machine Tools ï Base & Pal
2. M/c Tool Design ï N.K.Mishra.

REFERENCE BOOKS:

1. Machine Tool Design Vol. I,II,III,IV, N. Acherkar (Mir Pub.)
2. Principles of Machine Tools ï Sen & Bhattacharya
3. Design Principles of Metal ï Kondsberger Cutting Machine Tools
4. Machine Tool Desting Vol. I to VI ï CMIT, Banglore.

8ME02 PROFESSIONAL ELECTIVE- III
(3) FINITE ELEMENT METHOD

SECTION - A

Unit I: **Introduction :** Application, Advantages, Steps of FEM, Stress and Equilibrium, Boundary conditions, Strain Displacement Relations, Stress-strain Relations, Von mises stress, Temperature effect, Potential Energy & Equilibrium, Gelerkinôs Method, stiffness (Displacement) Method. (7 Hrs)

Unit II: **Matrix Algebra & Gausian Elimination :** Matrix Multiplication, Transposition, Diagonal Matrix, Symetric Matrix, Upper Triangular Matrix, Determinant of Matrix, Matrix Inversion Eligen values & Elgenvectors, Gaussian elimination. (7 Hrs)

Unit III: **ID Problems :** Finite Element modeling, coordinate Shape function, The potential Energy approah, The Galerkinôs Approach, assemblies of the global stiffness matrix and loac vectors, Properties of stiffness Matrix, Treatment of boundary conditions, quadratic Shape Functions, Temperature Effects. (7 Hrs)

SECTION – B

Unit IV : **2D Problems for CST :** Constant strain triangle, isoperimetric Representation , potential Energy energy approach, element stiffness, galaerkinôs approach, temperature effects, problem modeling and boundary conditions. (7 Hrs)

Unit V: **Development of equations:** Truss equations, derivation of the stiffness, matrix for a bar element in local coordinate, global stiffness matrix, beam equation. Beam stiffness, example assemblage of beam stiffness matrix, plain stress & plain stress stiffness equations, basic concept of plain stress and plain strain, derivation of the CST stiffness matrix and equations Treatment of body and surface forces. (7 Hrs)

Unit VI: **Heat Transfer :** Derivation of the basi differential equations, Heat transfer with conduction, radiation, ID Formulation using variational method.

Fluid Flow : Derivation of the basic differential equations, Id Finite Element formulation, Computer Implementation (prepossessing, post processing, input data file, mesh generation)

BOOKS RECOMMENDED:
TEXT BOOKS:

1. Introduction to Finite Element Engineering ï T.R.Chandrupatla, Belegunda; PHI
2. A First course in Finite Element Method- Darya Logon, Thompson Learning (TL Publisher)

REFERENCE BOOKS:

1. The Finite Element Method in Engineering- S.S.Rao, Elsveir Pub., 4th Edition.
2. Fundamentals of Finite Element Method analysis ï D.V.Huttan, Tata Mcgraw Hill

3. Concept & Applications of Finite Element Analysis ï Robert D.Cook
4. Finite & Boundary Element Method in Engineering ï O.P.Gupta
5. An Introduction to Finite Element Method- J.N.Reddy, Tata Mcgraw Hill, 2nd Edition, 2005.

8ME02 PROFESSIONAL ELECTIVE - III
(4) ROBOTICS

SECTION – A

Unit I : **Fundamentals of Robotics-** Introduction, Automation & Robotics-robot applications robotic systems, robot anatomy and robot configurations, Joint types used in robots, robot wrists, joint notation schemes, work value for various robot anatomies, robot Specifications**.** (8 Hrs.)

Unit II : **Robots end-effectors**-classification of end-effectors, mechanical grippers, hooking or Lifting grippers, grippers for molten metals, plastics, vacuum cups,magnetic grippers Electrostatic grippers, multiple grippers, internal & external grippers, drive systems for gripers, active & passive grippers**.** (7 Hrs.)

Unit III : **Robot drives & control-**pneumatic power drives, hydraulic systems, electric drives, robot controllers-servo and non servo systems, motion control of robots, point to point and continuous path control, teaching of robots, robot programming methods. (7 Hrs.)

SECTION – B

Unit IV : **Robot Sensors :** Scheme of robotic sensors, contact type sensors, force, torque, touch, position, velocity sensors, non-contact type sensors, electro-optical imaging sensors, proximity sensors, range imaging sensors, robot environment and robot input/output interfaces, machine intelligence, safety measures in robots**.** (7 Hrs.)

Unit V : **Robot Kinematics-** Forward & reverse kinematics, forward and reverse transformation of two DOF & three DOF 2-D manipulator, homogeneous transformations.

Unit VI : **Quantitative Techniques for economic performance of robots-** Robot investment coats, robot operating expenses. methods of economic evaluation, method of pay-back period, return on investment method, discounted cash flow method. (7 Hrs.)

RECOMMENDED BOOKS :

TEXT BOOKS :

1) Robotics Technology & Flexible Automation by S.RDeb, Tata Mcgraw Hill.

2) Industrial Robotics by M.P.Groover, McGraw Hill.

REFERENCE BOOKS:

1. Robotics for Engineering, Korean Yoram, McGraw Hill.
2. Robots & Manufacturing automation by Asfahal, C.Ray, John Wiley.
3. Robotic Engineering by Richard D.Klafter, PHI.

8ME03 I. C. ENGINES
SECTION – A

UNIT I : **Introduction to IC Engines and cycle analysis:** Basic of I.C. Engines , Details of two stroke and four stroke engines, Air standard cycles, Fuel air cycle and actual cycle. Variation in specific heat, Dissociation and their effect on engine performance. Review of other losses in IC engines. (7 Hrs)

UNIT II: **Fuels and alternative fuels :** Conventional fuels for IC engines, requirement, properties, fuel additive, limitations of fossil fuels. Review of various alternative/non-conventional fuels . Studies of fuel injection systems : Fuel pump and their working, different types of fuel feed systems, studies of injectors nozzles, Bosch type fuel pump. (8 Hrs)

UNIT III: **Combustion SI Engine:-** Stages of combustion, factors influencing various stages, Normal and abnormal combustion, Detonation, Factors responsible for detonation. Effect of detonation. Octane rating of fuel, Requirement of combustion chambers for SI engines, important types, relative advantages and disadvantages and application. (8 Hrs.)

SECTION - B

UNIT IV: **Combustion in CI. Engines:-** Stages of combustion in CI Engines, Delay period, factor affecting delay period, diesel knock, cetane rating, Requirements of combustion chamber for CI Engines. Methods of generating turbulence in combustion chamber. Types of combustion chambers for CI Engies. (8 Hours)

UNIT V: **Performance testing of IC Engines:** Evaluation of various performance parameters of IC Engines including heat balance, sheet and excess air calculation. Methods of determination of friction power. Supercharging : Basic principles, objectives, arrangements for super charging, advantages and limitations of super charging (8 Hours)

UNIT VI: **Emission from IC Engines :** review, their effect on human health, cause of formation and approaches to control this pollutants. Study of BIS, EURO emission norms, IC Engines: Recent trends: Microprocessor based engines, management multi-point fuel

injection engines, common rail direct injections engines, variable valve timing engines. (8 Hours)

TEXT BOOKS:

1. Internal combustion Engines - M.L.Mathur & Sharma Dhanpatrai & Sons.
2. Internal combustion Engines ï V.Ganeshan, Tata Mcgraw Hills.

REFERENCE BOOKS :

1. Internal combustion Engines Fundaments- John B. Heywood, Mcgraw Hills
2. Internal combustion Engines & Air Pollution- Obert E.F.Intext Educational.

8ME04 OPERATION RESEARCH TECHNIQUES

SECTION – A

UNIT I : Operations Research : Introduction, characteristics, Phases, Limitations, Models and classification of O.R.Models.
Linear Programming : Formulation, Standard Form, Graphical and simplex methods, Primal-Dual relationship. (8 Hrs)

UNIT II : Transportation Models : Introduction, LP Formulation of transportation problems, Methods for finding initial solution, MODI method.
Assignment Models : Introduction, Mathematical statement and solution methods of assignm. Problems, variations of assignment Problems. (6 Hrs)

UNIT III: **Network Models :** Network construction, PERT analysis, CPM analysis, cost analysis & Crashing the network, Updating resources smoothing and leveling. (6 Hrs)

SECTION- B

UNIT IV: Waiting line models : Introduction, characteristics, classification, analysis of M/M/1 and M/M/s models.
Sequencing : processing of n jobs through two machines, n jobs through m machines, two jobs through m machines**.** (7 Hrs)

UNIT V : **Replacement models :** introduction, value of money, individual and group replacement policies.
` **Simulation :** introduction, Monte Carlo simulation, advantages and limitations, applications of simulation to queuing models, inventory models, maintenance models , etc. (7 Hrs)

UNIT VI: Dynamic programming: introduction, characteristics, applications of dynamic programming to capital budgeting, production

scheduling, travelling sales men, cargo loading problems, etc. (6 Hrs)

RECOMMENDED BOOKS:

TEXT BOOKS:

1. Operations Research and Theory applications- II ed.J.K.Sharma; Macmilan Business Books
2. Operations Research; Prem kumar Gupta, D.S.Hira; S.Chand & Co. ltd.

REFERENCE BOOKS:

1. Inroduction to Research Operation, 7th Edition; Hiller/Lieberman; Tata Macgraw Hills.
2. Operations Research : An Introduction, 7th Edition, H.A.Taha; PHI.
3. Operations Research: Principles and practices; 2nd Edition, Ravindran, Philips, Solberg, John Willey & Sons.
4. Operations Research: Kapoor .

8 ME05 PROJECT & SEMINAR

8ME06 PROFESSIONAL ELECTIVE- III
(1) REFRIGERATION & AIR CONDITIONING - LAB.

List of Practicals :-

Any six of the following should be conducted and a report there of should be submitted

1. Trial on Vapour compression system.
2. Trial on Air-conditioning system.
3. Study of Electrolux system.
4. Study of Water cooler.
5. Study of window Air conditioner.
6. Study of household refrigerator.
7. Study of desert cooler.
8. Study of cold storage plant.
9. Testing and changing of refrigeration system.
10. Study of defrosting system.
11. Study/trial of ice plant.
12. Study of various refrigeration and air-conditioning controls.

Practical Examination:

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE- III
(2) MACHINE TOOL DESIGN - LAB.

PRACTICALS :-

(1) Design of speed box.
(2) Design of feed box.
(3) Design of combination guide way.

(4) Design of combination guide way.
(5) Acceptance lists
(6) Pneumatic trainer
(7) Hydraulic Trainer.
(8) Design of Laths bed

Note :- At least 6 practicals from above list should be done.

PRACTICAL EXAMINATION:-

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE- III
(3) FINITE ELEMENT METHOD- LAB.

PRACTICAL EXAMINATION:-

It shall consists of viva-voce based on term work and syllabus.

8ME06 PROFESSIONAL ELECTIVE- III
(4) ROBOTICS – LAB.

PRACTICAL : The students are expected to perform 5 practicals based on the above syllabus

8ME07 I. C. ENGINES- LAB.

List of Experiments :

Any six of the following practical should be performed and

1. Performance test on a single cylinder diesel engine.
2. Performance test on a single cylinder petrol engine.
3. Evaluation of the heat balance for single cylinder diesel engine.
4. Performance test on a multi-cylinder petrol engine.
5. Mors test on multi-cylinder petrol engine.
6. Trial on petrol/ diesel engine to plot p-0 and p-V diagram.
7. Measurement of exhaust gas emission from S.I.engine
8. Measurement of smoke density of CI engine exhaust.
9. Study of Bosch type single plunger fuel pump.
10. Study of various types of fuel injectors and nosels.

It shall consist of viva-voce based on term work and syllabus.

8ME08 OPERATION RESEARCH TECHNIQUES - LAB.

List of Practicals:-

At least 6 practical from above list should be done.

1. Formulation of LPP from real life situation.
2. Solution of LPP by using MS Excel.
3. Case study of transportation problems.
4. Case study of assignment problems
5. Case study on project network.
6. Case study on sequencing problems
7. Constructing and solving the simulation model from real life situations
8. Study of Replacement model through different problems.
9. Case study on dynamic programming problems.

External Practical Examination ï Viva voce on the term work and syllabus.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRONICS & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 EP01/7EL01/7EE01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:
Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ï Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ï SISO Systems.

Unit III : State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbertôs method and Kalmanôs test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ï open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Juryôs Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :
Non-linear system behavior ï types and characteristics; Describing functions - typical non-linearity and their

characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI : Non-Linear System Analysis II

Linearization - Around operating point; Singular points ï Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction ï analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal ï Control System Engineering,Wiley Eastern Limited, New Delhi.
2. K . Ogata - Modern Control Theory, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Modern Control System, Richard Dorf, Robert Bishop, PEARSON education, 11th edition 2008

REFERENCE BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. D.Roy Choudhary, Modern Control Engineering,Prentice Hall of India Pvt Ltd. New Delhi.
3. R.C. Sukla ï Control Systems Dhanpat Rai & Co.Pvt Ltd.

7EP02/7EL02/7EE02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I

Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II

Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 200

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi
4. P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication.

7EP03 /7EL03/7EE03 ELECTRICAL POWER - II

SECTION-A

Unit I :: Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system ï application.

Unit II : Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV : Overvoltages

Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters ï reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)

FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS :-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4 Modern Power System Analysis by D.P.Kothari, I.J.nagrath TMH 3rd edition, 20th reprint 2010

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH,Revised 1st edition 2011

REFERENCE BOOKS :-

1. S. Rao ï ñEHV A.C. and HVDC Transmission Engineering and Practiceò, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi ï ñUnerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - ñFlexible AC transmission Systems (FACTS), T and D reference bookò Westing house.

7EP04 /7EL04/7EE04 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6 , Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV: A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : **A.** Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS: -

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

7EP05 /7EL05/7EE05/ 7EX 05 PROFESSIONAL ELECTIVE - I

(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: **Signal Generation and Analysis**

Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: **Signal Counting and Recording**

Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV : **Signal conditioning and Conversions.**

Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: **Signal Processing**

Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS: -

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7EP05/ 7 EX 03 PROFESSIONAL ELECTIVE - I

(2) COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: **Processing Unit:** fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: **Memory Unit:** basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsôalgorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: **Computer Peripherals:** Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

REFERENCES BOOKS:

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7EP05 / 7EL05 / 7EE05 PROFESSIONAL ELECTIVE - I

(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I : **Representation of power systems for computerized analysis :** Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : **Topology of Electric Power Systems** ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices,

primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : **Formation of bus impedances and admittances matrices by algorithm** ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV: **Short circuit studies :** Three phase networks , Symmetrical components. Theveninôs theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: **Load flow studies :** formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : **Stability studies of power system** ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFRENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) Computer Technniques in Power System Analysis, by M.A.PAi TMH 10th reprint 2011

7EP05/ 7EL05/7EE05 PROFESSIONAL ELECTIVE - I
(4) ARTIFICIAL INTELLIGNCE

SECTION-A

UNIT I : Introduction
Biological Neurons and their artificial models, introduction to neural computing
Components of neuron, input and output weight, threshold,weight factors, transfer
Functions ,concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :
Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .
Multilayer Network : Architecture of feed forward network ,learning rule, generalized
Delta rule,learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:
Introduction, Counter propagation networks, Kohonenôs self organizing maps.
Hopfields networks.

SECTION-B

UNIT IV: Introduction:
Uncertainty in information,basic concepts of Fuzzy sets , operations on fuzzy sets , properties.
Fuzzy relations : operations,properties ,value assignments.

UNIT V : Membership Functions:
Features, fuzzification, membership value assignments, Fuzzy Rule based
Systems, Graphical technique of inference.
Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations , Defuzzification methods

UNITVI : Genetic Algorithm (GA):
Introduction to genetic algorithm,working principle,coding of variables, Fitness function. GA operators , similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm , real coded GA ,Advanced GA, global optimization using GA .

TEXT BOOKS

1 J.M. Zurada : Introduction to Artificial Neural Network, Jaico Publishing House

2 Meherotra Kishan ,Mohan C.K, Ranka Sanjay : Elements Of Artificial Neural networks Penram Int Pub Mumbai.
3 D.E Goldberg ,Addision Genetic Algorithm in Search Optimization and Machine Learning Wesley Publication
4 Kalyanmoy Deb Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi.
5 M.Kishan, Mohan C.K., Ranka Sanjay; Elements of Artificial Neural Networks, Penram Int. Publications.

REFRENCE BOOKS:

1. G.J. Khir and T.A. Folger : Fuzzy sets , Uncertainity and Information PHI Publication
2. Koska Bart Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd , New Delhi

7EP06/ 7EL06/7EE06 PROJECT & SEMINAR

7EP07/ 7EL07/7EE07 ELECTRICAL POWER II - LAB

Any TEN experiments based on contents of 7EP03 ELECTRICAL POWER - II

7EP08/ 7EL08/7EE08 SWITCHGEAR & PROTECTION -LAB

Any TEN experiments based on contents of 7EP04 SWITCHGEAR & PROTECTION

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SEMESTER : EIGHT

8EP01/8EL01/8EE01 POWER SYSTEM STABILITY

SECTION-A

Unit I : Basic Concepts
Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Parkôs Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I
Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarkeôs diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II
Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I
Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II
Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System
Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS :

1 E W Kimbark- Power System Stability, Vol.1 and 3, Dover Publications Inc., New York.

2 Power System Stability & Control by Prabha Kundur, TMH 11th reprint 2011

3. S.B Crary- Power System Stability, Vol.1 and 3, Hohn Wiley and Sons, New York.

REFERENCE BOOKS:

1 L.P Singh ï Computer Aided Power System Operation and Dynamics, Wiley Eastern Ltd. New Delhi.

2 I.J.Nagrath and D.P.Khothari ï Modern Power System Analysis, Tata Mc-Graw Hill Publishing Company, New Delhi.

8EP02/8EL02/8EE02/7EX05(III) HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS-

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

8EP 03/8EL03/8EE03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, óDigital Signal Processingô, PHI Publication
2. Oppenhavm & Scheffer, óDiscrete Time Processingô, John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010

4. Mitra S.K, óDigital Signal Processingô, TMH Publication

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II
(1) ELECTRIC DRIVES & CONTROL

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS :

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH

3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 . Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction
Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics
Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards
Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,
Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION -B

Unit IV: Power Quality Solutions
Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding
Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II
(3) EMBEDED SYSTEMS

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O

: Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture. Implementing the Design. Quality Assurance and Testing of the Design.

TEXT BOOK:

Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education
3. Vahid & Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8EP 04/8EL04/8EE04 PROFESSIONAL ELECTIVE - II

(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I : Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II : Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C.Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.

Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics.High torque cage motors- deep bar rotor and double cage rotor induction motors, steady stateanalysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and scharge motor and steady state analysis.

TEXT BOOKS :

1. M.B.Say: Introduction to Unified Theory of Electrical Machine, ELBS.
2. SEELY: Electromechanical Energy Conversion

8EP 05/8EL05/8EE05 PROJECT & SEMINAR

8EP06 DIGITAL SIGNAL PROCESSING - LAB

Any TEN experiments based on contents of
8EP03/ 8EL03/ 8EE 03 DIGITAL SIGNAL PROCESSING

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7EX01 UTILISATION OF ELECTRICAL ENERGY

SECTION-A

Unit I : Concept of electrical drive, classification, advantages of electrical drive, selection criterion for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, general workshop, Textile mill, Paper mill, Cement mill, Coal mining, Sugar mill, Printing industry.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations. Introduction for conducting and reporting the test on induction motors as per Indian standard.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Quadrantal diagram of speed-torque characteristics of motors, starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

SECTION -B

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V : Traction motors, general features and types, characteristics, control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.

Unit VI:
a) Nature of light-units, luminous efficiency, Glare production of light, Polar curves, control of light by reflection, refraction and diffusion. Lighting calculations, factory lighting, flood lighting, street lighting.
b) Methods of heating and welding furnaces

TEXT BOOKS:

1) E.O.Taylor : Utilization of Electric Energy in SI Units, published by Orient Longman Ltd.
2) S.K.Pillai : A First Course in Electrical Drives, published by New Age International.

REFERENCE BOOKS:

1) Vedam Subrahmanyam : Electric Drives, published by Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2) C.L.Wadhwa : Generation Distribution and Utilization of Electrical Energy, published by New Age International Pvt. Ltd.
3) Specification of Three Phase Induction Motors as per Indian Standard, published by Indian Standard Institute, New Delhi.
4) H.Pratap : Utilization of Electrical Energy.

7EX02 ELECTRONIC COMMUNICATION

Unit I : **Signal and Noise : -** Audio signals, frequency range speech and music, sound intensity, loudness, level, frequency response, bandwidth, bandwidth requirement for different types of signals such as telegraph, telephone speech, music and video Noise: External and internal noise, noise figure, signal to noise ratio, noise figure measurement.

Unit II: **Modulation Techniques : -** Amplitude modulation theory, Frequency spectrum representation of AM, Modulation index side bands, power relations, current relations and voltage relation in the AM wave. Frequency modulation and phase modulation, frequency deviation, modulation index, frequency spectrum.

Unit III: **AM Transmitters : -** Principles of DSB-FC, DSB-SC, SSB-SC modulation and their comparison, Details of DSB-FC transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC transmitter. Generation of SSB-SC by phase-shift method.

Unit IV : **AM Receivers : -** TRF receiver, superhetrodyne receiver, details of each block such as RF amplifier, Oscillator, IF amplifier, Diode detector, audio amplifier. Mixer: Principle, Need and type of AGC, Practical radio receiver circuit with AGC, characteristics such as selectivity, sensitivity, and fidelity communication receiver.

Unit V : **FM Transmitter : -** Circuits for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow band and wide band FM, their comparison, de-emphasis and pre-emphasis. FM transmitter & stereo FM transmitter.

Unit VI : **FM Receivers :-** Details of FM receiver, blocks such as RF amplifier, local oscillator, IF amplifier, Mixer, audio Ampl. AGC, limiter, FM discriminator, single slope and balanced slope detector, analysis of Foster seeley and ratio detectors, stereo FM receiver.

TEXT BOOK :

1. Kennedy G.: Electronics Communication System, Tata McGraw Hill Co.New Delhi.

REFERENCE BOOKS :-

1. Young P.H.: Electronics Communication Techniques, A Bell and Howell Co. Indiana.
2. Martin James. : Telecommunication and the Computer, Prentice Hall Inc. New Jersey.
3. Roddey D. Coolen S.: Electronics Communication, Prentice Hall India Pvt. Ltd.
4. Beck, Robert and J.Schoen: Electronics Communication, Modulation and Transmission, A Bell and Howell Co.

7EX03 COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsô algorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays, video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT-BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill (ISE).

REFERENCE BOOKS :

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7EX04 POWER ELECTRONICS - II

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT-VI Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH
3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

7EX05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION - A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II : Signal Generation and Analysis Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III : **Signal Counting and Recording:** Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV: **Signal conditioning and Conversions:**
Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: **Signal Processing :**
Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital

telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS:

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS :

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7EX05 PROFESSIONAL ELECTIVE - I
(2) POWER SYSTEM SIMULATION

SECTION-A

Unit I : Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : Topology of Electric Power Systems ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : Formation of bus impedances and admittances matrices by algorithm ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV : Short circuit studies : Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: Load flow studies : formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : Stability studies of power system ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFERENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) M.A. Pai : Computer Techniques in Power System Analysis, TMH

7EX05 PROFESSIONAL ELECTIVE - I
(3) HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases
Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsend's law, Streamer mechanism of spark pashan's law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS :

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

7EX05 PROFESSIONAL ELECTIVE - I
(4) WIND ELECTRICAL SYSTEMS

SECTION A

Unit I : Fundamentals of Wind Turbines
Power Contained in Wind, Thermodynamics of Wind Energy, Efficiency Limit for Wind Energy Conversion, Maximum Energy Obtainable for a Thrust-operated Converter,Efficiency Limit for a Thrust ï operated Converter Types of Wind Energy Conversion Devices, Dutch Windmills, Multiblade Water ï pumping Windmills , High ï speed Propeller ï type Wind Machines The Savonius Rotor, The Darrieus Rotor, Aerodynamics of Wind Roto Aerodynamic Efficiency, Power ï Speed Characteristics, Torque ï Speed Characteristics, Wind Turbine Control Systems, Control Strategy.

Unit II: Wind Site Analysis and Selection
Wind Speed Measurements Robinson Cup Anemometer, Pressure Tube Anemometer, Hot Wire Anemometer, Wind Speed Statistics Statistical Wind Speed Distributions, Site and Turbine Selection

Unit III: Basics of Induction and Synchronous Machines
The Induction Machine, Constructional Features, Steady-state Equivalent Circuit Model, Performance Characteristics, Saturation Characteristics, Modified Equivalent Circuits, Effect of Rotor-injected Emf ï Slip Power Recovery Scheme, Dynamic d-q Axis Model

The Wound-field Synchronous Machine, Constructional Features, Dynamic Machine Equations, Steady-state Operation, Steady-state Model with Rectifier Load, The Permanent Magnet Synchronous Machine Constructional Aspects, Steady-state Equations, Power Flow Between Two Synchronous Sources, Induction Generator Versus Synchronous Generator

SECTION B

Unit IV: Grid-connected and Self-excited Induction Generator Operation
Constant-voltage, Constant-frequency Generation, Single-output System

Double-output System with a Current Converter , Equivalent Circuits, Reactive Power and Harmonics, Double-output Systems with a Voltage Source Inverter, Reactive Power Compensation, Variable-voltage, Variable-frequency Generation, The Self-excitation Process, Circuit Model for the Self-excited Induction Generator, Analysis of the Steady-state Operation, The Steady-state Characteristics, The Excitation Requirement, Effect of a Wind Generator on the Network

Unit V: Generation Schemes with Variable-speed Turbines
Classification of Schemes, Operating Area Induction Generators , Cage Rotor Induction Generator, Doubly Fed Induction Generator, Wound-field Synchronous Generator, The Permanent Magnet Generator

Unit VI: Hybrid Energy System
Diesel Generator and Photovoltaic System, Diesel Engine, Photovoltaic Power Generation Wind-Diesel Hybrid System. System With No Storage, System With Battery Backup Wind-Photovoltaic Systems, Wind Solar hybrid system

TEXT BOOK :-
S.N.Bhadra, S.Banerjee, D.Kastha Wind Electrical System, Oxford University Press, India.

7EX06 PROJECT & SEMINAR

7EX07 UTILISATION OF ELECTRICAL ENERGY - LAB
Any TEN experiments based on contents of
7EX01 UTILISATION OF ELECTRICAL ENERGY

7EX08 COMPUTER ORGANIZATION - LAB
Any TEN experiments based on contents of
7EX03 COMPUTER ORGANIZATION

7EX09 POWER ELECTRONICS - LAB
Any TEN experiments based on contents of
7EX04 POWER ELECTRONICS - II

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SEMESTER: EIGHTH

8EX01 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 2009

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi
4. P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.

5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication

8EX02 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

Unit II : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6, Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV : A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK :

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS :

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

8EX03 EMBEDED SYSTEMS

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O : Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture.

Implementing the Design. Quality Assurance and Testing of the Design.

TEXT BOOK:

Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education
3. Vahid & Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8EX04 PROFESSIONAL ELECTIVE - II
(1) POWER SYSTEM MANAGEMENT

SECTION-A

UNIT-I : Principle and Practice of Management:

Basic Concepts- basic concepts of management-Role and importance of management in modern society, management as a profession

The Process of Management- The process of management; planning, organizing, directing, controlling, decision-making, leading etc.

Management Concepts- Managerial authority and responsibility-delegation and decentralization- Line and staff concepts-concepts in e-commerce etc.

UNIT-II : Marketing & Production/Operation Management:

Marketing Management- Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/ Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.

Production/Operation Management- Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

UNIT-III : Project, Financial & Human Resource Management:

Project Report: Preparation of -Project Report, Profit and Loss statement, Balance Sheet.

Financial Management: Costing- Principles, types- operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.

Human Resource Management: Human resource planning- concepts & process, Job analysis & description- recruitment, selection process, Training & development, Employee welfare, issues related to management of trade union.

SECTION-B

UNIT-IV: Dimensions of Power System Restructuring

Power system Restructuring:: Introduction to Power Sector Reforms/Restructuring/ Deregulation ï issues, prospects and lessons to developing countries

Environmental dimensions in power sector: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.

Rural Electrification: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.

Power Sector Restructuring in India: History, Problems and status in India, Accelerated Power Development and Reform Programme (APDRP), Reforms in G,T, D sector, Electricity Act:2003- issues, Problems & prospects, Legal and regulatory framework, Rural Electrification Programme, Environmental Pollution Programme.

UNIT-V: Management issues in Power Sector:

Financing of power sector:: Financial problems of SEBs, strategies - for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.

Human Resource development in power utilities: Change management, Training & Development, Culture of empowerment and accountability etc.

Transmission & Distribution Management: Transmission management under open access- transmission Pricing/Tariff, Congestion Management, Micro distribution models- private investors, Multi Licensee System, Distribution Management, Power Quality, Demand Side Management, Energy Metering, Accounting and Auditing, SCADA etc.

UNIT-VI: Marketing issues in Power Sector:

Issues of Power Tariff, Prices in Competitive Electricity Markets, Bidding strategy, Availability Based Tariff (ABT), Embedded and Spot pricing, Power Trading, Market Operations in Electric Power Systems, Marketing of energy and services in competitive electricity markets.

TEXT BOOKS:

1. Koontz H., Oôdonnel C. and Whierich: Principle of Management, Tata McGraw Hill Publishing Co., Ltd., New Delhi
2. Muhlemann , Production Operation Management, Macmillan publication
3. Dencenzo & Robbins, Human Resource Management
4. Monappaa, Human Resource Management, Macmillan Publication
5. Ramaswamy & Namamkumari, Marketing Management Macmillan Publication
6. Philip Kotler, Marketing Management, PHI, New Delhi

REFERENCE BOOKS:

1. Economic Evaluation of Projects in the Electricity Supply Industry, by H. Khatib.
2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
3. Energy and Power Risk Management by Alexander Eydeland, KrzysztofmWolyniec
4. Power System Economics, by Steven Stoft
5. Market Operations in Electric Power Systems, by M. Shahidehpour, H. Yamin, Zuyi Li.
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
7. Modelling Prices in Competitive Electricity Markets (The Wiley Finance Series), by Derek W. Bunn.
8. A Shock to the System, by Timothy J. Brennan, Karen L. Palmer, Raymond J. Kopp, Alan J. Krupnick, Vito Stagliano, Dallas Burtraw.
9. Power pricing by Dolan & Siman, The free Press,1996
10. Customer Choice: Purchasing Energy In A Deregulated Market: by Albert Thumann
11. Indiaôs Power Sector Reforms Update, Paryas, Pune

8EX04 PROFESSIONAL ELECTIVE - II
(2) FUZZY LOGIC & CONTROL

SECTION - A

UNIT - I: THE MATHEMATICS OF FUZZY CONTROL:

Basic definitions, a-level sets, comparison with classical (crisp) sets Fuzzy sets, Properties of fuzzy sets, operation in fuzzy sets, Fuzzy complement, t-norms, t-conorms, combination of operations, aggregation operations. , fuzzy relations, the extension principle

UNIT–II: THEORY OF APPROXIMATE REASONING:

Fuzzy numbers, linguistic variables, arithmetic operations on intervals, arithmetic operations on fuzzy numbers, lattice of fuzzy numbers, fuzzy equations.

Linguistic variables, Fuzzy proportions, Fuzzy if- then statements, inference rules, compositional rule of inference.

Unit-III: **Fuzzy Relations:** Crisp versus fuzzy relation, projections and cylindric extensions, binary fuzzy relations, binary relations on a single set, fuzzy equivalence relations, fuzzy compatibility and fuzzy ordering relations.

Possibility Theory: Fuzzy measures, evidence theory, possibility theory, fuzzy sets and possibility theory.

SECTION - B

Unit -IV: **Fuzzy Logic:** An overview of classical logic, multivalued logic, fuzzy propositions, fuzzy quantifiers, linguistic hedges, inference from conditional fuzzy propositions, inference from conditional and qualified propositions.

NON-LINEAR FUZZY CONTROL: FKBC as a linear transient element, PID like FKBC, sliding mode FKBC, Sugeno FKBC.

Unit -V: **FUZZY KNOWLEDGE BASED CONTROLLERS (FKBC):** Basic concept structure of FKBC, choice of membership functions, scaling factors, rules, fuzzyfication and defuzzyfication procedures. Simple applications of FKBC (washing machines, traffic regulations, lift control, etc).

UNIT-VI: **ADAPTIVE FUZZY CONTROL:** Process performance monitoring, adaption mechanisms, membership functions, tuning using gradient descent and performance criteria. Set organizing controller model based controller.

TEXT BOOKS:

1. An Introduction to Fuzzy Control- D. Diankar, H. Hellendoom and M. Reinfrank- Narosa Publishers India, 1996.
2. Fuzzy Sets Uncertainty and Information- G. J. Klir and T. A. Folger- PHI IEEE, 1995.

REFERENCE BOOKS:

1. Essentials of Fuzzy Modeling and Control- R. R. Yaser and D. P. Filer -John Wiley, 1994.
2. Fuzzy Logic With Engineering Applications- Timoty Ross,- McGraw Hill.
3. Fuzzy Logic Intelligence Control And Information- Yen- Pearson education.

8EX04 PROFESSIONAL ELECTIVE - II

(3) RPC & FACTS CONTROLLER

UNIT-I: **CONTROL OF VOLTAGE AND REACTIVE POWER**

Introduction, Generation and absorption of reaction power, relation between voltage, power and reactive power at a node,

methods of voltage control. Injection of reactive power, use of tap changing transformers, combined use of tap changing transformers and reactive power injection.

Unit II: Introduction to FACTS- Basic Types of FACTS controllers, Description and definition of FACTS controllers ï Benefits from FACTS technology- Static Var Compensator(SVC): Principle of operation, configuration and control, Thyristor Controlled Series compensator(TCSC): Principle of operation, configuration and control, Application of TCSC for damping electromechanical Oscillations, Application of TCSC for mitigation of SSR ï

Unit III: Static Compensator(STATCOM): Principle of operation, configuration and control ï Static Synchronous Series Compensator(SSSC): Principle of operation, configuration and control, Thyristor Controlled Phase Angle Regulator(TCPAR): Principle of operation, configuration and control, Unified Power Flow Controller(UPFC): Principle of operation, configuration and control, Simulation of UPFC, Steady state model of UPFC, Interline Power Flow Controller(IPFC) - Principle of operation, configuration and control.

Unit IV: Oscillation Stability Analysis and Control: Introduction ï Linearised model of power systems installed with FACTS based Stabilisers ï Heffron-Phillips model of a SMIB system installed with SVC, TCSC and TCPS ï Heffron-Phillips model of a SMIB system with UPFC ï Heffron-Phillips model of a Multimachine system installed with SVC, TCSC and TCPS

Unit V: Analysis and Design of FACTS based stabilisers: Analysis of damping torque contribution by FACTS based stabilisers installed in SMIB systems, Design of robust FACTS based stabilisers installed in SMIB systems by phase compensation method - Selection of installing locations and feed back signal for FACTS based stabilizers

Unit VI: Transient Stability control with FACTS: Introduction ï Analysis of Power systems installed with FACTS devices: Power transmission control using Controllable Series Compensation(CSC), Power Transmission Control using SSSC, Power Transmission Control using UPFC, Power Transmission Control using Phase Shifting Transformer(PST), Power Transmission Control using UPFC, Control of FACTS devices for transient stability improvement ï General considerations of FACTS control strategy: CSC,SSSC, SVC, STATCOM and UPFC control strategy ï General Structure of the FACTS devices control.

REFERENCE BOOKS :-

1. ó*Reactive Power Control in Power Systems*ô T J E Miller,John Wiley, 1982
2. ó*Computer modeling of Electrical Power Systems*ô J Arriliga and N R Watson, ï John Wiley, 2001
3. ó*Understanding FACTS*ô N G Hingorani and L Gyugyi, IEEE Press, 2000
4. ó*Flexible ac Transmission Systems(FACTS)*ô, Y.H. Song and A.T. Johns, IEE Press, 1999

8EX04 PROFESSIONAL ELECTIVE - II
(4) POWER QUALITY

SECTION - A

Unit I: Introduction

Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics

Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards

Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards, Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION -B

Unit IV: Power Quality Solutions

Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters,

Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8EX05 PROJECT AND SEMINAR

8EX06 EMBEDED SYSTEMS - LAB
Any TEN experiments based on contents of
8EX03 EMBEDED SYSTEMS

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL (ELECTRICAL & POWER) ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 EL01/7EP01/7EE01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:
Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ï Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ï SISO Systems.

Unit III : State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbertôs method and Kalmanôs test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ï open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Juryôs Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :
Non-linear system behavior ï types and characteristics; Describing functions - typical non-linearity and their

characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI : Non-Linear System Analysis II
Linearization - Around operating point; Singular points ï Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction ï analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal ï Control System Engineering,Wiley Eastern Limited, New Delhi.
2. K . Ogata - Modern Control Theory, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Modern Control System, Richard Dorf, Robert Bishop, PEARSON education, 11th edition 2008

REFERENCE BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. D.Roy Choudhary, Modern Control Engineering,Prentice Hall of India Pvt Ltd. New Delhi.
3. R.C. Sukla ï Control Systems Dhanpat Rai & Co.Pvt Ltd.

7 EL02/7EP02/7EE02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I
Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 200

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi
4. P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication

7 EL03/ 7EP03/7EE03 ELECTRICAL POWER - II

SECTION-A

Unit I :: Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system ï application.

Unit II : Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV : Overvoltages

Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters ï reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)

FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS :-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal, 2nd Edition, 2009, PEARSON Education
4 Modern Power System Analysis by D.P.Kothari, I.J.nagrath TMH 3rd edition, 20th reprint 2010

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH,Revised 1st edition 2011

REFERENCE BOOKS :-

1. S. Rao ï ñEHV A.C. and HVDC Transmission Engineering and Practiceò, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi ï ñUnerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - ñFlexible AC transmission Systems (FACTS), T and D reference bookò Westing house.

7 EL04/7EP04/7EE04 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6 , Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV: A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS: -

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

7 EL05/7EP05/7EE05/ 7EX05 PROFESSIONAL ELECTIVE - I
(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis

Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording

Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV : Signal conditioning and Conversions.
Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing
Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS: -

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7 EL05/7EP05/7EX03 PROFESSIONAL ELECTIVE - I
(2) COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsôalgorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT-BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

REFERENCE BOOKS:

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7 EL05/7EP05/7EE05 PROFESSIONAL ELECTIVE - I
(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I : Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : Topology of Electric Power Systems ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive

impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : Formation of bus impedances and admittances matrices by algorithm ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV: Short circuit studies : Three phase networks , Symmetrical components. Thevenin's theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: Load flow studies : formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : Stability studies of power system ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.

2) Y.Wallach : Calculations and programs for Power System Network.

3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFERENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.

2) Computer Technniques in Power System Analysis, by M.A.PAi TMH 10th reprint 2011

7 EL05/7EP05/7EE05 PROFESSIONAL ELECTIVE - I

(4) ARTIFICIAL INTELLIGNCE

SECTION-A

UNIT I : Introduction

Biological Neurons and their artificial models, introduction to neural computing

Components of neuron, input and output weight, threshold,weight factors, transfer

Functions ,concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :

Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .

Multilayer Network : Architecture of feed forward network ,learning rule, generalized

Delta rule,learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:

Introduction, Counter propagation networks, Kohonen's self organizing maps.

Hopfields networks.

SECTION-B

UNIT IV: Introduction:

Uncertainty in information,basic concepts of Fuzzy sets , operations on fuzzy sets , properties.

Fuzzy relations : operations,properties ,value assignments.

UNIT V : Membership Functions:

Features, fuzzification, membership value assignments, Fuzzy Rule based

Systems, Graphical technique of inference.

Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations , Defuzzification methods

UNITVI : Genetic Algorithm (GA):

Introduction to genetic algorithm,working principle,coding of variables, Fitness function. GA operators , similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm , real coded GA ,Advanced GA, global optimization using GA .

TEXT BOOKS :

1 J.M. Zurada : Introduction to Artificial Neural Network, Jaico Publishing House

2 Meherotra Kishan ,Mohan C.K, Ranka Sanjay : Elements Of Artificial Neural networks Penram Int Pub Mumbai.

3 D.E Goldberg ,Addision Genetic Algorithm in Search Optimization and Machine Learning Wesley Publication

4 Kalyanmoy Deb Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi

5. M.Kishan, Mohan C.K., Ranka Sanjay; Elements of Artificial Neural Networks, Penram Int. Publications.

REFRENCE BOOKS

1. G.J. Khir and T.A. Folger : Fuzzy sets , Uncertainity and Information PHI Publication

2. Koska Bart Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd , New Delhi

7 EL06/7EP06/7EE06 PROJECT & SEMINAR

7 EL07/7EP07/7EE07 ELECTRICAL POWER II - LAB

Any TEN experiments based on contents of 7EP03 ELECTRICAL POWER II

7 EL08/7EP08/7EE08 SWITCHGEAR & PROTECTION - LAB

Any TEN experiments based on contents of 7EP04 SWITCHGEAR & PROTECTION

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SEMESTER : EIGHT

8 EL 01 /8EP01/8EE01 POWER SYSTEM STABILITY

SECTION-A

Unit I : Basic Concepts

Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Parkôs Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I

Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarkeôs diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II

Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I

Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II

Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System

Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS

1 E W Kimbark- Power System Stability, Vol.1 and 3, Dover Publications Inc., New York.

2 Power System Stability & Control by Prabha Kundur, TMH 11th reprint 2011

3. S.B Crary- Power System Stability, Vol.1 and 3, Hohn Wiley and Sons, New York.

REFERENCE BOOKS:

1 L.P Singh ï Computer Aided Power System Operation and Dynamics, Wiley Eastern Ltd. New Delhi.

2 I.J.Nagrath and D.P.Khothari ï Modern Power System Analysis, Tata Mc-Graw Hill Publishing Company, New Delhi.

8 EL 02 /8EP02/8EE02 HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases

Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics
Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection
Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.
Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS-

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press
4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.

7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

8 EL 03 /8EP03/8EE03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, óDigital Signal Processingô, PHI Publication
2. Oppenhavm & Scheffer, óDiscrete Time Processingô, John Wiley Publication

3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010
4. Mitra S.K, "Digital Signal Processing", TMH Publication

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(1) ELECTRIC DRIVES & CONTROL

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley

2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH
3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 . Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction
Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics
Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards
Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,
Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION-B

Unit IV: Power Quality Solutions
Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters,

Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: **Wiring and Grounding**
Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: **Power Quality Measurement Tools & Power Quality Surveys**
Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS: -

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(3) EMBEDED SYSTEMS

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O : Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture.
Implementing the Design. Quality Assurance and Testing of the Design.

TEXT BOOK:

Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education
3. Vahid & Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8 EL 04 /8EP04/8EE04 PROFESSIONAL ELECTIVE - II
(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I : Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II : Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C.Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.
Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics.High torque cage motors- deep bar rotor and double cage rotor induction motors, steady stateanalysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and scharge motor and steady state analysis.

TEXT BOOKS :

1. M.B.Say: Introduction to Unified Theory of Electrical Machine, ELBS.
2. SEELY: Electromechanical Energy Conversion

8 EL05/ 8EP05/8EE05 PROJECT & SEMINAR

8 EL06/ 8EP06/8EE06 DIGITAL SIGNAL PROCESSING - LAB

Any TEN experiments based on contents of
8 EL03/ 8EP03/8EE03 DIGITAL SIGNAL PROCESSING

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 EE01/7EP01/7EL01 CONTROL SYSTEM - II

SECTION-A

Unit I : Compensation Techniques:
Introduction, Preliminary considerations of Classical Design, Lead Compensator, Lag Compensator, Lag- Lead Compensator, Cascade Compensation in time domain, Cascade compensation in Frequency domain, Feedback compensation in frequency domain .

Unit II : State Space Techniques I:
State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model; Transfer matrix; State equations solution - State transition matrix (STM); STM Computation ï Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response ï SISO Systems.

Unit III : State Space Techniques II:
Concept - controllability and observability; SISO/MIMO Linear systems -Gilbertôs method and Kalmanôs test; SISO controllable systems Design -state feedback.

SECTION-B

Unit IV Sampled Data Control Systems:
Representation, Z Transforms. review, Sampler and Hold - zero order hold; Sampling theorem; Z Transform analysis ï open loop and closed loop sampled data systems, Z Transfer functions, Difference equation solution and response; Z Transform Method,. Discrete Systems Response, Open and closed loop systems pulse transfer functions - Different sampler locations; Digital Controller - transfer function; Stability analysis - S and Z Domain relationship, Juryôs Test and Bi-Linear Transformation, Root and root locus method.

Unit V : Non-Linear System Analysis I :
Non-linear system behavior ï types and characteristics; Describing functions - typical non-linearity and their

characteristics; Stability analysis - Describing function method and Limit cycles; Limitations - describing function method.

Unit VI : Non-Linear System Analysis II

Linearization - Around operating point; Singular points ï Classification and Nature; Phase-plane method - non- linear systems analysis; Phase trajectories construction ï analytical method and graphical method by isocline method; Stability analysis - limit cycle; Limitations - phase-plane method.

TEXT BOOKS:

1. I.J. Nagrath and M. Gopal ï Control System Engineering,Wiley Eastern Limited, New Delhi.
2. K . Ogata - Modern Control Theory, Prentice Hall of India Pvt. Ltd. New Delhi.
3. Modern Control System, Richard Dorf, Robert Bishop, PEARSON education, 11th edition 2008

REFERENCE BOOKS:

1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010
2. D.Roy Choudhary, Modern Control Engineering,Prentice Hall of India Pvt Ltd. New Delhi.
3. R.C. Sukla ï Control Systems Dhanpat Rai & Co.Pvt Ltd.

7 EE02/7EP02/7EL02 POWER SYSTEM OPERATION & CONTROL

SECTION-A

Unit I : Economic Operation – Part I

Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II : Economic Operation – Part II

Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III : A. Generator Control Loops

Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)

Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION-B

Unit IV : Automatic Load Frequency Control

Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V : Control Area

Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI : Steady-State Instabilities

Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

TEXT BOOKS :-

1. O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edition, McGraw-Hill Book Comp. N. Y. 1987.
2. Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
3. Power System Operation by R.Miller, J.H.Malinowski, TMH, 2nd reprint 200

REFERENCE BOOKS :

1. L. K. Kirchamayor ï Economic Operation of Power System- Wiley Estern Pvt. Ltd., New Delhi.
2. Hadi Saadat ï Power System Analysis ï WCB/McGraw-Hill International Edition 1999
3. I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc-Graw Hill Publishing Company, New Delhi 4.
   P. S. R. Murty ï Power System Operation and Control ï Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Wood and Wollenberg ï Power Generation, Operation and Control ï Willey ï Inter Science Publication

7 EE03/7EP03/7EL03 ELECTRICAL POWER - II

SECTION-A

Unit I :: Symmetrical components

Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank- sequence voltages and currents relationship; power system elements ï sequence impedance and sequence networks ; Various three phase transformer connections ï zero sequence rules; Unbalanced load system ï application.

Unit II : Symmetrical Fault Analysis

Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis

L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults-loaded and unloaded conditions.

SECTION-B

Unit IV : Overvoltages

Causes ï internal and external; Voltage surge, Basic insulation level, Protection ï earthing screen, overhead ground wire, lightning arresters.

Unit V: HVDC Transmission Basic principle, Transmission equipments, Comparison with AC links, Inverters ï reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)

FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

TEXT BOOKS :-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9th reprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, PEARSON Education
4 Modern Power System Analysis by D.P.Kothari, I.J.nagrath TMH 3rd edition, 20th reprint 2010

5. Power System Analysis by Hadi Saadat TMH, 1st reprint 2004
6. Electrical Power System, by Syed A. Nasar TMH,Revised 1st edition 2011

REFERENCE BOOKS :-

1. S. Rao ï ñEHV A.C. and HVDC Transmission Engineering and Practiceò, Khanna Publishers, New Delhi.
2. Narain G. Hingorani and Lazlo Gyugyi ï ñUnerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.
3. Yong Hua Song and Allan T. Johns - ñFlexible AC transmission Systems (FACTS), T and D reference bookò Westing house.

7 EE04/7EP04/7EL04 SWITCHGEAR & PROTECTION

SECTION-A

Unit I : Circuit Interruption

Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon- maintenance, properties and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications

B. Circuit Breaker (Part ï I)

Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operationand application.

Unit III : Circuit Breaker (Part – II)

SF_6, Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV: A. RelayingPrinciple

Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.

B. ElectromagneticRelays

Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines

Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.

B. Static Relaying

Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

TEXT BOOK:-

1. Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

REFERENCE BOOKS: -

1 R. T. Lythall ï ñSwitchgear Handbookò J and P Newness Butterworth, London.

2 C. R. Mason ï ñThe Art and Science of Protective Relayingò

3 A. R. Van and C Warringtan ï ñProtective Relaying , Vol 1 and 2,ò Chapman Hall, London.

4 Geosonoviz ï ñHigh Voltage Circuit Breakersò

5 V. A. Slabikov ï ñGeneration Protection and Switchgearò CIT, Coimbatore.

6 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.

7 B. Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

8. Handbook of switchgear by BHEL, TMH 6th reprint,2010

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I

(1) PROCESS CONTROL SYSTEMS

SECTION-A

Unit I : Electronics Instruments for Measurement of Electrical Parameters Advantages of Electronic Instruments, Electronic Voltmeters Electronic Multimeters, differential volt meter, Digital voltmeter, Q meter, vector impedance meter, vector voltmeter.

Unit II: Signal Generation and Analysis

Signal generators, Function generators. Wave analyzer Harmonic Distorsion Analysers, spectrum Analysis.

Unit III: Signal Counting and Recording

Decade counting Assembly, Binary counter, Decimal counter, Decade counter with digital disply, universal counter, Digital readot devices, storage type CRO, Servotype X-Y recorder.

SECTION-B

Unit IV : Signal conditioning and Conversions.

Frequency characteristics of various types of signals,active filters bandpass,low pass and high pass filters using opAmps. Various techniques od A/D and D/A conversions. Modulation and demodulation PCM techniques, phase locked loop.

Unit V: Signal Processing

Pulse times, triggered elayed sweeps, discrete pulse delay circuits, pulses equencing, analog multiplexers and demultiplexers, digital multiplexing sample and hold circuits, serial and parallel digital data conversion. Signal transmission, Analog and digital telemetry techniques, MODEM and UART, keyboard and character generators, tape recorder,

Unit VI : Introduction to Processor and Processor based Techniques. Introduction to PLC, PLC architecture, programming; ladder diagram and examples, micro controller based instrumentation

TEXT BOOKS: -

1. H.S. Kalsi ï Electronic Instrumentation, - Tata Mc-Graw Hill Publishing Company, New Delhi.
2. Cooper, Helfrick ï Electronic Instrumentation and Measurement Techniques, A Prentice Hall of India. New Delhi.

REFERENCE BOOKS: -

1. B.R. Gupta-Electronics and Instrumentation ï Wheeler Publishing.
2. Rangan, Sharma & Mani ï ñInstrumentation ï devices & Systems.ò Tata Mc-Graw Hill Publishing Company, New Delhi.
3. R.P. Jain-Digital Electronics, Tata Mc-Graw Hill Publishing Company, New Delhi.
4. Microprocessors and Digital Systems, by:D.V. Hall,Tata Mc-Graw Hill Publishing Company, New Delhi.
5. Shoen Beck- Electronic Communication, Prentice Hall of India. Pvt. Ltd. New Delhi.
6. B. Ram- fundamental of Microprocessors, Dhanpat Rai & Sons, New Delhi.
7. A.K. Sawhney ï Acourse in Electrical & Electronics Instrumentation, Dhanpat Rai & Sons, New Delhi.

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I

(2) COMPUTER ORGANISATION

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsôalgorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

TEXT-BOOK:

V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

REFERENCES:

1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô(4/e) (McGraw-Hill).

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(3) COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION-A

Unit I : Representation of power systems for computerized analysis : Mathematical models of Synchronous generator for steady state and transient analysis . Transformer with tap changer, transmission line,phase shifter and loads.

Unit II : Topology of Electric Power Systems ï Network Graphs , Incidence matrices, fundamental loop and cutest matrices, primitive impedance and admittance matrices, equilibrium equations of networks . Singular and Nonsingular transformation of network matrices .

Unit III : Formation of bus impedances and admittances matrices by algorithm ï Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.

Three phase network elements ï transformation matrix ï incidance and network matrices for three phase l networks . Algorithm for formulation of 3 phase bus impedance matrix.

SECTION-B

Unit IV: Short circuit studies : Three phase networks , Symmetrical components. Theveninôs theorem and short circuit analysis using bus impedance matrix . Short circuit calculations for balanced three phase networks using bus impedance matrix.

Unit V: Load flow studies : formation of load flow problem ï Gauss Seidel method ï Newton Unit III Raphson method ï decoupled method, fast decoupled methods ï sparsity technique.

Unit VI : Stability studies of power system ï Development of mathematical model for multimachine system stability analysis ï Formation of equations and methods of solutions .Transient stability analysis including synchronous machines , system networks and loads . Solution of state equation by modified Euler method and Runge Kutta 4th order Approximation method.

TEXT BOOKS:

1) L.P.Singh : Advanced Power System Analysis and Dynamics, WEL.
2) Y.Wallach : Calculations and programs for Power System Network.
3) G.W.Stage and A.H.El-Abiad : Computer Methods in Power System Analysis, McGraw Hill.

REFRENCE BOOKS:

1) R.N.Dhar : Computer Aided Power System Operation and Analysis, TMC.
2) Computer Technniques in Power System Analysis, by M.A.PAi TMH 10th reprint 2011

7 EE05/7EP05/7EL05 PROFESSIONAL ELECTIVE - I
(4) ARTIFICIAL INTELLIGNCE

SECTION-A

UNIT I : Introduction
Biological Neurons and their artificial models, introduction to neural computing
Components of neuron, input and output weight, threshold,weight factors, transfer
Functions ,concepts of supervised and unsupervised learning.

UNIT II: Supervised Learning :
Single Layer network, perceptron, Linear Separability, Training algorithm and limitations .
Multilayer Network : Architecture of feed forward network ,learning rule, generalized
Delta rule,learning function . Back propagation algorithm.

UNIT III: Unsupervised Learning:
Introduction, Counter propagation networks, Kohonenôs self organizing maps.
Hopfields networks.

SECTION-B

UNIT IV: Introduction:
Uncertainty in information,basic concepts of Fuzzy sets , operations on fuzzy sets , properties.
Fuzzy relations : operations,properties ,value assignments.

UNIT V : Membership Functions:
Features, fuzzification, membership value assignments, Fuzzy Rule based
Systems, Graphical technique of inference.
Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations , Defuzzification methods

UNITVI : Genetic Algorithm (GA):
Introduction to genetic algorithm,working principle,coding of variables, Fitness function. GA operators , similarities & differences between GAs and Traditional methods; Unconstrained and constrained optimization using Genetic Algorithm , real coded GA ,Advanced GA, global optimization using GA .

TEXT BOOKS

1 J.M. Zurada : Introduction to Artificial Neural Network, Jaico Publishing House

2 Meherotra Kishan ,Mohan C.K, Ranka Sanjay : Elements Of Artificial Neural networks Penram Int Pub Mumbai.
3 D.E Goldberg ,Addision Genetic Algorithm in Search Optimization and Machine Learning Wesley Publication
4 Kalyanmoy Deb Optimization for Engineering Design Algorithms and Examples, Prentice Hall of India New Delhi
5. M.Kishan, Mohan C.K., Ranka Sanjay; Elements of Artificial Neural Networks, Penram Int. Publications.

REFRENCE BOOKS

1. G.J. Khir and T.A. Folger : Fuzzy sets , Uncertainity and Information PHI Publication
2. Koska Bart Neural Network & Fuzzy systems Prentice Hall of India Pvt Ltd , New Delhi

7 EE06/7EP06/ 7EL06 PROJECT & SEMINAR

7 EE07/7EP07/ 7EL07 ELECTRICAL POWER II - LAB

Any TEN experiments based on contents of 7EE03 ELECTRICAL POWER II

7 EE08/7EP08/ 7EL08 SWITCHGEAR & PROTECTION - LAB

Any TEN experiments based on contents of 7EE04 SWITCHGEAR & PROTECTION

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SEMESTER : EIGHT
8EE 01/8EL01/8EP01 POWER SYSTEM STABILITY

SECTION - A

Unit I : Basic Concepts
Meaning of stability, Steady state, Transient and Dynamic stability limits; Three Phase Synchronous Machine-circuit representation, voltage equation and Parkôs Transformation; Transient and Sub transient state analysis and Phasor diagrams, Voltage behind the transient and sub transient impedances, Parameters and Time Constants determination.

Unit II: Steady State Stability - I
Steady state stability limit-short transmission line, Two machines system, Medium and Long transmission line, Clarkeôs diagrams for system with and without loss, Effect of inertia, Conservative criterion, Synchronizing coefficients and Multi machine system.

Unit III: Steady State Stability – II

Saturation effect, Saturated reactance, Equivalent reactance and its graphical determination; Short circuit ratio, Governor action and automatic voltage regulator effects.

SECTION-B

Unit IV: Transient State Stability – I

Review of basics concepts, Transient state stability and equal area criterion, Swing equation and its point by point solution, Critical clearing angle and time.

Unit V: Transient State Stability – II

Type of faults, Grounding and high speed re-closing effects, Pre-calculated swing curves and their use, Faults clearing Time, Excitation and governing action effects, Stability improvement methods, Multi machine problem, Network analyzer, Digital Computer role.

Unit VI: Excitation System

Unit exciter and common bus system, Self and separate excitation, Exciter type of and their description, Exciter drives, Quick response excitation system, Voltage-current methods differential equations for obtaining voltage ï time curves, Exciter response from voltage time curves, Dispersion coefficient, Constant leakage Inductance, Eddy current effects on exciter response, Loaded exciter response, Exciter response improvement methods.

TEXT BOOKS:

1 E W Kimbark- Power System Stability, Vol.1 and 3, Dover Publications Inc., New York.

2 Power System Stability & Control by Prabha Kundur, TMH 11th reprint 2011

3. S.B Crary- Power System Stability, Vol.1 and 3, Hohn Wiley and Sons, New York.

REFERENCE BOOKS:

1 L.P Singh ï Computer Aided Power System Operation and Dynamics, Wiley Eastern Ltd. New Delhi.

2 I.J.Nagrath and D.P.Khothari ï Modern Power System Analysis, Tata Mc-Graw Hill Publishing Company, New Delhi.

8EE 02/8EL02/8EP02 HIGH VOLTAGE ENGINEERING

SECTION-A

Unit I : Breakdown in Gases

Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics

Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching Over Voltage and Protection

Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high d.c, a.c and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Non-destructive measurement and testing, High voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design.

Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

TEXT BOOK :

1. M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Publishing, Company, New Delhi.

REFERENCE BOOKS-

1. E.Kuffer and W.S.Zaenglo- High Voltage Engineering, Pergamon Press,
2. Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
3. E.Kuffer and M.Abdullaha _High Voltage Engineering, Pergamon Press

4. M.S.Naidu and V.N.Maller- SF6 and Vaccum Insulation for High Voltage Application, Khanna Publications, Delhi.
5. Prof.D.V.Razeving (Translated from Russian by Dr.M.P.Chaurasia) ï High Voltage Engineering, Khanna Publications, Delhi.
6. An introducation to High Voltage Engineering by Subir Ray, Prentice ï Hall & India, Private Limited, New Delhi.
7. High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications

8EE 03/8EL03/8EP03 DIGITAL SIGNAL PROCESSING

SECTION - A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III: Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION-B

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI: DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts

TEXT BOOKS:

1. Proakis & Monolakis D.G, óDigital Signal Processingô, PHI Publication
2. Oppenhavm & Scheffer, óDiscrete Time Processingô, John Wiley Publication
3. Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010
4. Mitra S.K, óDigital Signal Processingô, TMH Publication

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(1) ELECTRIC DRIVES & CONTROL

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II: Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, Braking of d c and induction motors.

UNIT III: DC Drive Control Basic machine equations, schewe of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, Closed loop control, PLL control, microcomputer control.

SECTION-B

Unit-IV: Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, varible frequency control, Rotor resistance control, slip-power recovery scheme, Synchronus motor drive, Microprocessor controlled AC Drive.

UNIT V: Vector controlled Drive,Principle of Vector Control, Equivalent ckt. Direct v.c., Flux vector estimation, Indirect v.c., v.c. of line side pular rectifer exator flux oriented v.c., v.c. of current fed inventer drive & cycloconverter drive servorless control speed estimation controls ï EKF method

UNIT VI: Direct torque & adoptaive controlled Drive Torque Expression o& control strategy self tuning control MRAC sliding mode control self commissiong of drive, Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

REFERENCE BOOKS:

1. Power Electronics : (Converts, Application & Design) ï Mohan/ Undeland/ Rossing- John wiley
2. Power Electronics : M.D. Singh, K.B. Khan Chardalli ï TMH
3. Power Electronics : M.H. Rashid ï Pearson Education
4. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
5 G. K. Dubey Fundamentals of Electrical Drives, , Narosa Publishing House,2005
6 . Electric Drives ï Concepts & Applications by V.Subrahamanyam, TMH 2nd edition 2010

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(2) POWER QUALITY

SECTION - A

Unit I: Introduction

Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II: Power Quality Characteristics

Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III: Power Quality Standards

Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards,
Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION-B

Unit IV: Power Quality Solutions

Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V: Wiring and Grounding

Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI: Power Quality Measurement Tools & Power Quality Surveys

Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

TEXT BOOKS:-

1. Barry W. Kennedy: Power Quality Primer, McGraw-Hill
2. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd edition 2011

REFERENCE BOOK: -

1. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

8EE 04/8EL04/8EX04 (i) PROFESSIONAL ELECTIVE - II
(3) POWER SYSTEM MANAGEMENT

SECTION-A

UNIT-I : Principle and Practice of Management:

Basic Concepts- basic concepts of management-Role and importance of management in modern society, management as a profession

The Process of Management- The process of management; planning, organizing, directing, controlling, decision-making, leading etc.

Management Concepts- Managerial authority and responsibility-delegation and decentralization- Line and staff concepts-concepts in e-commerce etc.

UNIT-II : Marketing & Production/Operation Management:

Marketing Management- Introduction to Marketing, Marketing strategy, Consumer Behaviour, Marketing Research, Product/ Services Decisions, Pricing Products/Services, Distribution management, Advertising & Sales promotion etc.

Production/Operation Management- Introduction to Production Planning and Process, Issues in Material and Inventory Management, Quality control and Management (quality circle, ISO 9000 series, just-in-time, TQM.), Maintenance Management, Purchasing Decision.

UNIT-III : Project, Financial & Human Resource Management:

Project Report: Preparation of -Project Report, Profit and Loss statement, Balance Sheet.

Financial Management: Costing- Principles, types- operating, marginal, incremental, embedded etc, Budgeting & financial planning, Risk management etc.

Human Resource Management: Human resource planning-concepts & process, Job analysis & description- recruitment, selection process, Training & development, Employee welfare, issues related to management of trade union.

SECTION-B

UNIT-IV: Dimensions of Power System Restructuring

Power system Restructuring:: Introduction to Power Sector Reforms/Restructuring/ Deregulation ï issues, prospects and lessons to developing countries

Environmental dimensions in power sector: Pollution & Depletion of natural resources, Waste Management, environmental legislation, green power, strategies for environmental management in power sector.

Rural Electrification: Issues relating to revised definition of village electrification, issues in electrifying remaining villages, decentralized generation and distribution for rural electrification etc.

Power Sector Restructuring in India: History, Problems and status in India, Accelerated Power Development and Reform Programme (APDRP), Reforms in G,T, D sector, Electricity Act:2003- issues, Problems & prospects, Legal and regulatory

framework, Rural Electrification Programme, Environmental Pollution Programme.

UNIT-V: Management issues in Power Sector:

Financing of power sector:: Financial problems of SEBs, strategies - for financing capacity addition to generation, transmission and rural electrification, Risk management in power sector.

Human Resource development in power utilities: Change management, Training & Development, Culture of empowerment and accountability etc.

Transmission & Distribution Management: Transmission management under open access- transmission Pricing/Tariff, Congestion Management, Micro distribution models- private investors, Multi Licensee System, Distribution Management, Power Quality, Demand Side Management, Energy Metering, Accounting and Auditing, SCADA etc.

UNIT-VI: Marketing issues in Power Sector:

Issues of Power Tariff, Prices in Competitive Electricity Markets, Bidding strategy, Availability Based Tariff (ABT), Embedded and Spot pricing, Power Trading, Market Operations in Electric Power Systems, Marketing of energy and services in competitive electricity markets.

TEXT BOOKS:

1. Koontz H., OôDonnel C. and Whierich: Principle of Management, Tata McGraw Hill Publishing Co., Ltd., New Delhi
2. Muhlemann , Production Operation Management, Macmillan publication
3. Dencenzo & Robbins, Human Resource Management
4. Monappaa, Human Resource Management, Macmillan Publication
5. Ramaswamy & Namamkumari, Marketing Management Macmillan Publication
6. Philip Kotler, Marketing Management, PHI, New Delhi

REFERENCE BOOKS:

1. Economic Evaluation of Projects in the Electricity Supply Industry, by H. Khatib.
2. Fundamentals of Power System Economics, by Daniel S. Kirschen, Goran Strabac
3. Energy and Power Risk Management by Alexander Eydeland, KrzysztofmWolyniec
4. Power System Economics, by Steven Stoft

5. Market Operations in Electric Power Systems, by M. Shahidehpour, H. Yamin, Zuyi Li.
6. Electricity Economics, by Geoffrey Rothwell, Tomas Gomez
7. Modelling Prices in Competitive Electricity Markets (The Wiley Finance Series), by Derek W. Bunn.
8. A Shock to the System, by Timothy J. Brennan, Karen L. Palmer, Raymond J. Kopp, Alan J. Krupnick, Vito Stagliano, Dallas Burtraw.
9. Power pricing by Dolan & Siman, The free Press,1996
10. Customer Choice: Purchasing Energy In A Deregulated Market: by Albert Thumann
11. Indiaôs Power Sector Reforms Update, Paryas, Pune

8EE 04/8EL04/8EP04 PROFESSIONAL ELECTIVE - II
(4) GENERALISED MACHINE THEORY

SECTION-A

Unit I : Elements of Generalized Theory: essentials of rotating machines, conventions, basic two pole machines, transformer with movable secondary transformer and speed voltage in armature, kions, primitive machine, leakage fluge, voltage and torque equations.

Unit II : Linear transformations in machines: invariance of power transformation from displaced brush axis, three-phase to two-phase transformation power invariance, transformation from rotating axes to stationary axes, impedance matrix, application of generalized theory, electrical torque, limitations of generalized theory.

Unit III: D.C.Machines: separately excited DC generators and motors formulation of mathematical model, steady state and transient analysis, Ward-Leonard system of speed control.
Steady state analysis of DC series, shunt and compound machine and their characteristics cross-field machines, metadyne transformer, metadyne generator.

SECTION-B

Unit IV: Poly-phase synchronous machine, three phase synchronous machine, steady state and transient analysis, phasor equations and phasor diagram, power angle characteristics, DWR synchronous machine generalized mathematical model, steady state analysis, phasor diagram.

Unit V: Induction Machine: Transformations, electrical performance, equation, steady state analysis, equivalent circuit, torque-slip characteristics.High torque cage motors- deep bar rotor and

double cage rotor induction motors, steady stateanalysis, comparison between single cage and double cage motors.

Unit VI: Generalized theory of single-phase series motor, repulsion motor and scharge motor and steady state analysis.

TEXT BOOKS :

1. M.B.Say: Introduction to Unified Theory of Electrical Machine, ELBS.
2. SEELY: Electromechanical Energy Conversion

8EE 05/8EL05/8EP05 PROJECT & SEMINAR

8EE 06 DIGITAL SIGNAL PROCESSING LAB

Any TEN experiments based on contents of 8EP03 DIGITAL SIGNAL PROCESSING

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ARCHITECTURE
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

07AR01 ADVANCE CONSTRUCTION - I

Objective : The course will enable the learning in progression , starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: Analysis of different type of foundation as per load bearing capacity of soils, types of soil and building loading conditions. Caisson foundation its types and purposes. Combined foundation its purposes types.

Unit II: Earthquake resistant structure.

a) Introduction of earthquake, types of earthquake, origin and causes of earthquake.

b) Failure mechanism of structures due to earthquake. Analysis of earthquake affected load bearing masonary and framed structures

Unit III: a) Remedial measures in terms of planning , designing , materials and techniques for earthquake resistant structure.

b) Retrofitting of earthquake affected buildings.

Unit IV: a) General study of standardisation of building elements its uses for various construction.

b) Study of Modular co-ordination and its multipurpose functional application.

Unit V: Concept of curtain wall and structural glazing material and construction techniques, fixing details of various metal casements.

Unit VI: Architectural glass system.

Sessional work: Assignments, test, site visit and drawing on the above topics.

REFERENCE BOOKS:

1. S.C. Rangwala, Engineering Materials, Charotar Publishing House, Anand,1997
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.
3. W.B. Mckay Building Constrution, vol. 1,2,3, Longmans, U.K.1981.
4. Don A Watson, Construction Materials and Processes, McGraw Hill Co.,1972.

5. R. Chudley, Construction technology, Richard Clay (Chaucer Press) Ltd.,Suffolk,1978.
6. J.H.callender,Time saver standard for Architectural Design Data, McGraw-Hill,1994.

07AR02 ENVIRONMENTAL SERVICES – I

Objective: To impart knowledge of various aspects of city level water supply systems, drainage and solid waste disposal.

Unit I: Sources of water supply their types, water collection, water treatment, distribution of water from various sources.

Unit II: Rain water disposal and roof drain and rain water harvesting system.

Unit III: Water pollution and preventive measures.

Unit IV: Sewage treatment plant and its locational factor..

Unit V: Garbage disposal and recycling methods. Concept of recycling of solid and liquid waste in building. Vermicomposition, Biogas production.

Unit VI: Sewage disposal systems in unsewered location viz. septic tank, soak pit, acqua privy.

Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

1. Manual of Water supply and treatment , second edition, CPHEEO, Ministry of Works and housing, New Delhi, 1977.
2. Manual of Sewerage and sewage treatment, CPHEEO Ministry of Works and housing, New Delhi, 1980.
3. S.C.Rangwala, water supply and sanitary Engineering,Charotar publishing House , Anand 1989.
4. Bureau of Indian Standards.
5. Pachauri, A.K., ñWater Supply and Sanitary Installations, Design, Construction and Maintenanceò, New Age International Ltd.
6. Manas Handbook of Plumbing, Manas Publishers

07AR03 PROFESSIONAL PRACTICE

Objective: The objective of the course is to expose the students to the present trends of architectural practice and valuation.

Unit I: Role of professional bodies such as The Indian Institute of Architects, working, byelaws, categories of membership, election procedure and code of conduct; The Architects Act of 1972 and the Council of Architecture.

Unit II: Professional responsibilities of the architect, copyrights, scale of charges, variation of charges, mode of payment, termination of services, specialized building services.

Unit III: Techniques of valuation, elements of valuation and factors affecting valuation. Methods, valuation of landed and building property, comparable cost of sale, purchase and mortgage.

Unit IV: Valuation for compensation on acquisition, compensation under central and state legislation, relevance of the Town Planning Act.

Unit V: Valuation for renewal or lease/extension of lease, standard rent, easement rights, dilapidation, insurance, estate development and advice on investment policy.

Unit VI: Arbitration, arbitrators, umpire and nature of arbitration.
Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

1. Rangwala, S C , ñValuation of Real Propertiesò, Charotar Book Stall.
2. Piotrowski, A. and Williams, Julia, ñThe Discipline of Architectureò, University of Minnesota Press. 3. Eldred, G.W., ñThe Beginners Guide to Real Estate Investingò, John Wiley & Sons
4. Publications of COA, IIA Hand Book on Professional Practice, The Architects publishing Corporation of India, and Bombay 1987.

07AR04 : URBAN PLANNING

Objective: The objective of the course to develop the understanding of urban planning process through surveys, analysis, alternative planning strategies and urban planning issue.

Unit I: Need and study of Urban planning interrelationship between urban planning, urban design, urban landscape design and Architecture planning as a team work and role of urban planner in planning team. Hierarchical levels of planning.

Unit II: Planning during Medieval and renaissance period in western and Indian context.

Unit III: Evolution of modern planning concepts. Impact of industrial revolution on planning process. Planning theories developed by Patric Geddis, Ebenzer Howard, Lewis Mumford, C. L. Doxiadis, Patric Abercrombie.

Unit IV: Introduction to TPS, master plans, structure plan, regional plans, land use planning , Neighbourhood Planning, zoning.

Unit V: Recent trends in urban planning, New towns development, SEZ, JNNURM, Green cities, ISHDP, Urban renewal process.

Unit VI: National habitat and housing policy. Slum improvement scheme, ISHDP, DCR relevant to housing.
Sessional work: Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS :

1. Gallion Arthur B & Eisna Simon, The Urban Pattern, City Planning and Housing.
2. C. L. Doxiadis, Ekistics, An introduction to the Science of Human Settlements, Hutchinson, London, 1968
3. John Ratchiffe, An Introduction to Town and Country Planning.
4. Gupta, V., ñEnergy and Habitat: Town Planning and Building Design for Energy Conservationò, Wiley Eastern.
5. Rangwala, S.C., ñTown Planningò, Charotar Publishing House.
6. Eleanor, S.M., ñBritish Town Planning and Urban Design: Principles and Policiesò, Longman.
7. Randall, A., ñCrossroads, Hamlet, Village, Town: Design Characteristics of Traditional Neighbourhoods, Old and Newò, American Planning Association.

07AR05 ARCHITECTURAL STRUCTURE-VI

Objective: Understanding of Basic Theory and principles of structural analysis and structural properties of elements.

Unit I : Design and detailing of simple G + 1 structure.

Unit II: Walls and chimneys subjected to kind pressure.

Unit III: Introduction to flat slabs, combined and eccentric footings selection criteria for above structures. (only Theory no Design)

Unit IV: Failure of structured
- a. Types of failure in various structure.
- b. Causes of failure.
- c. Evaluation of damage
- d. Non destructive testing techniques .
- e. Techniques to prevent collapse failure of structures.
- f. Repaired and rehabilitation of structures.

Unit V: Simple welded and riveted connection (without moments) only axial loads .

Unit VI: Design of simple tension and compression member of trusses.

Sessional work:

Visit to construction sites to study R.C.C. Structures and steel fabrication work and preparing report.

REFERENCE BOOKS:

1. P.C.Punmia, Strength of Materials and Theory of Structures; vol I, Laxmi Publications, Delhi 1994.
2. S.Ramanmurtham, Strength of Materials ï Dhanpatrai & Sons, Delhi 1990
3. W.A.Nash, Strength of Materials ï Schaums Series ï McGraw Hill Book Company, 1989
4. R.K.Bansal ï engineering Mechanics and Strength of Materials ï Lakshmi Publications, Delhi, 1990

07AR06 ARCHITECTURAL DESIGN STUDIO - VII

Objective: To enable the student to design the large scale housing and housing project in an urban environment with emphasis on advanced building services and systems, urban development regulations, building byelaws.

BASIC CONTENTS:

1) Introduction to the designing of multifunctional community housing project on an appropriate scale.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Planning and designing of large scale housing and building projects in an urban environment, advance building services, energy conservations, cost effective techniques and materials, building bye laws, housing schemes etc.
5) Architectural study tour relevant to design project.

Sessional work: One major design project and one time project with other task and assignments.

Viva Voce by external examiner at the end of Semester.

Suggested text books:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)

3. Scott: Design Fundamentals ,Edward d Mills- Planning the Architects Hand Book ï Bitterworth, London, 1985.
4. Watson,D (editor) Time ï saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., ñForm defining strategis: experimental architectural designò. Wasmuth, 2007.

07AR07 ADVANCE CONSTRUCTION STUDIO - I

Sessional work;

Assignments and drawing on the above topics given in the subject 07AR01 Advance construction ï I.

Viva Voce by external examiner at the end of Semester.

07AR08 URBAN PLANNING STUDIO

Sessional work;

Assignments and drawing on the above topics given in the subject 07AR04 Urban Planning.

Viva Voce by external examiner at the end of Semester.

SEMESTER: EIGHTH

08AR01 ARCHITECTURAL DESIGN - VIII

Objective : To expose students for designing of large scale urban design projects with emphasis on modern material, techniques , architectural styles advanced services, sustainable architecture, green architecture, climate responsive architecture etc.

Basic contents:

1) Introduction to urban design project planning and design consideration.
2) Importance of case studies, data collection, area analysis, evolution of plan forms, climatic oriented planning and design features, space utilization, building & site services, site analysis and site planning ,etc; in the Architectural design process.
3) Importance of culture, tradition, topography, climate and building bye laws in generating built form.
4) Major design project may include high rise/tall buildings viz. apartment and commercial mixed used complexes, five star Hotel, multifunctional complex, community centers, super specialty hospital, institutions etc.
5) Architectural study tour relevant to design project.

Sessional work:

One major design project and one time project with other task and assignments.

SUGGESTED TEXT BOOKS:

1. Ching, F.D.R.: Form, Space and Order, Van Nostrand Rheinhold, New York (1979).
2. Parmar V.S.: Design Fundamentals in Architecture, Somoiya Publications, Bombay (1973)
3. Scott: Design Fundamentals Edward d Mills- Planning the Architects Hand Book ï Bitterworth, London, 1985.
4. Watson,D (editor) Time ï saver standards for Architectural Design: Technical data for professional practice, McGraw-Hill, 2005.
5. Neufert,P; Architects Data; Blackwell Science, 2000.
6. Agkathidis, A, Hudert, M and Schiling, G., ñForm defining strategis: experimental architectural designò. Wasmuth, 2007.

08AR02 ADVANCE CONSTRUCTION - II

Objective: The course will enable the learning in progression , starting from simple building elements, components, materials and construction techniques to develop strong sense of visualization.

Unit I: General introduction to large span structures and high rise structures, planning features and its construction aspects. Chronological development of large span structural framework such as lamella, laminated portal frame , R.C.C. & steel portal frames.

Unit II: A) R.C.C. and steel space frame structures. B) Study of shell structures and its construction techniques from historical perspective. C) Shell structures such as Geodesic Schwedeler and Gitter Kuppel and its construction aspect.

Unit III: Constructions aspect consider in temporary structures which are in portable nature for various short terms events. Use of modular techniques and materials.

Unit IV: Ferrow cement techniques and its appropriate various uses for building construction elements.

Unit V: Introduction to prestressed concrete, principle and method of prestressing, advantages and disadvantages.

Unit VI: Types of elevators ï Electric, hydraulic, passenger, hospital, capsule, freight etc., details of lift shaft and other mechanism

escalators and conveyors. Parallel and criss cross escalators, horizontal belt conveyors , horizontal moving walkwayôs.

Sessional work:

Assignments, test, site visit and drawing on the above topics.

REFERENCE BOOKS:

1. S.C. Rangwala, Engineering Materials, Charotar Publishing House, Anand,1997
2. HUDCO - All you want to know about soil stabilized mud blocks, HUDCO Pub, New, Delhi, 1989.
3. W.B. Mckay Building Constrution, vol. 1,2,3, Longmans, U.K.1981.
4. Don A Watson, Construction Materials and Processes, McGraw Hill Co.,1972.
5. R. Chudley, Construction technology, Richard Clay (Chaucer Press) Ltd.,Suffolk,1978.
6. J.H.callender,Time saver standard for Architectural Design Data, McGraw-Hill,1994.

08AR03 ENVIRONMENTAL SERVICES – II

Objective: To expose the students specialized services in buildings.

Unit I: Natural and artificial ventilation system in buildings. Air conditioning methods equipments and ducting.

Unit II: Refuse disposal system in high-rise buildings, viz. ï refuse chute, purpose of service floor and other services.

Unit III: Lift , escalator, different type and use their lay out , lighting conductors, building automation system.

Unit IV: Energy construction, low energy systems, hybrid systems, integration and P. V. and wind system in the building, wind , solar and other non-conventional energy systems, solar thermal application for heating and cooling, electricity generation in building.

Unit V: Fire safety ï general provisions. Causes of fire in buildings, Fire protection standards ï safety regulation ï NBC ï planning consideration in building like non- combustible material, construction , stair cases and lift lobbies , fire escapes and A.C. system. Special features required for physically handicraft and elderly in building types.

Unit VI: Fire detectors and fighting installation. Type of detectors and usage. Alarm system, Fire fighting pumps , fire tank , dry and wet risers, automatic sprinkler, fire drill , refuge areas.

Sessional work:

Assignments, test, site visit and drawings on the above topics.

REFERENCE BOOKS:

1. Manual of Water supply and treatment , second edition, CPHEEO, Ministry of Works and housing, New Delhi, 1977.
2. Manual of Sewerage and sewage treatment, CPHEEO Ministry of Works and housing, New Delhi, 1980.
3. S.C.Rangwala, water supply and sanitary Engineering,Charotar publishing House , Anand 1989.
4. Bureau of Indian Standards.
5. Pachauri, A.K., ñWater Supply and Sanitary Installations, Design, Construction and Maintenanceò, New Age International Ltd.
6. Manas Handbook of Plumbing, Manas Publishers

08AR04 SUSTAINABLE ARCHITECTURE

Objective: To sensitize students about the importance and need for Sustainable Planning concept and appropriate Architectural design concept as an emerging thrust area.

UNIT-I: Introduction : Planning concept ï Environmental Impact Analysis ï Ecological foot prints ï Essential ingredients of sustainable development apart from social and economical ï environment , stake holder, participation , institutional mechanism.

UNIT-II: Development in Historical Context - Early settlement pattern ï Climate Responsive Planned Layouts ï orientation of Streets and Buildings, Creation of Habitable Environment , Early Planning Methods.

UNIT-III: Resource Efficiency ï Land , Water, Energy, Human Resource, Biodiversity ï Suitable practices at settlement, Campus and Building Level.

UNIT-IV: Sustainable Architecture ï Appropriate materials and construction ï review of their properties workability, Eco Friendly construction practices ï sustainable campuses and case studies..

UNIT-V: Sustainable Planning and Policies ï Awareness programme at National, International levels Rio de Jenero agenda ï Earth summits ï agenda involved ï their realization.

Sessional work: Assignments and test on the above topics.

REFERENCE BOOKS:

1. O.H.keonigsberger; T.G. Ingersoll and others; Manual of tropical housing and building- Part-I; Longmans,London-1980
2. M. Evans; Housing, climate and comfort; Architectural press London- 1980
3. B.G.Givoni; Man,climate,and architecture; Applied science, banking, Essex, 1982

4. N.K Bansal and others; Passive building design; Elsevier science-1994.
5. S.Drake; The third skin architecture,technology and environment;UNSWï press-2007.
6. Manik & Girish Komisva, IIPA, keeping Cities Clean and Green, Uppal Publishing House, 1997.
7. Beer, Environment Planning for Site Development.

08AR05 LANDSCAPE DESIGN

Objective: To enable students realize that architectural design could enhance and enrich built environment through a study and understanding of plants and vegetation historical achievements and techniques of application in the overall context of ecology.

UNIT-I: Introduction : Landscape Architecture. Understanding man and nature land and landscape. Relationship of architecture and Landscape Architecture.

UNIT-II: History of the art of garden design of India, China, Persia, Japan, Italy, France and England.

UNIT-III: Garden Design of the modern world.

UNIT-IV: Basic Principles of landscape design and element. Types of landscape elements and its various uses.

UNIT-V: Plant classification and nomenclature, plant identification. Characteristics of various types of plants and their suitability of landscaping, plant selection criteria, planting design and visual aspects of plant form.

UNIT-VI: Methodology and process of site analysis, data collection, compilation , Presentation and analysis techniques. Preparation, interpretation and evolution of landscape plans site planning.

Sessional work:
Assignments, tests, and tutorials on the above topics

REFERENCE BOOKS:

1. Sylvia Crowe Sheila Haywood, The Gardens of Mughal India , Vikas Publishing House, Pvt. Ltd, India, Delhi,1973.
2. Garrett Eckbo, The Art the Home Landscaping, McGraw-hill Book Co., London, 1956.
3. Testsuro Yoshida, Gardens of Japan, Jr. Marcus G. Sims, 1963.
4. Sir Banister Fletcher, A History of Architecture, University of London, The Antholone press, 1986.

5. Percy Brown, Indian Architecture (Islamic period), Taraporevala and Sons, Bombay, 1983tt

6. Satish Grover, The Architecture of India (Buddhist and Hindu Period), Vikas Publishing Housing Pvt. Ltd., New Delhi, 1981

7. Christopher Tadgelli, The History of Architecture in India from the Dawn of Civilization to the end of Raj, Longman group, U.K.Ltd., London, 1990

08AR06 PROFESSIONAL ELECTIVE – I (1) HOUSING

Objective: To sensitize students about the need for , demand and supply of housing in India, to expose the role or function of various housing agencies, the typologies of housing with basic environmental issues.

UNIT-I: Housing Issues ï Indian Context. Housing as Architecture ï basic need ï demand and supply of housing ï Housing Agencies and their role in housing development.

UNIT-II: Social factors influencing housing design, affordability , economic factors and influence of traditional housing and planning features.

UNIT-III: Housing surveys and standards. Sources of Data and information, methods and techniques of housing survey, housing standards etc.

UNIT-IV: Housing Design ï Traditional Patterns ï Row housing and cluster housing ï layout concepts ï use of open spaces ï utilities and common facilities.

UNIT-V: Case studies of housing schemes designed by eminent architects. High Rise Housing.

UNIT-VI: National habitat and housing policy slum improvement scheme, ISHDP, DCR relevant to housing.

Sessional work :
Assignment and case studies of above topics.

TEXT BOOKS :

1. Joseph de chiara and others ï Time Saver Standards for Housing and Residential Development McGraw-Hill Co., New York, 1995

2. Karnataka state Housing Board ï MANE ï Publication - 1980

08AR06 PROFESSIONAL ELECTIVE – I (2) ENVIRONMENTAL PLANNING

Objective: To Provide advanced knowledge on how all issues and concerns of environment can integrate to architectural design process.

UNIT-I: Introduction to the ideas, issues and concepts of sustainable Architecture, Global Environment , Principles of environmentally and ecologically supportive Architecture.

UNIT-II: Early Settlement Patter ï Climate Responsive Planned Layouts ï Orientation of streets and buildings. Creation of Habitable Environment, Early Planning Methods.

UNIT-III: Quality of Urban Environment and Living ï Past , Present and Future Trends role of Urban Design in Urban Environment, Planning for Quality Living in Urban Areas.

UNIT-IV: Conservation of Water, Land, Energy its methods. Environmental impact assessment.

UNIT-V: Solid & Liquid Waste from residential & Commercial Buildings ï Environmental significance ï Segregation and treatment of waste-degradation of environment due to wast .

UNIT-VI: Salient Features of environmental laws ï Rain Water Harvesting Techniques. Biological and Thermal Energy Options ï Biogas Production ï Liquid Waste, Recycling Methods & Practices.

Sessional work :
Assignment and case studies of above topics.

TEXT BOOK :

1. Gosling and Maitland ï Environmental Planning ï St. Martinôs Press, 1984

08AR06 PROFESSIONAL ELECTIVE – I (3) CONSTRUCTION MANAGEMENT

Objective: To establish and develop construction management skills network techniques, construction equipments and methods along with quality control in construction.

UNIT-I: Introduction to project management concepts ï background of management, purpose, goal and objectives. Traditional management system, Ganttôs approaches, load chart, progress chart, bar charts, merits and limitation schedule time estimates units.

UNIT-II: Project management, resources balancing, phasing of activities, programmes, scheduling project control, reviewing, updating and monitoring.

UNIT-III: Introduction to modern management concepts. Introduction to PERT and CPM network concepts, inter relationship , information, data sheets and development of network. CPM for management, CPM network analysis, identification of critical path floats computation result sheets.

UNIT-IV: PERT Network, introduction to the theory of probability and statistics, probabilistic aim estimates for the activities of PERT Network.

UNIT-V: Financial management. Introduction to two dimensional network analysis activity cost information. Cost time relationship, crashed estimates for the activities, project direct cost and indirect cost.

UNIT-VI: Construction quality control and inspection, significance of variability and estimation of risks , construction cost control, crashing of networks.

Sessional work :

Assignment and case studies of above topics.

TEXT BOOKS :

1. Dr. B. C. Punmiya and K. K. Khandelwal ï Project Planning and Control with PERT/CPM Laxmi Publications, New Delhi, 1987.
2. S. P. Mukhopadyay, Project Management for Architects and Civil Engineers, IIt, Kharagpur.
3. Ahuja H. N. ñConstruction Performance Control by Networksò, Wiley Inter science Publication.
4. Peurifoy, R. I. ñConstruction Planning Equipments and Methodsò McGraw Hill Book Co. Inc.
5. Srivastva, U. K. ñConstruction Planning Managementò Galgotia Publisher.

08AR07 ARCHITECTURAL DESIGN STUDIO - VIII

Sessional work:

Assignments and drawing on the above topics given in the subject 08AR01 Architectural Design Studio ï VIII.

Viva Voce by external examiner at the end of Semester.

08AR08 ADVANCE CONSTRUCTION STUDIO - II

Sessional work:

Assignments and drawing on the above topics given in the subject 08AR08 Advance construction Studio ï II.

Viva Voce by external examiner at the end of Semester.

08AR09 LANDSCAPE DESIGN STUDIO - II

Sessional work:

Assignments and Sketches, Case Studies of contemporary period, Landscape Proposals for Residential, Public , Institutional Buildings on the above topics given in the subject 08AR09 Landscape Design Studio ï II.

Viva Voce by external examiner at the end of Semester.

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SEMESTER : NINTH

09AR01 PRACTICAL TRAINING

Each candidate shall have to prepare a detail report along with necessary drawing, sketches, measurement, record, reading, observations, survey analysis, log sheets and modes, if necessary on the following siz aspects which are concerned with the poetical training. This report shall be submitted for the Viva-Voce examination duly certified by the Principal of the College.

1. Critical appraisal - of any building that he/she-ôor his/her employer has designed and executed. The building shall be used and the students may record the reactions of the users to support his/her appraisal in addition to photographs, drawing etc.

   Marks (Sessional)- 25

2. Site Supervision and Practice-A detail report of any major part of a small building that has been personally supervised by the candidate. It may include checking site measurement preparation of a bill, site instructions and checking of the executed work.

   Marks(Sessional)- 25

3. Field Observation - A report on architectural use of the site conditions. For example, Electric poles, Water tanks, slope of the site etc.

   Marks (Sessional)- 25

4. Log sheet and office certificate - A student shall fill the log sheets as a record of his every day work aid shall submit the same along with the certificate from his/her employer.

   Marks (Sessional)- 25

5. Working drawing and complete estimate of small project - A student shall submit all die working details prepared by him/her during his/heir practical training along with estimate of small project.

   Marks (Sessional)- 100

6. Viva-Voce Each candidate shall be individually interviewed and questioned on any of the sublet mentioned above by a Principal,

Head of Department of Architecture and Two external examiner appointed by the University.

Marks(Viva-Voce)-100
Total Marks - 300
Pass Marks - 150

SEMESTER: TENTH

10AR01 PROFESSIONAL ELECTIVE – II
(1) INDUSTRIAL ARCHITECTURE

Objective: To impart knowledge of planning and design features, materials and techniques useful in industrial structures.

UNIT -I : Meaning of industrial architecture, scope , context. Impact of industrial revolution ï origin in the context of Britain and the United States ï Impact of materials and technology.

UNIT-II : Automation techniques & its impact, circulation and area requirement, influence on design ï Internal & External Environment Control ï Precaution at site.

UNIT-III : Pioneers and Architects role in industrial design. Study of examples of pioneer to include Peter Behrens, Max Berg, Hans Poelzigôs and P. L. Nervi ï impact of expressionism and international style.

UNIT-IV : Responsibilities of architect in innovative corporate image, understanding industrial environments through Indian case studies.

UNIT-V : Zoning principle, Factories Act and Rules (1948) in India ï Role of Pollution Control Boards, organizing principles. Environmental Control & Waste Management.

Sessional work :
Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture .

10AR01 PROFESSIONAL ELECTIVE – II
(2) CLIMATE RESPONSIVE ARCHITECTURE

Objective: To sensitize students about the importance and need for Climate Responsive Architecture Design concept.

UNIT-I: Introduction to the ideas, issues and concepts of sustainable Architecture, related to types of climates. Global Environment & Principles of Environmentally and supportive Architecture.

UNIT-II: Non- conventional Energy Systems, Solar Thermal Application for heating and cooling.

UNIT-III: Low Energy design Hybrid Systems, Integration of PV and wind systems in the buildings.

UNIT-IV: Day Light principles , Glare amount of daylight, daylight factor, orientations and sizes of opening to achieve diffused lights.

UNIT-V: Application of Climatic Principles ï Evolution of Plan Form to minimize Heat Gain in Tropical Climates, Orientation of Building with respect to sun , wind, sizes of fenestration & its orientation, Use of evaporative cooling, ground coiling, cavity walls, topography , water bodies, vegetation. Landscape elements, cross ventilation system to achieve natural comfort level in indoor & outdoor spaces.

UNIT-VI: Planning and Design features to be considered with respect to various Climate.

Sessional work :
Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture .

10AR01 PROFESSIONAL ELECTIVE – II
(3) VERNACULAR ARCHITECTURE

Objective: To impart knowledge about various manmade and natural forces behind the evolution of traditional architecture.

UNIT -I : Approaches and Concepts to the study of vernacular architecture ï Aesthetics ï Anthropological ï Architectural ï Developmental ï Geographical ï Historical ï Spatial ï Folkloristic.

UNIT-II : Traditional Principles of Planning in Western & Northern India ï Primitive Forms, Symbolism, Colour, Folk Art etc. in the Architecture of the Deserts of Kutch and Gujrat State ï Wooden Houses & Mansions (Havelis) Gujrat & Rajsthan ï House boats (Dhugas) Kashmir ï Material of Construction & Construction details.

UNIT-III: Vernacular Architectural of South India ï Wooden Houses, Palaces & Theatres in Kerala, Palaces in Tamilnadu, Principles of Planning, Proportions, Elements, Beliefs & Culture, Material of construction and construction detail.

UNIT-IV : Western influences on Vernacular Architecture ï Colonial influence on the traditional House, Bangla & Bungalow, House typologies, settlement planning, Pondicherry & Cochin.

UNIT-V: Secular Architecture ï Medieval Period ï Citadels, Palaces, Towers, Gateways, Public Buildings etc. in the medieval towns of Jodhpur, Jaipur, Jaisalmer, Gwalior etc.

Sessional work;

Assignments and drawing on the above topics given in the subject 10AR01 Climate Responsive Architecture .

10AR02 ARCHITECTURAL PROJECT / THESIS

Objective: Develop any chosen architectural design project, emphasis being on integration of all technical, human & aesthetic aspect in the Architectural design solution.

The topic would be selected by students, subject to approval by the department. The topic selected may be a live design project or research oriented but essentially concluding in its application in architectural design project. The work progress evaluation would also be based on intermediate reviews of the study in presence of panel of teachers and experts from professional field.

The Viva-voce would be in the form of final Review on the basis of sessional submission in presence of two External Examiners. The H.O.D. Department of Architecture and studentôs teacher Guide would act as Internal Examiners.

The students would be required to explain and defend their study and design. The submission would consist of proper Presentation of Drawings, Thesis Report and Model.

The candidate shall carry out thesis considering the following aspect ï Research analysis and data collection, site selection & justification, user requirements & justification, climatic conditions, socio-economic problems, communication, Transportation, Landscape & Urban Planning.

10AR03 SEMINAR

Objective: Seminar is intended to evaluated the studentôs ability to explore in the field of architecture and make in depth investigation in the chosen area.

The students are expected to choose topics which are of special interest to them and prepare a Report and Drawings to show analysis of investigation. The Review of work would be done in presence of H.O.D. Department of Architecture, and nominated teacher guide, and other teachers.

The Viva-voce would be in the form of proper presentation of the Drawings, Information/ Data and Report. The Viva-voce would be in

presence of External Examiner. The H.O.D. Department of Architecture, and studentôs teacher Guide would act as internal examiners.

The Seminar topic can be related to any of the following subject ï Architectural theory , history, design determinates, design language , design evaluation, building types, urban planning and design, housing, interior design, landscape design, building technology and environmental sciences, professional practice and any other related field, accepted and approved by the Department.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7IT 01 DIGITAL SIGNAL PROCESSING

Unit I: Discrete ï Time Signals and Systems: Introduction to DSP, Advantages, basic elements of DSP system, sampling theorem, A/D, D/A conversion, quantization. Elementary discrete-time sequences. Discretetime systems: description, representation, classification (linear, time-invariant, static, casual, stable)

Unit II: Analysis of DTLTI systems: The convolution sum, properties of convolution, Analysis of causal LTI systems, stability of LTI systems, step response of LTI systems, difference equation, recursive & non recursive discrete-time systems, solution of difference equations, Impulse response of LTI recursive system. Correlation of discrete time signals.

Unit III: z- Transform and Analysis of LTI Systems: Definition of z-Transform, properties, rational z-Transforms, evaluation of the inverse z- Transforms, analysis of linear time invariant systems in z-domain, transient and steadystate responses, causality, stability, pole-zero cancellation, the Schur-Cohn stability test

Unit IV: Fourier Transforms, the DFT and FFT: Definition & properties of Fourier transform, relation with ztransform. Finite duration sequences and the discrete Fourier transform(DFT), properties, circular convolution, Fast algorithms for the computation of DFT: radix-2 and radix-4 FFT algorithms

Unit V: Design of Digital Filters: Classification of filters: LP, HP, BP, FIR and IIR filters, filter specifications. Design of FIR filters using Windows and by Frequency sampling methods. Design of IIR filters from Analog filters using approximation of derivatives, Impulse invariant transformation, Bilinear transformation and Matched z-Transformation, Commonly used Analog filters and IIR Filter design example

Unit VI: Realization of Discrete-Time systems: Structures for realization of Discrete-Time systems, realization of FIR systems: Direct Form, Cascade Form, Frequency sampling and Lattice structures. Realization of IIR filters: Direct Form, Signal flow graph and Transposed structures, Cascade form, Lattice and Lattice-ladder. Realization for IIR systems.

TEXT BOOK :

J G Prokis and D G Manolokis, ñDigital Signal Processing: Principles Algorithms and Applications (Pearson Education)

REFERENCE BOOKS:

1. S.Salivahanan, A Vallavaraj,C Gnanapriya ñDigital Signal Processingò (TaTa McGraw Hill)
1. S K Mitra: ñDigital Signal Processing: A Computer-Based Approachò (TaTa McGraw Hill)
2. E C Ifeacthor and B W Jervis ñDigital Signal Processing A Practical Approachò (Pearson Education)
3. A V Oppenheim, R W Schafer with J R Buck ñDiscrete Time Signal Processingò(PHI)

7IT02 OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT-I: Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT-II: Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams.

UNIT-III: Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages, Instances, Object Diagram

UNIT-IV: Basic Behavioral Modeling-I: Interactions, Use cases, Use case Diagrams, Interaction diagrams, Activity Diagrams.

UNIT-V: Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

UNIT-VI: Architectural Modeling: Component, Deployment, Collaborations, Component diagrams and Deployment diagrams.

TEXT BOOK:

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education.

REFERENCE BOOKS:

1. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, WILEY-Dreamtech India Pvt. Ltd.
2. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.
3. Pascal Roques: Modeling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
4. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.

5. Mark Priestley: Practical Object-Oriented Design with UML,TATA McGrawHill
6. Appling UML and Patterns: An introduction to Object ï Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

7IT03 WEB TECHNOLOGY

Unit –I : Web Essentials: The internet, Basic Internet Protocols, The World Wide Web, HTTP Request Massage, HTTP Response Massage, Web Clients, Web Servers, **Markup Languages: XHTML 1.0,** Basics of XHTML, Fundamentals HTML Elements, Relative URLs, Lists, Tables, Frames, Forms, Defining XHTMLôs abstract syntax: XML, Creating HTML Documents.

Unit – II: Style Sheets: Introduction to Cascading Style Sheets, CSS Features, CSS Core Syntax, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Beyond the Normal Flow

Unit –III: Client-Side Programing: Introduction to Java Script™ Language, JavaScript in Perspective, Basic Syntax, Variables and Data types, Statements, Operators, Literals, Functions, Objects, Arrays, Built-in Objects, JavaScript Debuggers, **Host Objects:** Introduction to the Document object Model, Intrinsic Event Handling, Modifying Element Style, The Document Tree, DOM Event Handling, Accommodation Noncompliant Browsers, Additional Properties of Window

Unit-IV: Server-Side Programming : Java Servlets Servlet Architecture Overview, Servlet Generating Dynamic Content, Servlet Life Cycle, Parameter Data, Sessions, Cookies, URl Rewriting, Other Servlet Capabilities, Data Storage, Servlet and Concurrency,

Unit-V: Representing Web Data: XML Documents and Vocabularies, XML versions and XML Declaration, XML Namespaces, JavaScript And XML:Ajax , Dom-Based XML Processing, Event-Oriented parsing: SAX, Transforming XML Documents, Selecting XML Data : XPath, Template-Based Transformation: XSLT, Displaying XML Documents in Browsers, Introduction to Java Server Pages, JSP and Servlets, Running JSP Applications, Basic JSP, JavaBeans Classes and JSP, Tag Libraries and Files,

Unit-VI: Web Services: Web Service Concepts, Writing a Java Web Service, Writing a Java Web Service Client, Describing Web Services: WSDL, Representing Data Types :XML Schema, Communicating Object Data :SOAP,

TEXT BOOK:

1. Web technologies by Jeffrey C. Jackson (Pearson)

REFERENCE BOOKS:

1. The Web Warrior guide to Web Programming by Xue Bai, Micheal Ekedahl, Don Gosselin (CENGAGE Learning)
2. Internet Protocols by Subrata Goswami (Springer India)
3. Dietel and Dietel: WWW: How to Program, (LPE)
4. Dustin R Callaway: Inside Servlets (LPE)

7 IT 04 REAL TIME & EMBEDDED SYSTEMS

UNIT I: Introduction to embedded systems, Processor in the system, Hardware units required in the exemplary cases, Software embedded into a system. Final Machine implement able software for a product, Software in Processor specific assembly language and high level language, Device drivers device management using an operating systems, Software design for scheduling multiple tasks and devices using RTOS, Embedded SoC and in VLSI circuits.

UNIT II: Structural units of the processor, Allocation of memory to program segment and blocks, memory map of the system, Memory blocks for different data sets and structures, serial communication using I2C, CAN and advanced I/O buses between the networked multiple devices, Device drivers, Virtual Devices, Device drivers for parallel port, serial and timing devices, Context and periods for context switching, deadline and interrupt latency.

UNIT III: Software programming in assembly language and C, Use of data structures, Queues, Stacks, Lists and Trees, Function pointers, Function queues and ISR queues, Queues for implementing protocol for a network, Queuing of functions on interrupts, Use of FIFO queues, Stacks, Lists and Ordered Lists, Embedded programming

UNIT IV: Modeling process, Use of dataflow & control data flow graphs, Programming model for event controlled or response time constraint, Real time programs, Inter process Communication and Synchronization, Multiple processes in an application, Sharing data by multiple tasks, use of finite states machine model & Petri net Model, Process, Tasks, Threads.

UNIT V: Use of Semaphores for a task or for Critical section of code, Mutex & P & V, Priority inversion problems & deadlock situations IPC issues, Use of Semaphore flags or Mutex as resource key, use of message queues, mailboxes, pipes, virtual sockets, RPCs.

UNIT VI: Introduction to RTOS, OS Services, RTOS Services, Schedule management for multiple tasks in Real Time, Handling of interrupt source call, RTOS task scheduling models, Cooperative Round Robin Scheduling using a Circular Queue of ready tasks and using and Ordered list as per precedence constraints, Cycling scheduling in Time Sharing, Preemptive scheduling, Critical section service by preemptive scheduler, fixed Real Time scheduling, Precedence assignment in Scheduling algorithms. Performance metrics, IEEE Standard POSIX 1003.1B, fifteen-pointó strategy for Synchronization, Embedded Linux Kernel.

PRACTICALS : Minimum 12 experiments based on above syllabus.

TEXT BOOK:

1. Rajkamal Embedded Systems, Architecture, Programming & Design, TMH.

REFERENCE BOOKS:

1. Real Time Systems, Jane W. S. Liu, Pearson Education
2. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid, Tony Givargis, John Wiley & Sons P Ltd

PROFESSIONAL ELECTIVE - I

7IT05 (1) DISTRIBUTED DATABASE MANAGEMENT SYSTEM

UNIT-I: Introduction to DDBS: Introduction, Promises of DDBs, Problem areas. Overview of Relational DBMS: RDBMS concept, Normalization, Integrity Rules. Review of Computer Networks: Data Communication Concepts, Types of Network, Protocol Standard. (8)

UNIT-II: Distributed DBMS architecture: DBMS standardization, Architectural Models, Distributed DBMS arch. Distributed Database Design: Alternative Design Strategies, Distributed Design issues, Fragmentation, Allocation Semantic Data Control: View Management, Data Security, Semantic Integrity Control. (8)

UNIT-III: Overview of Query Processing: Problem & objectives of Query Processing, Characteristics of Query processors, Layers of Query processing. (9)

UNIT-IV: Distributed Transaction management and Concurrency control: Definition, Properties and types of Transaction. Distributed Concurrency control: Serilizability, Taxonomy, Locking based concurrency control algorithms, Deadlock management. (9)

UNIT-V: Distributed DBMS reliability: Reliability concepts and measures, Failures and Fault tolerance in distributed systems, Failures in DDBMS, Local reliability protocols, dealing with site failures. (8)

UNIT-VI: Distributed Object Database Management Systems: Fundamental, Design and Architectural issues of ODBMS, Current issues: Data Delivery Alternatives, Dataware housing. World wide web, Mobile databases. (8)

TEXT BOOKS :

1. M. Tamer Oizsu and Patrick Valdurlez : Principles of Distributed Database Systems, 2nd ed. (Text Book) Person Education, LPE.
2. Ceri and Palgetti : Distributed Database System-(Reference Book) TMH.

PRFESSIONAL ELECTIVE - I

7IT05 (2) MODELING & SIMULATION

UNIT I: System Models and System Studies

Basic concepts of systems ,System Environment , system modeling ,Types of Models, Principles used in modeling, Corporate models, Types of System Study-analysis, design and postulation of systems.

UNIT II: Basic Concepts and continuous systems

Monte Carlo Method ,Numerical Computation Technique for Continuous Models, & Discrete Models, Distributed log models, Cobweb Models , Analog and hybrid computers CSMP III.

UNIT III: System dynamics, probability concepts and basic principles of discrete simulation Growth and decay models system dynamics diagrams examples. Discrete Probability functions , Continuous Probability functions , Measures of Probability functions , Numerical on evaluation of Continuous Probability functions, Continuous Uniformly Distributed Randam Numbers ,Computer Generation of Random number .

UNIT IV: Simulation of Queueing System and PERT Network

Simulation of Queueing systems: Rudiments of queueing theory, simulation of a single server queue, Simulation of a two-server queue, simulation of more general queues.

Simulation of a PERT Network: Network model of a project, Analysis of an activity network, critical path computation, and uncertainties in activity durations, simulation of an activity network.

UNITV: Simulation of Inventory Control & Forecasting Design and Evaluation of Simulation Experiments

Inventory Control and Forecasting: Elements of inventory theory, More complex inventory models, Simulation example-1, Generation of Poisson and Erlang variates, Simulation example-2, Forecasting and regression analysis.

Design and Evaluation of Simulation Experiments: Length of simulation runs, variance reduction techniques,Experimental layout, validation, summary an conclusions.

UNITVI: Simulation Languages and Introduction to GPSS
Different special purpose languages used for continuous and discrete systems and comparison-factors affecting the selection of discrete system simulation language-comparison of GPSS and SIMSCRIPT. A detailed study of GPSS with examples.

TEXT BOOKS:

1. Groffrey Gordon ñSystem Simulationò, IInd Edition, PHI Pvt. Ltd.,New Delhi-1987.
2. Narsingh Deo, ñSystem Simulation with Digital Computersò PHI Pvt.Ltd., New Delhi.

REFERENCE BOOKS:

1. Shannon R.E., ñSystem Simulation: The Art of Scienceò Prentice Hall, Englewood Cliffs, NY, 1975.
2. Hugh J. Watson, John H. Blackstone, Jr., ñComputer SimulationòIInd Edition, John Wiley & Sons.

PRFESSIONAL ELECTIVE - I

7IT05 (3) ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

Unit-I: **Introduction to Artificial Intelligence:** The AI Problems, The Underlying Assumption, What is an AI Technique; **Problems, Problem Spaces, and Search,** Production Systems, Problem Characteristics , Production System Characteristics, Issues in the Design of Search Programs

Unit-II: **Heuristic Search Techniques:** Generate-and-Test, Hill Climbing, Best-first Search, A* Algorithm, Problem Reduction, AND-OR Graphs, The AO* Algorithm, Constraint Satisfaction, Means-ends Analysis,

Unit–III: **Knowledge Representation Issues:** Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, The Frame Problem, **Predicate Logic:** Representing Simple Facts in Logic,
Representing Instance and *ISA* Relationships, Computable Functions and Predicates, Resolution, Natural Deduction **Representing Knowledge Using Rules,** Procedural Versus Declarative Knowledge, Logic Programming Forward Versus Backward Reasoning , Matching, Control Knowledge.

Unit –IV: **Symbolic Reasoning Under Uncertainty** Introduction to Nonmonotonic Reasoning , Logics for Nonmonotonic Reasoning, Implementation Issues, Augmenting a Problem-solver,

Implementation: Depth-first Search, Implementation: Breadth-first Search, **Statistical Reasoning** Probability and Bayesô Theorem, Certainty Factors and Rule-based Systems, Bayesian Networks, Semantic Nets, Frames.

Unit-V: **Understanding** What is Understanding?, Understanding as Constraint Satisfaction, **Natural Language Processing,** Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural Language Processing, Spell Checking, **Common Sense** Qualitative Physics, Common Sense Ontologies.

Unit-VI: **Expert Systems** Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition, **Fuzzy Logic Systems:** Introduction, Crisp Sets, Fuzzy Sets, Some Fuzzy Terminology, Fuzzy Logic Control, **Genetic Algorithms:** Significance of the Genetic Operators, Termination Parameters, Evolving Neural Networks.

TEXT BOOK:

Artificial Intelligence ï Elaine Rich, Kevin Knight, Nair (Third Edition) [Mc Graw Hill]

REFERENCE BOOKS.:

1. Introduction to Artificial Intelligence and expert system ï Dan W. Patterson
2. Expert System- Peter Jackson (Third Edition)
3. Introduction to Artificial Intelligence ï Rajendra Akerkar

PRFESSIONAL ELECTIVE - I

7IT05 (4) MULTIMEDIA TECHNOLOGIES

UNIT I: Multimedia Authoring and Data Representations: Introduction, Components of Multimedia, Hypermedia and Multimedia, Overview of Multimedia Software Tools, Multimedia Authoring and Tools: Multimedia Authoring, VRML. Graphics and Image Data Representations: Graphics/Image Data Types, 1-Bit Images, 8-Bit Gray-Level, Images, Image Data Types, Popular File, Formats, GIF, JPEG, PNG, TIFF, EXIF, Graphics Animation Files, PS and PDF, Windows WMF, Windows BMP, Macintosh PAINT and PICT, X Windows PPM.

UNIT II: Color in Image and Video: Color Science, Color Models in Images, and Color Models in Video.Fundamental Concepts in Video: Types of Video Signals, Component Video, Composite Video, S-Video, Analog Video, NTSC Video, PAL Video, SECAM Video, Digital Video, Chroma Sub sampling , CCIR Standards for Digital Video, High Definition TV.

UNIT III: Basics of Digital Audio: Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface, Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion, Quantization and Transmission of Audio, Coding of Audio, Pulse Code Modulation, Differential Coding of Audio, Lossless Predictive Coding, DPCM, DM, ADPCM.

UNIT IV: Multimedia Data Compression: Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding (VLC), Dictionary-Based Coding, Arithmetic Coding, Lossless Image Compression. The JPEG Standard.

UNIT V: Basic Video Compression Techniques: Introduction, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, Intra-Frame (I-Frame) Coding, Inter-Frame (P-Frame) Predictive Coding, Quantization in H.261, H.261 Encoder and Decoder, H.261 Video Bitstream Syntax, MPEG-1, Motion Compensation in MPEG-1 , Major Differences from H.261

UNIT VI: Basic Audio Compression Techniques: ADPCM, Vocoders, Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP. MPEG Audio Compression: Psychoacoustics, Equal-Loudness Relations, Frequency Masking, Temporal Masking, MPEG Audio, MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithm, MPEG-2 AAC (Advanced Audio Coding).

TEXT BOOK:

Ze-Nian, Li, Mark S. Drew ñFundamentals of Multimediaò (Pearson Education)

REFERENCE BOOKS:

1. Rajan Parekh ñPrinciples of Multimediaò (Tata McGraw-Hill)
2. S.J.Gibbs & D.C.Tsichritzis ñMultimedia Programmingò, Addison Wesley 1995
3. P.W.Agnew & A.S.Kellerman ñDistributed Multimediaò, , Addison-Wesley 1996
4. C.A.Poynton, ñA Technical Introduction to Digital Videoò Wiley 1996
5. F.Fluckiger, ñUnderstanding Networked Multimediaò, Prentice-Hall 1995

7IT06 DIGITAL SIGNAL PROCESSING - LAB:

Minimum 8 experiments based on the syllabus of 7IT01.

7IT07 WEB TECHNOLOGY - LAB:

Minimum 8 experiments based on the syllabus of 7IT03.

7IT08 REAL TIME EMBEDDED SYSTEMS - LAB:

Minimum 8 experiments based on the syllabus of 7IT04.

7IT08 REAL TIME & EMBEDDED SYSTEMS

UNIT I: Introduction to embedded systems, Processor in the system, Hardware units required in the exemplary cases, Software embedded into a system. Final Machine implement able software for a product, Software in Processor specific assembly language and high level language, Device drivers device management using an operating systems, Software design for scheduling multiple tasks and devices using RTOS, Embedded SoC and in VLSI circuits.

UNIT II: Structural units of the processor, Allocation of memory to program segment and blocks, memory map of the system, Memory blocks for different data sets and structures, serial communication using I2C, CAN and advanced I/O buses between the networked multiple devices, Device drivers, Virtual Devices, Device drivers for parallel port, serial and timing devices, Context and periods for context switching, deadline and interrupt latency.

UNIT III: Software programming in assembly language and C, Use of data structures, Queues, Stacks, Lists and Trees, Function pointers, Function queues and ISR queues, Queues for implementing protocol for a network, Queuing of functions on interrupts, Use of FIFO queues, Stacks, Lists and Ordered Lists, Embedded programming

UNIT IV: Modeling process, Use of dataflow & control data flow graphs, Programming model for event controlled or response time constraint, Real time programs, Inter process Communication and Synchronization, Multiple processes in an application, Sharing data by multiple tasks, use of finite states machine model & Petri net Model, Process, Tasks, Threads.

UNIT V: Use of Semaphores for a task or for Critical section of code, Mutex & P & V, Priority inversion problems & deadlock situations IPC issues, Use of Semaphore flags or Mutex as resource key, use of message queues, mailboxes, pipes, virtual sockets, RPCs.

UNIT VI: Introduction to RTOS, OS Services, RTOS Services, Schedule management for multiple tasks in Real Time, Handling of interrupt source call, RTOS task scheduling models, Cooperative Round Robin Scheduling using a Circular Queue of ready tasks and

using and Ordered list as per precedence constraints, Cycling scheduling in Time Sharing, Preemptive scheduling, Critical section service by preemptive scheduler, fixed Real Time scheduling, Precedence assignment in Scheduling algorithms. Performance metrics, IEEE Standard POSIX 1003.1B, fifteen-pointó strategy for Synchronization, Embedded Linux Kernel.

PRACTICALS : Minimum 12 experiments based on above syllabus.

TEXT BOOK:

1. Rajkamal Embedded Systems, Architecture, Programming & Design, TMH.

REFERENCE BOOKS:

1. Real Time Systems, Jane W. S. Liu, Pearson Education
2. Embedded System Design, A Unified Hardware/Software Introduction, Frank Vahid, Tony Givargis, John Wiley & Sons P Ltd

7IT09 PROJECT AND SEMINAR:

Seminar should be preferably based on the proposed project to be covered in final year. The semester should be conducted in seventh semester and evaluated. Each candidate shall submit a seminar report, deliver the seminar and face the viva-voce. The distribution of internal 50 marks shall be as follows.

1.	Seminar report preparation and submission :-	10 marks
2.	Seminar delivery/ presentation:-	20 marks
3.	Seminar viva-voce:-	10 marks
4.	Attendance in all seminar session:-	10 marks

SEMESTER: EIGHT

8IT01 DIGITAL AND WIRELESS COMMUNICATION

Unit I: Information Theory: Elements of digital communication system, ,Unit of information, Entropy, Rate of information, Joint entropy, Conditional entropy, Mutual information ,Channel Capacity ,Shenonanõs Thorem, Shenonan and Hartely Theorem, coding efficiency, Shananon-Fano coding Theorem.

Unit II: Error controlling and coding: Methods of controlling error, linear block codes, matrix description of linear block codes, error detection and error correction capabilities of linear block codes, single error correcting Hamming codes, Cyclic codes, syndromes calculation, error detection, Introduction to Convolution codes

Unit III: Spread Spectrum Sign**a**l**s**: Model of spread spectrum communication system, direct sequence spread spectrum signals, generation of PN sequences, frequency hopping spread spectrum (slow frequency and high frequency hopping), comparison, basic principles of TDMA, FDMA, CDMA.

Unit IV: Cellular Telephone Concepts: Introduction, mobile telephone service, cellular telephone architecture, frequency reuse, cell splitting, sectoring, segmentation and dualization, cellular system topology, roaming and handoffs.

Unit V : GSM & CDMA Technologies : Introduction to GSM, GSM Network Architecture, Protocol Architecture, GSM Channels, Frame structure for GSM, Authentication & Security in GSM, Introduction to CDMA, Architecture of CDMA System, IS-95 CDMA Forward & Reverse channel, Soft handoff.

Unit VI: Wireless network technology: IEEE 802.11WLAN technology, ETSI HIPERLAN Technology, IEEE 802.15 WPAN Technology, IEEE 802.16 WMAN Technology, Mobile Ad hoc Network (MANETs), Mobile IP and Mobility Management, Mobile TCP, Wireless Sensor Networks, RFID Technology, Security Requirements for Wireless Network

TEXT BOOKS:-

1. K.S.Shanmugam: Digital & Analog Communication Systems, Wiley
2. T.L.Singal Wireless communications Mc Graw Hill.

REFERENCE BOOKS:-.

1. R.P. Singh,S.D. Sapre:Communication System Mc Graw Hill.
2. William Stallings : ñWireless Communication and Networksò, Pearson Education Asia .
3. J.G.Proakis: Digital Communication, Mc Graw Hill.
4. P. Ramakrishna Rao: Digital Communication, Mc Graw Hill.
5. Wayne Tomasi : Advanced Electronics Communication Systems, Pearson.
6. Theodore S. Rappaport, ñWireless Communications- Principles and Practice, Pearson.

8IT02 NETWORK ADMINISTRATION AND SECURITY

UNIT I: Introduction to network security, passive and active attacks, authentication, integrity, access control, The model of internetwork security, internet standards: the internet society and RFC publications (Request for comments.)

UNIT II: Cryptography: Encryption principles and various algorithms, standardization process, key distribution, public key cryptography and message authentication, digital signature.

UNIT III: Network security applications: Kerberos, X.509 directory authentication services, e-mail security PGP (Pretty Good Privacy) operational description. MIME (Multipurpose Internet Mail Extensions), S MIME (Security/Multipurpose internet mail extensions) functionality.

UNIT IV: IP Security: Overview, IP security architecture, Authentication header, Web Security: Web security requirements, secure socket layer SSL, Transport layer security TLS, Secure electronic transactions TES.

UNIT V: Network Management Security: Basic concepts of SNMP, Network management architecture and protocol architectures, proxies, services, SNMPv1 authentication service, access policy and proxy service, SNMPv2 architecture, message processing and user security model, view based access control.

UNIT VI: System Security: Intruders, Intrusion technologies, password protection, password selection strategies, Intrusion detection, viruses and related threats: Nature of viruses, types, micro viruses and various antivirus approaches. Firewall: Characteristics, types of fire walls, Firewall configuration, Trusted systems, data access control, the concept of the trusted systems.

TEXT BOOKS :

Network Security Essentials - William Stallings (Pearson Edu. Asia)

REFERENCE BOOKS :

1. Security for Telecommunication and Network management by Moshe Rozenbit (PHI)
2. Internet Security Protocols - Protecting IP Traffic, by Uyless Black (Pearson Edu. Asia)

8IT03 SOFTWARE ENGINEERING

UNIT I: Evolving role of Software. Software crises & myths. Software engineering. Software process & process models : Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts : People, Product, Process, Project. WSHH principle, critical practice.

UNIT II: Measures, Metrics & Indicators. Metrics in process & project domains-software measurment, Metrics for software quality, small organization. Software projects Planning : Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection,refinement & RMMM plan.

UNIT III: Project Scheduling : Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.

UNIT IV: System engineering : Hierarchy, Business Process & Product engineering : Overviews. Requirement engineering, System

modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.

UNIT V: Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation.

UNIT VI: Software testing fundamentals ; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.

TEXT BOOK :

Pressman Roger. S. : Software Engineering, A Practitioner's Approach TMH.

REFERENCE BOOKS :

1. Somerville : Software Engineering (Addison-Wesley) (5/e)
2. Fairly R. : Software Engineering (McGraw Hill)
3. Davis A. : Principles of Software Development (McGraw Hill)
4. Shooman, M.L. : Software Engineering (McGraw-Hill)

8IT04 PROFESSIONAL ELECTIVE - II

(1) DATA WAREHOUSING AND DATA MINING

UNIT I: Introduction, Data mining, Data mining functions, classification and major issues. Data Preprocessing : Data cleaning, data integration and transformation, data reduction, discretisation & concept hierarchy generation. (10 hours)

UNIT II: Data mining primitives : Data mining primitives, data mining query language. Concept description : concept description, data generalization, Analytical characterization, mining class comparison. (8)

UNIT III: Application and trends in data mining : data mining applications, data mining systems and research prototypes, additional themes on data mining, trends in data mining (8)

UNIT IV: Data ware house and OLAP Technology for data mining : What is data ware house, multidimensional data model, data ware house architecture, data ware house implementation. (8)

UNIT V: Data Stagiing : overview, plan effectively, dimension table staging, fact table loads and ware house operations, data quality and cleansing, miscellaneous issues. (8)

UNIT VI: Building end user applications : role of end user application, application specification, end user application development, maintaining and growing data ware house : manage the exisiting data ware house environment, prepare for growth and evaluation. (8)

TEXT BOOKS :

1. J. Han and M.Kamber : Data Mining Concepts and Techniques, Elsevier Pub. Indian Reprint, 2004.
2. R. Kimball : The Data Ware House Life Cycle Tool Kit, Wiley Press,John Wiley and Sons (ASIA) Pvt. Ltd.

REFERENCE BOOKS :

1. Berson : Data Ware Housing, Data Mining and OLAP, Tata McGraw Hill.
2. Arun K. Pujari : Data Mining Techniques, University Press (Orient Longman)

8IT04 PROFESSIONAL ELECTIVE - II
(2) WEB COMMERCE

UNIT-I: Basic web commerce concepts, electronic commerce environments,electronic marketplace technologies , commerce modes:overview, EDI, electronic commerce with www-internet,commerce net advocacy.

UNIT-II: Approach to safe E-commerce: overview , secure transport protocol and transaction, SEPP, SET, certificate for authentication, security on web server and enterprise network.

UNIT-III: Electronic cash and Electronic payment scheme:Internet monetary payment and security requirements; Payment & purchase order process, Online Electronic cash.

UNIT-IV: Internet/Intranet Security issues and solutions: Needs for computer security, security strategies, Encryption. MasterCard/ visa secure Electronic Transaction: Introduction requirements and concepts, payment processing.

UNIT-V: Secure E-mail Technologies:Introduction, means of distribution, models for message handling, How does Email work? MIME, S/ MIME, moss comparisons of security methods, MIME and Related facilities for EDI over the internet

UNIT-VI: Internet & web site Establishment:Internet Resources for commerce: introduction, Web server Technologies, internet tools Relevant to commerce, internet applications for commerce, internet Access and Architecture,Internet searching.

TEXT BOOK :

Daniel Minoli & Emma Minoli : Web Commerce Technology Hand Book

REFERENCE BOOKS :

1. David Whiteley : E Commerce (TMH)
2. Kalakota Whinston ï frontiers of e Commerce (Pearson education)

8IT04 PROFESSIONAL ELECTIVE - II
(3) CLOUD COMPUTING

UNIT I: **Introduction:** Cloud Computing Defined, the SPI Framework for Cloud Computing: Relevant Technologies in Cloud Computing, the Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Barriers to Cloud Computing Adoption in the Enterprise.

UNIT II: **Infrastructure Security:** The Network Level: Ensuring Data Confidentiality and Integrity, Ensuring Proper Access Control, The Host Level: SaaS and PaaS Host Security, IaaS Host Security, Virtual Server Security, The Application Level: SaaS Application Security, PaaS Application Security, IaaS Application Security, **Data Security and Storage:** Provider Data and Its Security.

UNIT III: **Identity and Access Management:** Need of IAM , IAM challenge and definition, IAM Architecture and Practice, **Security Management in the Cloud:** Security Management in the Cloud, Availability Management, SaaS, PaaS, IaaS Availability Management, Access control.

UNIT IV: **Privacy:** Key Privacy Concerns in the Cloud?, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, International Laws and Regulations.

UNIT V: **Audit and Compliance:** Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Illustrative Control Objectives for Cloud Computing, Incremental CSP-Specific Control Objectives, Additional Key Management Control Objectives, Control Considerations for CSP Users, Regulatory/External Compliance.

UNIT VI: **The Impact of Cloud Computing on the Role of Corporate IT**: Why Cloud Computing Will Be Popular with Business Units, Potential Threats of Using CSPs, A Case Study Illustrating Potential Changes in the IT Profession Caused by Cloud Computing, Governance Factors to Consider When Using Cloud Computing.

TEXT BOOK:

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy, OõReilly.

REFERENCES:

1. George Reese, Cloud Application Architectures, OõReilly.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing

8IT04 PROFESSIONAL ELECTIVE - II
(4) NEURAL NETWORK AND FUZZY LOGIC

UNIT-I: Fundamental of Neural Network: Basic concepts of Neural Network, Human Brain, Model of artificial neurons, Neural Network architecture, Characteristics of Neural Network, Learning methods, Taxonomy of Neural Network architecture, Early Neural Network architecture. (08 Hrs)

UNIT II: Backpropogation Networks: Architecture of a Back propagation Network, The Perceptron Model, The solution, Single Layer Artificial Neural Network, Model for Multiayer Perceptron, Back propagation learning, Input Layer, Hidden Layer and Output Layer Computation, Calculation of error, Training of Neural Network, Method of Seepest Descent, Effect of Learning rate, Adding a momentum Term, Backpropogation Algorithm. (08Hrs)

UNIT III: Associative Memory:- Autocorrelation, Hetro-correlation, Multiple training encoding strategy, Exponential BAM, Associate memory for Real coded pattern pairs, Character recognition application, (08 Hrs)

UNIT IV: Adaptive Resonance Theory:- Cluster structure, Vector quantization, classical ART network, simplifier ART architecture, ART1: architecture, special features and algorithm, ART2: architecture, special features and algorithm, character recognition using ART1. (08 Hrs)

UNIT-V: Fuzzy Set Theory: Fuzzy verses Crisp, Crisp sets, Operations and Properties of Crisp Sets, Partition and Covering, Fuzzy sets, Membership Function, Basic Fuzzy Set Operation, Properties of Fuzzy Sets, Crisp Relations, Cartesian product, other relations, Operations on Relations, Fuzzy Relations, Fuzzy Cartesian Product, Operations on Fuzzy Relations. (08Hrs)

UNIT VI: Fuzzy Systems: Crisp logic, Laws of Propositional logic, Inference in Propositional logic, Predicate logic, Interpretations of Predicate Logic Formula, Inference in Predicate Logic, Fuzzy logic, Fuzzy Quantifiers and Inference, Fuzzy rule based system, Defuzzification methods, applications. (08 Hrs)

TEXT BOOK :

S. Rajesekaran, G. A. Vijayalakshmi Pai: ñNeural Network, Fuzzy logic, and Genetic algorithms Synthesis and Applicationsò PHI.

REFERENCE BOOKS:

1. S. Hykin: ñ Neural Networksò Pearson Education.
2. Jang,Sun and Mezutani: ñ Neuro Fuzzy and Soft Computingò .
3. Zurada: ñ Artificial Neural Neworksò.
4. N.P.Pahey: ñArtificial Intelligence and Intelligent Systemsò, Oxford University Press.

8IT05 NETWORK ADMINISTRATION AND SECURITY - LAB:
Minimum 8 experiments based on the syllabus of 8IT02.

8IT06 SOFTWARE ENGINEERING - LAB:
Minimum 8 experiments based on the syllabus of 8IT03.

8IT07 COMPUTER LAB-V (CONTENT MANAGEMENT SYSTEM):
Practicals based on Content Management Systems:
A list of sample practicals can be as under:

1. To Study Content Management System.
2. To Study Different Types of Content Management System.
3. Installation of Content Management System framework.
4. Installation of Different Tool on Content Management System framework.
5. To Study WAMP Server and there installation.
6. To creating & Configuring Menus in Joomla
7. To installing & Configuring Templates in Joomla.
8. To design advance templates & CSS Tricks
9. To Customise XML Templates in Joomla

8IT08 PROJECT AND SEMINAR:
The project shall be evaluated in three phases based on the progress of the project work.
Phase I: - Problem, Definition and Design
Phase II: - Problem Implementation and Testing
Phase III: - Project demonstration & report submission.
Each phase shall be internally evaluated for 25 marks.

The external evaluation of the project shall be based on demonstration of the project and viva-voce

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
BIOMEDICAL ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : SEVENTH

7 BM01 BIO SIGNAL PROCESSING

UNIT I : Discrete-time Signals and Systems:-
Characterization, classification and time-domain representation of discrete-time signals, Typical sequences and their representation, Classification of sequences, Basic operations on sequences, Discrete-time systems.

UNIT II : The discrete-time Fourier transform (DTFT):-
The discrete Fourier Transform (DFT), Computation of the DFT. Theory of Z-Transform Mathematical derivation of the unilateral z-transform, Properties of the z-transform, the inverse z-transform, The bilateral z-transform, Power series, Region of convergence (ROC) and its impedance.

UNITIII : Neurological Signal Processing:-
The brain and its potentials, The electrophysiological origin of brain waves, The EEG signal and its characteristics, EEG analysis, Linear prediction theory, The autoregressive (AR) method, Recursive estimation of AR parameters, Spectral error measure, Adaptive segmentation, Transient detection and elimination ï the case of epileptic patients, Overall performance.

UNIT IV: Cardiological Signal Processing:-
Basic electrocardiography, ECG data acquisition, ECG lead system, ECG parameters and their estimation, the use of multiscale analysis for parameters estimation of ECG waveforms, Arrhythmia analysis monitoring, Long-term continuous ECG is recording.

UNIT V: ECG Data Reduction Techniques:-
Direct data compression techniques, Direct ECG data compression techniques, Transformation compression technique, other data compression techniques, The PRD index.

UNIT VI: Data compression techniques:-
ECG acquisition and transmission. Data reduction algorithms. Turning point. AZTEC, CORTES and the KL transform.

TEXT BOOKS :-

1. Biomedical Signal Processing, Principles and Techniques by D.C.Reddy, Tata McGraw Hill, 2005.
2. Biomedical signal processing. Vol-I, Time frequency analysis. Cohen A. CRC press.

3. Biomedical signal processing. Akay M. Academic Press.D.C.Reddy,òBiomedical Signal Processing ï Principles and Techniquesò, TMH

.

REFERENCE BOOKS :

1. Wills J. Tompkins, ñBiomedical digital signal processingò, PrenticeHall of India Pvt. Ltd.
2. Digital biosignal processing. Weitkunat R, Elsevier.

7 BM02 ARTIFICIAL ORGANS & REHABILITATION ENGINEERING

UNIT I : Introduction to artificial organs: Biomaterials used in artificial organs and prostheses, inflammation, rejection, correction.Rheological properties of blood, blood viscosity variation: effect of shear rate, hematocrit, and temperature and protein contents. Casson equation, flow properties of blood through the blood vessels, problems associated with extracorporeal blood low**:**Substitutive medicine, outlook for organ replacement, design consideration, evaluation process.

UNIT II: Audiometry: air conduction, bone conduction, masking, functional diagram of an audiometer. Hearing aids: different types,receiver amplifiers. Opthalmoscope, retinoscope,I.A.B.P principle and application.
Rehabilitation Engineering: Impairments, disabilities and handicaps, Measurement and assessment. Characterizing engineering concepts in sensory and motor rehabilitation. Engineering concept in communication disorders. Rehabs for locomotion, visual, speech & hearing. Artificial limb and hands.

UNITIII : ARTIFICIAL HEART AND CIRCULATORY ASSIST DEVICES:
Engineering design, Engg design of artificial heart and circulatory assist devices, blood interfacing implants ï introduction, total artificial hearts & ventricular assist devices,vascular prostheses, Non-blood interfacing implants for soft tissues- sutures and allied augmentation devices,percutaneous and skin implants, maxillofacial implants, eye and ear implants.

UNIT IV: CARDIAC VALVE PROSTHESES: Mechanical valves, tissue valves, current types of prostheses, tissue versus mechanical, engineering concerns and hemodynamic assessment of prosthetic heart valves, implications for thrombus deposition, durability, current trends in valve design, vascular grafts-history, synthetic grafts, regional patency, thrombosis, neointimal hyperplasia, graft infections.

UNIT V: ARTIFICIAL KIDNEY: Functions of the kidneys, kidney disease, renal failure, renal transplantation, artificial kidney, dialyzers,

membranes for haemodialysis, haemodialysis machine, peritoneal dialysis equipment-therapy format, fluid and solute removal.

ARTIFICIAL BLOOD: Artificial oxygen carriers, flurocarbons, hemoglobin for oxygen carrying plasma expanders, hemoglobin based artificial blood.

UNITVI: **ARTIFICIAL LUNGS:** liver Gas exchange systems, Cardiopulmonary bypass (heart-lung machine)-principle block diagram and working, artificial lung versus natural lung. Liver functions, hepatic failure, liver support systems, general replacement of functions.

ARTIFICIAL PANCREAS: Structure and functions of pancreas, endocrine pancreas and insulin secretion, diabetes, insulin, insulin therapy, insulin administration systems. Tracheal replacement devices, laryngeal replacement devices, Artificial esophagus Artificial Skin: Vital functions of skin, current treatment of massive skin loss, design principles for permanent skin replacement.

TEXT BOOKS:

1. Biomedical Engineering Handbook-Volume 1, 2nd Edition ï by J.D.Bronzino, CRC
2. Biomedical Engineering Handbook-Volume 2 (2nd Edition) - byJ.D.Bronzino, CRC

REFERECNE BOOKS:

1. Hand book of Biomedical Engineering. Bronzino. Joseph
2. Hand book of Biomedical Instrumentation. R.S.Khandpur
3. Artificial Organs. Erie.D.Blom, Howard.B.Rotham.
4. Biomedical Engineering Principles (Volume ï II). David O. Cooney.,Marcel Dekker Inc.

7BM03 MEDICAL EXPERT SYSTEMS

UNIT–I: General issues and overview of AI, AI Techniques, AL problems, AI Techniques, importance and areas of AI, problem solving state space search-DLF, BFS Production system, problem haracteristics.

Heuristic Search Techniques: Generate and Test, Hill Climbing, Best First Search, Problem reduction, Constraint satisfaction-Cryptarithmetic and problems.

UNIT-II: Knowledge representation & mapping, approaches to knowledge to representation, issues in knowledge representation, Representing simple facts in logic, representing instance and relationships, Resolution and natural deduction Representing knowledge using rules, Procedural v/s Declarative knowledge,

Logic programming, Forward v/s Backward chaining, Matching & control knowledge.

UNIT III: AI programming language: Prolog- objects, relationships, facts, rules and variables, Prolog: Syntax and data structures, representing objects & relationships by using ñtreesò and ñlistsò, use of cut, I/O of characters and structures.

UNIT-IV: Symbolic reasoning under uncertainty: Introduction to monotonic reasoning, Logics for Nonmonotonic reasoning, implementation issues, implementation: DFS & BFS. Architecture of the expert system ï problem selection ï formalization -implementation ï evaluation.

UNIT–V: Slot and filler structures: Semantic nets, frames, conceptual dependency, scripts, CYC Natural languages and NLP, Syntactic processing parsing techniques, semantic analysis case grammar, augmented transition net, discourse & pragmatic processing, translation.

UNIT-VI: Definition and characteristics of Expert System, representing and using domain knowledge, Expert system shells Knowledge Engineering, knowledge acquisition, expert system life cycle & expert system tools, MYCIN & DENDRAL examples of expert system

TEXT BOOKS:

1. Introduction to AI & Expert System ï D. W. Patterson, Prentice hall of India
2. Principles of Artificial Intelligence& Expert Systems Development ï David W.Rolston, Tata McGraw Hill

REFERECNE BOOKS:

1. Artificial Intelligence ï Elaine Rich, McGraw Hill
2. Principles of Artificial Intelligence ï Nils J. Nilsson, Springer Verlag
3. Introduction to Artificial Intelligence ï Charnaik & McDermott, Addison Wesley

7 BM 04 HOSPITAL ENGINEERING & MANAGEMENT

UNIT I: **Classification of hospital & architecture:** General hospital, specialized hospital, primary health care ï their role and functions. Aspects of hospital services ï inpatient, outpatient and mergency. Location and environment of hospital.

UNIT II: **Hierarchy of medical and paramedical staff & their functions and responsibilities:-** Modern Hospital Architecture- space in a

hospital building, design of ward, intensive care units, air conditioning, plumbing & sanitation, gas supply, waste disposal, cleaning, dietary, sterilizing, laundry, storage and operation theatre systems, Radiology, Central labs, Blood banks, OPD, Causality, etc.

UNITIII: Electrical power systems in hospitals: Safety of electrical systems, Protective systems ï interference of patientôs protection grounding. Design of sub stations, breakers, Surge protectors, EMI filters, voltage stabilizers, generator sets and UPS. Uninterrupted power supply for ICU and computerized monitoring units. Specification & estimation for hospital wiring.

UNITIV: Air conditioning & gas supply systems:
Air conditioning and refrigeration systems for small and large areas. Air changes, filtering and sterility. Deodorizations, disinfection, Dehumidification and cryogenic systems. Centralized supply of air, oxygen, nitrous oxide & vacuum -Principle of production of liquid oxygen. Management lifts fire fighting equipments.

UNITV: Hospital engineering & Management:
Definition of biomedical Engineering, clinical engineering & hospital engineering. Importance of BME department ï servicing and maintenance, testing, acceptance &maintenance protocols, Computerized preventive maintenance planning, MROs. Training of men for medical equipments preventive and periodical maintenance procedures. Preparation of estimates, specifications, tender details etc. Importance of ISO 9000 Certificates ï Obtaining ISO certificates in hospitals. Proposed protocols.

UNITVI: Hospital Information system: Role of database in HIS. Need of Networking in HIS. Overview of Networking, topologies and its configuration. Structuring medical records to carry out functions like admissions, discharges, treatment history etc. Computerization in pharmacy & billing. Automated clinical laboratory systems & radiology information system.

REFERENCE BOOKS:

1. Harold E. Smalley, ñHospital Management Engineering ï A guide to the improvement of hospital management systemò, PHI.
2. C. A. Caceras ,òClinical Engineeringò
3. L. C. Redstone ,òHospital and Health Care Facilitiesò Ward ,òAnesthetic Equipmentsò. IS, ñISO Certification detailsò
4. Bhaumick and Bhattachary,ò EHV Substation equipmentsò
5. Alexander Kusko,ò Emergency and Standby Power Systemsò

6. Balagune Swamy ,òReliability Engineeringò
7. Anantha Narayanan ,òBasic Refrigeration and Air Conditioningò

PROFESSIONAL ELECTIVE-I

7 BM 05 (1) TISSUE ENGINEERING

UNIT I : Introduction:
Basic definition, Structural and organization of tissues: Epithelial, connective; vascularity and angiogenesis, basic wound healing, cell migration, current scope of development and use in therapeutic and in-vitro testing.

UNIT II : Cell culture:
Different cell types, progenitor cells and cell differentiations, different kind of matrix, cell-cell interaction. Aspect of cell culture: cell expansion, cell transfer, cell storage and cell characterization, Bioreactors.

UNITIII: Molecular biology aspects:
Cell signaling molecules, growth factors, hormone and growth factor signaling, growth factor delivery in tissue engineering, cell attachment: differential cell adhesion, receptor-ligand binding, and Cell surface markers.

UNIT IV: Scaffold and transplant:
Engineering biomaterials for tissue engineering, Degradable materials (collagen, silk and polylactic acid), porosity, mechanical strength, 3-D architecture and cell incorporation.

UNIT V: Engineering tissues for replacing bone, cartilage, tendons, ligaments, skin and liver. Basic transplant immunology stems cells: introduction, hepatopoiesis.

UNIT VI: Case study and regulatory issues:
Case study of multiple approaches: cell transplantation for liver, musculoskeletal, cardiovascular, neural, visceral tissue engineering. Ethical, FDA and regulatory issues of tissue engineering.

TEXT / REFERENCE BOOKS:

1. Principles of tissue engineering, Robert. P.Lanza, Robert Langer & William L..
2. The Biomedical Engineering ï Handbook, Joseph D. Bronzino,
3. Introduction to Biomedical Engg. , Endarle, Blanchard & Bronzino,Academic
4. Tissue Engineering, B. Palsson, J.A. Hubbell, R.Plonsey & J.D.Bronzino

PROFESSIONAL ELECTIVE-I

7 BM0 5 (2) BIO-INFORMATICS

UNIT I : Introduction to genomics:
Information flow in biology, DNA sequence data, experimental approach to genome sequence data genome information resources.

UNIT II : Functional proteomics:
Protein sequence and structural data, protein information resources and secondary data bases. NBFR-PIR, SWISSPROT

UNITIII : Introduction to Genomic data and Data Organization:
Sequence Data Banks ï Introduction to sequence date banks ï , Signal peptide data bank, Nucleic acid sequence data bank ï GenBank, EMBL nucleotide sequence data bank, and AIDS virus sequence data bank. RRNA data bank, structural data Bank

UNIT IV: Computation genomics:
Internet basics, biological data analysis and application, sequence and data bases, NCBI model, file format, Perl programming, bioperl, introduction and overview of human genomic project.

UNIT V: Sequence alignment and data base search:
Protein primary sequence analysis, DNA sequence analysis, pair wise sequence alignment, FASTA algorithm, BLAST, multiple sequence alignment, DATA base searching using BLAST and FASTA.

UNIT VI: Structural data bases:
Small molecules data bases, protein information resources, protein data bank, genebank, swissport, enterz..

TEXT / REFERENCE BOOKS:

1. Introduction to bioinformatics, Atwood, Pearson education.
2. Introduction to bioinformatics, Arther M.Lesk-OUP
3. Bioinformatics sequences and genome analysis, David W.Mount,2nd. Edn. CBS publishers.
4. Introduction to bioinformatics computer skills, Cynthia Gibas and Per Jambeck, 2001 SPD.

7BM 06 BIOMEDICAL SIGNAL PROCESSING -LAB:-

List of Practicals :

1. Sine wave generation using C.
2. Designing an FIR filter using MATLAB and DSP Kit.
3. Designing an IIR filter using MATLAB and DSP Kit.
4. Fourier analysis of periodic signal.

5. Time frequency domain properties of different windows using MATLAB.
6. Implementation of the Double-Precision Complex FFT for ECG signal.
7. Design of Notch filter for elimination of 50Hz from ECG signal.
8. EMG processing using MATLAB ï Rectification and Signal Averaging.

7BM07 MEDICAL EXPERT SYSTEMS - LAB

Practicals : Minimum eight practicals based on syllabus

7 BM08 HOSPITAL ENGINEERING & MANAGEMENT - LAB

Laboratory Work:-
Minimum 8 Case Study based on syllabus to be conducted in Hospitals

7BM09 PROJECT AND SEMINAR

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SEMESTER- EIGHTH

8 BM01 PROFESSIONAL ETHICS AND VALUES

UNIT I : Science, Technology and Engineering as knowledge and as Social and Professional Activities Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome.

UNIT II : Limits of growth: sustainable development. Energy Crisis: Renewable Energy Resources. Environmental degradation and pollution. Eco-friendly Technologies. Environmental Regulations, Environmental Ethics. Appropriate Technology Movement of Schumacher; later developments. Technology and developing notions. Problems of Technology transfer, Technology assessment impact analysis. Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

UNIT III: Ethics of Profession:
Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics. Whistle blowing and beyond, Case studies.

UNIT IV: Profession and Human Values:
Values Crisis in contemporary society. Nature of values: Value Spectrum of a good life.

UNIT V: Psychological values: Integrated personality; mental health. Societal values: The modern search for a good society, justice,

democracy,secularism, rule of law, values in Indian Constitution.Aesthetic values: Perception and enjoyment of beauty,simplicity, clarity.

UNIT VI: Moral and ethical values:
Nature of moral judgements; canons of ethics; ethics of virtue;ethics of duty; ethics of responsibility.

Reference Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)
2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall,Englewood Cliffs, New Jersey 1991.
3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

8BM02 BIO MEDICAL IMAGING SYSTEMS

UNIT I : Digital image fundamentals: Image digitization, sampling and quantization, neighbour of pixels, connectivity, relations, equivalence and transitive closure, distance measures, arithmetic / logic operations, discrete transform, fast Fourier transform,2-D Fourier transform, inverse Fourier transform.

UNIT II : Image enhancement fundamentals: Spatial domain method, frequency domain method, contrast enhancement, histogram processing, image smoothing, image averaging, asking, image sharpening, removing of blur caused by uniform linear motion, enhancement in the frequency domain ï low pass, high pass, mean and band-pass filtering.

UNITIII : Image restoration fundamentals: Degradation model, discrete formulation, algebraic approach to restoration ï unconstrained & constrained.

UNIT IV: Image compression and segmentation fundamentals: Fidelity criteria, image compression models, loss and lossless compression technique.

UNIT V : Image segmentation: point detection, line detection, edge detection, edge linking and boundary detection.

UNIT VI: Algorithms used in medical image processing: Brief of reconstruction techniques ï algebraic, simultaneous iterative and simultaneous algebraic. Reconstruction algorithm for parallel projections, fan beam projection and back projection. Introduction to various approaches of pattern recognition.

Text books:

1. Digital image processing by Gonzalez and Woods, 2nd ed., Pearson
2. Digital image processing and analysis by Chanda & Majumdar, PHI
3. Fundamental of digital image processing by Jain, PHI
4. Pattern recognition by Tou and Gonzalez

PROFESSIONAL ELECTIVE-II
8BM03 (1) BIO-INSPIRED ALGORITHM

Unit I: Introduction to Biologically inspired Algorithms: Artificial neural network , Evolutionary computation , Social systems , Artificial Immune systems.

Unit II: Neural Network Methodologies: A taxonomy of NNs, the multilayer perceptron , training MLP , Practical issues in training MLP , Radial basis function network , Self organizing Maps , Implementation of a SOM

Unit III: Evolutionary Methodologies: Genetic algorithm , canonical GA , Example of GA , Extending the canonical GA , Schema and building blocks , Differential Evolution , DE Algorithm , Genetic programming , More Complex GP architectures , Combining EA and MLP methodologies .

Unit IV: Grammatical Evolution : Biological analogy , Mapping process , mapping example , mutation and crossover in GE , recent development in GE , Search engine, meta ï grammars , ð GE , applications and alternative.

Unit V: Particle Swarm model : PSO algorithm , constriction coefficient Ver , Parameter setting for PSO , Discrete PSO , comparing PSO and the GA , MLP swarm hybrids , grammatical swarm.

Unit VI: Ant colony models: Ant ï foraging models , Ant- foraging algorithm , Ant inspired classification algorithms
Artificial Immune Systems: Overview of natural immune systems , Innate Vs Adaptive Immunity , Component of the Immune systems , Designing artificial Immune algorithm, Negative selection algorithm , Clonal Expansion and selection algorithm.

TEXT BOOKS:

1. Handbook of Bioinspired Algorithms and Applications Stephan Olariu, Hardcover
2. Hanbook of Bioinspired Algorithms and Applications, Stephan Olariu and Albert Zomaya, Chapman and Hall, 2006
3. Biologically inspired algorithms for financial modelling ,Anthony Brabazon, Michael OÕNeill

PROFESSIONAL ELECTIVE -II

8BM03 (2) BIOFLUIDS & DYNAMICS

UNIT I : Fluids and non-fluids, continuum coordinate systems, force and moments, stress at a point, rate of strain, properties of fluids, classification of fluids.

UNIT II: Different types of fluid flows, laminar and turbulent flow, transition from laminar to turbulent flow, laminar flow-annulus, laminar flow between parallel plates, measurement of viscosity.

UNIT III: Development of boundary layer, estimates of boundary layer thickness, boundary layer equation, nature of turbulence, smooth and rough surface, boundary layer separation.

UNIT IV: Friction loss in flow in a tube, velocity distribution of aortic system, waveform of pressure and velocity in aorta,

UNIT V: Wave reflections and impedance in arterial segments, blood flow in veins and blood flow in capillaries.

UNITVI: Control theory and system analysis, mechanical analysis of circulatory systems, basic concept of myocardial mechanics, index of contractibility, fluid dynamics of aortic and mitral valves.

TEXT BOOKS :

1. K.L.Kumar, ñEngineering fluid mechanicsò, Eurasia Publishing House (P) Ltd., New Delhi, 1998. (UNITS I, II & III)
2. D.H.Bergel, ñCardiovascular fluid dynamicsò- Vol. I, Academic press, London & New York, 1972. (UNITS IV, V)

8 BM 04 BIO MEDICAL EMBEDDED SYSTEMS DESIGN

UNIT I : MCS 51 Microcontroller family

Introduction to MCS family, Comparison of microprocessor and microcontroller, Features, Architecture, functional pin description, SFRs, various resources of MCS-51 Hardware Review: Study of Port structure, Interrupt structure, Timer/ Counter, Serial port.

UNIT II : 8051 Assembly Language Programming

Addressing modes, Instruction set, Assembly Language Programming, CPU timings, 8051A as a Boolean Processor,Power Saving Options, 8051 I/O expansion using 8255, Typical MCS51 based system, Multiprocessor Communication in MCS-51, interfacing problems

UNITIII : Embedded Systems:

Basic concepts, requirements, categories, design challenges Embedded operating system ï Types , Hardware architecture,

Software architecture, application software, communication software, process of generating executable image,development/ testing tools

UNIT IV: Embedded System Development

The development process, requirements engineering, design, implementation, integration and testing, packaging, configuration management, management of development projects

UNIT V : The execution environment

Memory organization, system space, code space, data space, unpopulated memory space, i/o space, system start up,interrupt response cycle, Functions Calls & Stack Frames,run time environment.

UNIT VI: Architecture of Kernel, Tasks and Task Scheduler – Task States, Content Switching, Scheduling Algorithms, Rate Monotonic Analysis, Task management Function Calls. Interrupt Service Routines, Semaphores, mutex, mailboxes,message queues, event registers, pipes, signals, timers,memory management, Priority Inversion Problem Design methodologies and design flows, case studies- fetal heart rate monitor, versatile drop foot stimulator, myoelectric arm, telemonitoring system

TEXT BOOKS:

1. The 8051 microcontrollers-Kenneth J Ayala
2. Rajkamal, Embedded systems-architecture, programming and design,Tata McGraw Hill
3. Frank Vahid,Toney Givargi-Embedded System Design: A unified Hardware /Software Introduction John Wiley publication
4. David E. Simon -An Embedded Software Primer Pearson Education

REFERENCE BOOKS:

1. Muhammad A Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education
2. Sriram Iyer and Pankaj Gupta, Embedded Real-time systems programming, Tata McGraw Hill
3. Embedded Microcomputer Systems- Real time Interfacing ï Valvano
4. Arnold S. Berger, *An introduction to Processes, Tools and Techniques*, CMP books, 2005.
5. Dr.K.V.K.K.Prasad, *Embedded Real time Systems*, Dreamtech Press,2003.
6. Wayne wolf , ñComputers as Components: Principles of Embedded Computer systems designò, Morgan Kaufmann Publishers,2000

8BM 05 BIO MEDICAL IMAGING SYSTEMS - LAB

[Students are required to perform at least Eight experiments]

1. Maximum distance algorithm
2. Image enhancement ï Histogram
3. Image smoothing
4. Image sharpening
5. Algorithm for low pass filter, high pass filter, median filter
6. Point detection
7. Line detection
8. Edge detection

8 MB 06 BIO MEDICAL EMBEDDED SYSTEM DESIGN - LAB

Term work:

Minimum 10 experiments on MCS 51

List of Experiments

1. Interfacing with 8085 microprocessor and 8051 microcontroller
   a) Traffic light controller
   b) 7-segment display
   c) Analog to Digital Converter
   d) Matrix keyboard
   e) LCD display
   f) Digital to Analog Converter
   g) Stepper motor
   h) DC- motor
2. Interfacing of matrix sensors to PIC microcontroller
   a) Heart rate monitor
   b) ECG sensor
   c) Carbon dioxide and oxygen sensors
   d) Ion selective sensors
   e) Analog interfacing of rabbit core modules
   f) OP 7200 LCD display controller

8 BM 07 PROJECT AND SEMINAR

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NOTIFICATION

No. 77/2017 Date : 6/07/2017

Subject :- Continuation of Prospectus No. 121741 prescribed for Sem. III & IV B.E. (CGS) for the session 2017-2018.

It is notified for general information of all concerned that the Prospectus No.121741 prescribed for Semester **III & IV B.E. (CGS)** for the session 2011-2012 and continued upto the session 2016-2017 shall be continued for the academic session 2017-2018 with following substitutions for the examinations B.E. Sem. III & IV (Civil) and B.E. Sem. III & IV (Electrical & Electronics) as per **Appendices A & B** appended herewith as given below **:**

Sd/-
Registrar
Sant Gadge Baba Amravati University

Appendix – A

3CE02: STRENGTH OF MATERIALS

Section-A

Unit-I:

1. Mechanical properties : Concept of direct, bearing and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel and concrete, Generlized Hook's law, factor of safety.
2. Uniaxial stresses and strains : Stresses and strains in compound bars in uni-axial tension and compression, temperature stresses in simple restrained bars and compoundbars of two metals only.

Unit-II :

Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment, shear forceand axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs,relation between shear force, bending moment and loading intensity.

Unit-III :

Stresses in beams (Bending, Shear), i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stress distribution diagram in solid, hollow and built up section. ii) Shear : Distribution of shear stresses on beam cross sections. iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

Section - B

Unit-IV :

1. Torsion: Theory of torsion & assumptions, derivation oftorsion equation, polar modulus, stresses in solid
2. & hollowcircular shaft, power transmitted by shaft, closed coiled helical spring with axial load.Thin cylinders subjected to internal pressures.

Unit V :

1. Principal stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.
2. Combined direct & bending stresses : Combined direct and bending stresses, applications to short columns with eccentric loads.

Unit-VI :

Slope & deflection of beams :

1. Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method.
2. Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Moment Area method.

Books Recommended:

1. E.P. Popov, Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H. Young, Elements of Strength of Materials,East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, Strength of Materials, Harper and Row, New York
4. Shames, I. H., Introduction to solid mechanics, Prentice Hall of India,New Delhi
5. Natarajan, Mahadeoappa, Strength of materials
6. Junnarkar, S. B., Mechanics of materials
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore)Pte. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9.R.K. Bansal, Strength of materials,

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3CE03 TRANSPORTATION ENGINEERING –I

Section-A

Unit-I: Highway: Development And Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material And Testing. Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.

Unit-II: Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, superelevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.

Unit-III: Pavement Design : Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement, Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil.

Section-B

Unit-IV: Traffic Engineering : Traffic Characteristics, Traffic studies, road parking system, accident study, traffic control devices, marking, signs, signals, island its type, At grade intersections – clover leaf, diamond, rotary intersections & design elements, 3 E's of traffic, regulation for driving motor vehicle, motor vehicle Act & Rule.

Unit-V: Bridge Engineering – Component, classification and identification, data collection, site selection, economic span, different structural form – culverts, causeways, major and minor bridges, types of foundation, abutments, piers and wing wall, bearing their types and choices, Erection of bridge super structure.

Unit-VI: Bridge Hydrology - Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board. Load, Forces, Stresses – Loads, forces, stresses acting on bridges.IRC Specification and code practices, critical combination. Rating And Maintenance – Methods and techniques of rating of existing bridges, repairs, maintenance, corrosion – causes and prevention, Strengthning of bridge superstructure.

BOOKS RECOMMENDED :-

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transporatation & Highway Engg.
3) Dr.Kadiyali L.R. : Traffic Engg. & Transport Planning.
4) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
5) Bindra S.P. : Principles & Practice of Bridge Engg.
6) Bindra S.P. : A Course in Highway Engg.
7) Duggal A.K. & Puri V.P. : Laboratory Mannual in Highway Engg.

3 CE04 BUILDING CONSTRUCTION & MATERIALS

Section – A

Unit- I: Introduction : Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages, load bearing walls and partition walls, HDPE Wall panel. Foundation :- Definition and necessity, loads of foundation, Bearing Capacity soil, SBC values based on IS code, field methods of improving bearing capacity. Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls & columns, Raft foundations, Foundations in black cotton soils, under-reamed pile foundation, precautions to be taken. Causes of failure of foundations. Setting out for foundation, excavation for foundation.

Unit-II: Stone Masonry – Technical terms, General principles to be observed during construction, random rubble masonry, coursed and un- coursed rubble masonry, Selection of stone for masonry.
Brick Masonry – Classification of bricks, manufacturing of clay bricks, tests on bricks, properties of burnt bricks, new trends in brick manufacturing such as use of fly ash, stabilized
mud blocks. Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Earthquake force, various features for making load bearing structure earthquake resistant.

Unit-III: Floors – Types of Floors – Basement floor, ground floor and upper floors, Types of upper floors – R.C.C. slab floor, R.C.C. slab & beam floor, R.C.C. ribbed floor, R.C.C. Grid floor, R.C.C. flat slab floor, Floor finishes – Types of flooring material, Sahabad, Kotta, Granite, Ceramic tiles, plain tiles, mosaic tiles, glazed tiles, different types of floor finishes, their suitability,method of construction, criteria for selection. Roofs – Flat & pitched roof, steel roof trusses – types and suitability, fixing details at supports, types of roof covering, AC & GI sheets, acrylic sheets, fixing details of roof covering. Formwork – Different types, their relative merits & demerits, period for removal of formwork for different members.

Section – B

Unit-IV: Doors & Windows – Different forms of commercial woodsplywood, particle-board, batten-board, block-board, novapan, sunmica, veneer sheets. Doors : Purpose, criteria for location, size of door, door frames & its types, methods of fixing, T Types of door shutters and
their suitability, HDPE door shutter. Windows – Purpose, criteria for location, no. sizes & shapes
of Windows, types of windows & their suitability. Ventilators – Types and their suitability. Fixtures & fastening for doors & windows. Glass – Types of glass & their suitability. Arches & lintels – Types & their suitability, details of R.C.C. lintels & chajja, precast lintels & arches.

Unit-V: Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design. Lifts, ramps & escalators – suitability. Plastering & pointing- Necessity, types, processes of different types of plastering, defects in plastered work.
Painting & Colouring – Necessity, types, processes of painting & colouring to wall surfaces, wooden surface, iron & steel surfaces, types of paints and their uses. Scaffolding – Purpose, types, suitability.

Unit-VI: Special Aspects of Construction – Damp proofing – causes of dampness, its effects, various methods of damp proofing, material used for damp proofing, details of cavity wall construction. Fire proof construction – Points to be observed during planning & construction. Fire protection requirements for a multistoried building. Sound proof Construction – Sound absorbants and their characteristic, factors affecting the acoustical design of an auditorium.
Joints – Expansion & construction joints necessity, details of expansion joint at foundation level & roof level of load bearing structure and framed structure. Provision of construction joints in slabs, beams & columns.

BOOKS RECOMMENDED :

1) Mackay W.B. : Building Construction, Vol. I, II, III, Longmans.
2) Sushilkumar : Building Construction, Standard Publishers Distributors.
3) Deshpande R.S. and Vartak C.V. : A Treatise on Building Construction.
4) Sharma S.K. Kaul B.K. : A. T.B. of Building Construction, S. Chand & Co.
5) Gurucharan Sing : Building Construction Engg., Standard Book House, Delhi-6
6) Sane L.S. : Construction Engg., Manak Talas, Mumbai.
7) Chudley R. : Construction Technology, Vol. I, II, III & IV, Longmans Group Ltd.
8) ISE National Building Code of India, 1970.
9) Punmia B.C. : Building Construction.
10) A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

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3CE05 ENGINEERING GEOLOGY

Unit-I : Introduction - Different branches of Geology and importance of Geology in Civil Engineering. Mineralogy - Study of common rock forming and ore minerals with reference to its physical properties. Petrology - rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Unit II: Structural Geology - outcrop, dip strike, elementary ideas about folds, faults, joints and unconformity, effect of these structures in foundation. Earthquake Engineering - earthquake waves, causes and effects, magnitude and intensity, earthquake zones of India, seismic coefficient. Geological investigation - surface and sub-surface investigation, direct and indirect.

Unit-III : Rock as a material of construction. Study of engineering properties of rocks and soils. Geological studies related to site selection for dams and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields etc. Case histories of some major projects of tunnels, dams and reservoirs.

Books Recommended :

1) Parbin Singh: General & Engineering Geology.
2) Mukharjee : A Text Book of Geology.
3) Tyrell G.W. : The Principle of Petrology.
4) Wadia D.N. : Geology of India.
5) Krishan M.S. : Geology of India.
6) Date S.Y. & Mukharjee D.M. : Geological Maps.
7) Deshmukh D.N.: Engineering Geological Maps.
8) Gupte R.B. : Geology of Engineering.
9) Reddy Venkata : Engnieering Geology.

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3 CE06: STRENGTH OF MATERIALS - LAB

Practicals : Minimum seven out of following:

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on steel bar.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on steel bar.
7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3CE07 TRANSPORTATION ENGINEERING -I –LAB

PRACTICALS :

Based on the Transportration Engg.- I syllabus, following practical are required to be performed and a laboratory report be submitted by every student. Practical examination will be viva based on above system.

List of Experiments (Any Eight) :

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of penetration value of Bitumen
7. Determination of Viscosity of Bituminous material
8. Determination of softening point of bituminous material.
9. Determination of ductility of bitumen.
10. Determination of flash point and fire point of Bituminous material
11. Determination of marshal stability value
12. Field visit based on construction of Road

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3CE08 BUILDING CONSTRUCTION & MATERIALS – LAB

Practicals :

1. Drawing of following building elements on A-2 size sheet.
   a) Panelled door, flush door, glazed window.
   b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Development of free hand sketches of components of building (any six) on sketch book
6. Fields visits to building under construction and its report writing.

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3CE09 ENGINEERING GEOLOGY – LAB

Laboratory Work:-

1) Megascopic study of common rock forming and ore minerals.
2) Megascopic study of the common igneous, sedementary and metamorpic rocks.
3) Geological map reading and construction of sections from simple geological maps with engineering problems (about 8 maps)

   A report/journal on above practical conducted shall be submitted by each student. Practical examination shall be based on practical and viva-voce conducted on the above syllabus.

4) Field visit for identification of minerals, rocks and different geological structures.

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SEMESTER – IV

4CE01: GEOTECHNICAL ENGINEERING – I

SECTION – A

Unit- I History of development of soil mechanics, formation of soil, its significance to the field problems. Soil properties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Index properties of coarse and fine grained soil BIS classification of fine grained & coarse grained soil.

Unit-II Concept of clay mineral, major soil minerals, their structural formation and properties. Mechanics of compaction, factors affecting compaction, Standard and modified Proctor test, their field Determination, zero air-void line, concept of wet of optimum, and dry of optimum, different structures of soil, field compaction & their control. CBR test and CBR value for soak and unsoak conditions.

Unit-III Absorbed water, surface tension, capillarity and its effect on Soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection Permeability, determination of coefficient of permeability laboratory and field methods. permeability for stratified deposits. Drainage and dewatering of soil and it's various methods.

SECTION – B

Unit-IV Laplace equation, its derivation in Cartesian co-ordinate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design Terzagghi's criteria for graded filter, concept of piping and criteria of stability against piping.

Unit-V A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criteria, Mohr-Coulomb's theory and development of failure envelopes, Unconfined compression test, Laboratory measurement of shear strength for different drainage, conditions by direct shear test, Triaxial test for various drainage conditions, Merits and demerits of various shear strength tests. Concept of pore pressure coefficient shear characteristics of sand, NC and OC clays and partially saturated soil, Influence of soil structure and strain rate on shear strength.

Unit-VI State of stress at a point, stress distribution in soil mass, Boussinesq's theory and its applications, point load, uniformly loaded rectangular and circular area New-mark's chart, its preparation and use, equivalent point load Compression of laterally confined soil, concept of consolidation spring analogy , Terzaghi's theory of one dimensional consolidation. e-p curve, compression index, swelling index**,** coefficient of compressibility, Consoledometer-test, determination of C_v Cassagrande's method for determination of pre-consolidation pressure.

BOOKS RECOMMENDED :

1) Craig R.F.: Soil Mechanics,
2) Lambe T.W. & Whiteman R.V.: Soil Mechanics, John Wiley and Sons, 1969.
3) Terzaghi K. & Peck R.B.: Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
4) Gulhati S.K.: Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
5) Singh A.: Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
6) Venkataramiah C.: Soil Mechanics and Foundation Engineering.
7) B. M. Das Advanced Soil Mechanics.
8) S. K. Garg: Soil Mechanics and Foundation Engineering.

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4CE02 FLUID MECHANICS – I

SECTION - A

Unit I : Introduction: Definition of Fluid, physical properties of fluid mass density, unit weight, specific Gravity, dynamic viscosity, Kinematic Viscosity, Newton's law of viscosity, Rheological classification of fluids. Adhesion, Cohesion, surface tension, capillarity, pressure inside droplet & jet of liquid.
Fluid Statics I : Pressure at a point, Pascal's law, Equation of fluid static's & its integration, Measurement of pressure, absolute & gauge, types of manometers.

Unit II: Fluid Statics II : Forces on immersed areas – plane and curved, Buoyancy, equilibrium of floating bodies, metacenter, metacentric height, its determination by analytical method only. Kinematics : types of Flow – Eulerian approach of describing fluid motion, streamline, stream tube, streak line, Path line, substantive, local, convective acceleration, velocity potential, stream function, continuity equation of ID & 3D flow in Cartesian coordinates.

Unit III : Fluid Dynamics : Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, HGL, EGL, velocity distribution, Average velocity, Kinetic – Energy correction factor, momentum correction factor (Definition only) Momentum equation (Statement Only) Forces on pipe bends.

SECTION - B

Unit IV: Fluid Measurement –I : Venturimeter, Orificemeter, Pitot tube,Prandtl Pitot tube, circular orifices & mouthpieces, time of emptying of cylindrical tanks by orifices at bottom.
Fluid Measurement – II: Notches & weirs, Definition, Types rectangular, triangular, trapezoidal, cipolletti weir, end contractions, velocity of approach, Francis equation.

Unit V: Laminar flow through circular pipes, velocity distribution, Hayegen Puiseuille equation (no proof). Reynold's number, Boundary layer, definition, development along a flat plate, Nominal thickness, energy thickness, Momentum thickness, displacement thickness.

Unit VI : Flow around immersed bodies, drag, lift, different forms of drag, calculations of drag & lift on cylindrical bodies only. Pipe flow Darcy – Weisbach equation hf = flv2/2gd (no proof) major & minor losses, pipes in series, pipes in parallel, equivalent pipe, pipe Network (Hardy – Cross method only). Introduction to water hammer in pipes.

BOOKS RECOMMENDED :

1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition.
2) Dr. Jain A.K. : Fluid Mechanics.
3) Subramanya K. : Fluid Mechanics.
4) Streeter : Fluid Mechanics.
5) Garde & Mirajgaonkar : Fluid Mechanics.
6) Jagdish Lal; Hydraulics & Fluid Mechanics
7) K.C. Patra; Engineering Fluid Mechanics & Machines
8) Nagaratnam S.; Fluid Mechanics
9) Biswas Kharagpur; Fluid Mechanics
10) Mohonty; Fluid Mechanics
11) R.K. Rajput; Fluid Mechanics & Machines.

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4CE03 : THEORY OF STRUCTURES – I

SECTION – A

Unit-I

1. Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.
2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II

1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.
2. Deflection in determinate trusses.

Unit-III

1. Influence line diagrams for reactions, bending moment and shear force for determinate beams.
2. Rolling loads on simply supported beams concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION - B

Unit-IV :

1. Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.
2. Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit-V Slope deflection method:

1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

Unit-VI Moment Distribution method:

1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural analysis.

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4CE04 SURVEYING –I

SECTION-A

Unit-I Introduction: Surveying – Necessity & purpose, Geodetic & plane surveying, classification of survey, principles of surveying. Instruments for measurement of distance, linear measurements, corrections to field measurements, ranging out, direct and indirect ranging. Chain surveying: basic definition, principle, selection of survey stations, offsets for locating details, limiting length of offsets, degree of accuracy of offsets, use of cross staff, optical square, obstacles in chaining, plotting of chain survey work, cross staff survey.

Unit-II Instruments for measurement of angles: Prismatic compass, surveyor's compass, their use and adjustments. Traversing with chain and compass, Reference meridians, bearing and azimuths. Local attraction, magnetic declination and its variation. Open & closed traverses. Adjustment of closed traverse - Bowditch's Graphical method.

Unit-III : Instruments for measurement of elevation: Dumpy level, tilting and automatic level. Details of their construction. Temporary and permanent adjustments of Dumpy and tilting level.

SECTION - B

Unit-IV: Leveling: Definition of terms, Principle, leveling methods, leveling staves, Booking and reduction of field notes, curvature and refraction, reciprocal leveling, plotting of profiles, errors in leveling. Contouring: Definition, Characteristics and uses of contour maps, methods of contouring.

Unit-V: Vernier and microscopic theodolite, their temporary adjustment. Permanent adjustment of vernier theodolite. Measurement of horizontal and vertical angle with transit theodolite by different methods.Other uses of theodolite. Theodolite traverse, Latitude and departure.

Unit-VI : Plane tabling : equipments, methods, two point and three point problems, Advantages & disadvantages of plane tabling, Lehman's rules. Total station – construction, working and uses. Digital planimeter-working and use

BOOKS RECOMMENDED :

1. D.Clark : Plane and Geodetic Surveying, Volume I & II Aisa Publication House.
2. T.P.Kanetkar & Kulkarni : Surveying and Leveling, Part I & II, Pune Vidharthi Griha Prakashan, Pune.
3. B.C.Punmia : Surveying I & II, Standard Book House Delhi.
4. R.C.Brinker and P.R.Wolf, Harper and Row: Elementary Surveying
5. Higher surveying: A.M. Chandra New Age International publishers.
6. Higher surveying: B.C. Punamia, Ashok jain, Arun k. jain Laxmi publications (P), Ltd.

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4CE05 REINFORCED CEMENT CONCRETE – I

SECTION –A

Unit-I :

1. Cement: Physical properties of Portland cement, laboratory tests on cement, types of cements: Ordinary Portland cement, rapid hardening cement, sulphate resisting cement, Portland slag cement,quick setting cement, low heat cement,Portland pozzolana cement Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density, laboratory tests.
2. Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete.

Unit II :

1. Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage.
2. Durability of concrete, laboratory tests on concrete.

Unit III :

1. Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions.
2. Construction chemicals: concrete curing compounds, polymer bonding agent, surface retarders, bond aid for plastering, protective and decorative coating.

SECTION-B

Unit-IV :

Special concrete: Light weight concrete, fibre reinforcedconcrete, Roller compacted concrete, self compactedconcrete, high strength concrete, high performance concrete,high volume fly ash concrete. Special concreting techniques: Guniting, grouting and shotcreting concrete, introduction & application of Ferrocement.

Unit-V :
Introduction of mix design, factors governing mix design, IScode method of mix design (IS:10262 – 1982) and ACI method.

Unit-VI :
Basic elastic theory and concept of reinforced concrete, types of reinforcement, Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, and chajjas.

Students must be shown video CD, slides, transparencies, andphotograph of actual structures.

BOOKS RECOMMENDED :
1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold(Publishers) ltd.
2. Neville, A. M.: Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks: Concrete Technology, ELBS
4. Gambhir, M. L.: Concrete Technology, DhanpatRai and Sons
5. Orchard D. F.: Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S.: Concrete Technology, S. Chand
7. Varshney, R. S.: Concrete Technology, Oxford Pub. House.
8. IS: 456 – 2000,
9. IS: 10262 – 1982,
10. Krishna Raju: Design of Concrete Mixes, Mc – Graw Hill.
11. Shah and Kale: Reinforced Cement Concrete Design,
12. SushilKumar: Treasure of Reinforced Cement Concrete.

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4CE06 GEOTECHNICAL ENGINEERING - I LAB

Practicals :-
Based on above syllabus, following ten practical are required to be performed and a laboratory report be submitted by very student. Practical examination will be viva based on above syllabus.

Experiments :-

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying method.
3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination of Atterbergs limits (LL, PL and SL)
6. Determination of Compaction properties (Standard Proctor Test)
7. Determination of permeability of soil by using falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial list of UU type
11. C.B.R. test. Determination of C.B.R. value by conducting CBR test on soaked sample.
12. Determination of Coefficient of consolidation by conducting consolidation.

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4CE07 FLUID MECHANICS – I – LAB

Practicals :-

Minimum 8 practicals out of the list given should be carried out. The practical examination shall consist of viva-voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoullis theorem.
2. Reynolds experiment to determine type of flow.
3. Determination of coefficient of discharge for Venturimeter
4. Determination of coefficient of discharge for Orificemeter
5. Determination of hydraulic coefficients of orifice.
6. Determination of metacentric height.
7. Determination of friction factor for GI pipe
8. Determination of coefficient of discharge for rectangular notch .
9. Determination of coefficient of discharge for triangular notch.
10. Determination of coefficient of discharge for trapezoidal notch.
11. Determination of coefficient of discharge for mouthpiece.
12. Determination of Viscocity of fluid at different temperatures.

4CE08 SURVEYING –I - LAB

Practicals :

Practicals mentioned below shall be performed by each student, Observations, calculations and relevant work shall be submitted as a term work.

1. Locating various objects by Chain and Cross Staff Surveying.
2. Locating details of building by chain and compass traversing (one A-1 size drawing sheet)
3. Determination of elevation of various points with dumpy level by Line of collimation method and Rise and fall method.
4. L-section and Cross section of the road for minimum 50m of length. (One A-1 size drawing sheet)
5. Measurement of horizontal angle and Vertical angle by using Theodolite
6. Locating details of building by Theodolite Traversing (One A-1 size drawing sheet)
7. Locating details of building by Plane table traversing. (One A-1 size drawing sheet)
8. To determine area of irregular figure by digital Planimeter.

(Practical examination shall consist of field exercise and viva voce based on the above syllabus and practical work.)

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4CE09 REINFORCED CEMENT CONCRETE – I Lab.

Practicals :

- Compulsory Site visit and submission of site visit report.
- Minimum 8 out of following list.

1. Fineness of cement
2. Soundness of cement
3. Consistency and setting time.
4. Compressive strength of cement
5. Sieve analysis of aggregate : Practical size distributions curve
6. Bulking and silting of sand.
7. Workability of concrete by slump cone test.
8. Workability of concrete by compaction factor test.
9. Compressive strength of concrete.
10. Mix design by IS method.
11. Tests on fresh SCC (Minimum one): Flowing ability, Passing ability and Segregation registance.

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Appendix – B

B.E. (Electrical & Electronics) SEMESTER – III

3EP02/3EX02/3EL02/3EE02 NETWORK ANALYSIS

Course Learning Objectives :

At the end of the course, students will be:

able to Interpret analytical circuits results to properly assign power, current, and voltage values to circuit graphical representations or from values of power, current and volatge students can design analytical circuit .An ability to use the techniques, skills,logics and modern engineering tools necessary for electrical engineering practice.

SECTION A

Unit I : a] Terminal Element Relationships: V-I relationship for Dependent&Independent Voltage and Current Sources.Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh.

Unit-II :Graph Theory and Network Equation:- Graph of a networkTrees and loops, cut set of a network, Tie-set matrix and loop currents- analysis of network, Network equilibrium equation,duality-network transformation.

Unit III :Network Theorems : Source Transformations, SuperpositiontheoremThevinin's theorem , Norton's theorem, Maximum power transfer theorem,Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems.

SECTION- B

Unit IV :a] **Time Domain Analysis of Circuits:** Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step voltage/current inputs.Natural Response-Transient Response -Determination of initial conditions.

b]**Transformation of a Circuit into s-domain:**Review of Laplace Transforms with special emphasis on convolution theorem and convolution integral. Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit.

Unit V : Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series.

Unit VI : Two Port Networks: Two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets -Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

TEXT BOOK :

1) NETWORKS & SYSTEMS by D. Roy Choudhury – New Age International Publishers.

REFERENCE BOOKS :

1) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.
2) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005.
3) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009.
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009.
5) Electrical Circuits – David Bell, Oxford University Press, 2008.
6) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004.
7) Network Analysis, By M.E. Van Valkenberg, PHI, 2005.

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3 EP03/3EX03/3EL03/3EE 03 ENERGY RESOURCES AND GENERATION

Course Learning Outcomes-

After completion of this course, students will be able to:

Understand the sources of Energy and their contributions to the energy and power needs of the nation and the world&Calculate the basic performance parameters of a conventional generation system, such as efficiency and cost, Model renewable electrical energy systems for analysis and design.

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SECTION A

Unit I : Thermal and Hydro Power plant: Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Unit II: Nuclear and Diesel Power plant: Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant

Unit III : Solar Energy and its measurement: Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency

SECTION B

Unit IV : a] Fuel cells: Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system

b] Wind Energy: Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy storage, application of wind energy.

Unit V : Ocean and tidal energy: Ocean energy resources, ocean energy routes, ocean thermal energy conversion, progressive wave, wave data collection, Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in simple single basin tidal system.

Unit VI: Other non- conventional energy resources: Operating principle of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation, principle and operation of fuel cells, classification and types of fuel cells, performance characteristics of fuel cells.

Text Book :

1) Power System By V.K.Mehta

References :

1) Renewable Energy – Power for Sustainable Future, Godfrey Boyle,Oxford University Press, 2004
2) Conventional Energy Technology By S.B.Pandya, Tata McGrawHill,2005
3) Conventional Energy Resourses By B.H.Khan, Tata McGrawHill,2003.
4) Power plant engineering: - Domkundwar/Arora
5) Electrical power system: - Dr. S.L.Uppal.
6) Non Conventional Energy Resources By G.D.Rai, KhannaPublishers, 2001.

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3EP04/3EX04/3EL04/3EE04 ELECTRONIC DEVICES AND CIRCUITS

Course Learning Objectifies:

To enable the students to acquire fundamental knowledge of electronics devices and circuits so as to design various electronics based circuits such as rectifiers, voltage regulators, amplifiers, oscillators.

SECTION A

UNIT I : P-N Junction diode theory,Rectifiers - Half wave, full wave and bridge rectifier. Filters-C, LC and their analysis, Zener diode and its applications.
(As the above contents are most basic one we can keep them as it is no change)

UNIT-II : Theory and Analysis of Bipolar Junction transistor, 'h'Parameter, methods of biasing, their needs, 'Q' and stability factors.

UNIT-III : Study of typical transistor amplifier circuits :
i) Emitter follower,
ii) Darlington emitter follower.
iii) RC coupled amplifier,
iv) Transformer coupled amplifier,
v) Cascaded amplifier,
vi) Direct coupled amplifier,
vii) Cascade stage.

SECTION B

UNIT-IV : Class 'A' 'B' 'AB' and 'C' amplifiers, configuration of audio amplifiers, Calculations of power gain, efficiency, dissipation and distortion, oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.
(All the contents are important as they have their utilization in further years)

UNIT-V : Theory, construction and applications of Schottky diode,Tunnel diode, Varactor diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI :FETs (JFET & MOSFET) : Types, Characteristics and parameters (u, gm & Rds),Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

BOOKS RECOMMENDED:

TEXT BOOK :-
1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press.

REFERENCE BOOKS :

1) Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011
2) Microelectronic Circuits 5/3 – Sedra nad Smith Oxford University Press.
3) Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Pvt. Ltd., New Delhi (5th Edn.), 1993.

3 EP05/3EX05/3EL05/3EE05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

Course Learning Objectives:

Objective:- To Learn necessity and importance of Electrical Measurement devices, their characteristics, applications, advantages and their limitations. Also to know about all kinds of electrical parameter measurements and sensors for measurement of electro-mechanical quantities, temperature, pressure, etc.

SECTION A

Unit I: Measuring Instruments: Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electro dynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type.

Unit II: Watt meters & Energy meters: Electro dynamic & Induction type: construction, theory of operation, torque equation, errors & demerits, Electronic energy meter. Analysis of three phase balanced load, Blondel's Theorem, Measurement of active & reactive power & energy in single phase & three phase circuits.

Unit III: a] Instrument Transformer: Need of extension of range: extension using shunt & multipliers Instrument transformers CT & PT, Theory & construction, Phasor diagram, Ratio & Phase angle error, causes of error.

b] Special Measuring Instruments :- Maximum demand indicator, Frequency meter, P.F. meter, Phase sequence indicator.

SECTION B

Unit IV: Measurement of circuit parameters: Different methods of measurement of low, medium & high value of resistance, sensitivity & accuracy of different methods. AC & DC bridges : Wheatstone, Kelvin, Maxwell, Wein, Hay, Desauty, Anderson, Schearing

Unit V: Generalized instrumentation system , characteristics of measurement & instrumentation system Transducers : Definition, classification, specification, selection & loading effect, Displacement, Velocity, force, Resistive, Inductive, capacitive, Strain gauge, Piezoelectric, current & voltage transducers.

Unit VI: Transducers for pressure & temperature: Manometer, Elastic members (Bellows, Bourdon tube, Diaphragm), RTD, Thermocouple, Thermister, Infrared & Crystal Cathode ray oscilloscope: Time, frequency & phase angle measurement using CRO.

Text Book:

A course in Electrical, Electronics Measurement & Instrumentation, By A.K.Sawhney Dhanpat Rai & sons. 2006

Reference Books:

1) Instrumentation for scientists and Engineers – Turner Oxford University Press 2008.
2) Electronic Instrumentation & Measurement , David Bell Oxford University Press 2nd Ed.
3) Electrical measurement and measuring Instruments By Golding Wheeler Publishing 2003.
4) Electronic measurement and measuring Instruments By Coo.

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SEMESTER – IV

4 EP01/4EX01/4EL01/4EE01 ELECTERICAL MACHINES – I

Course Learning Objectives:-

To provide the students a detailed knowledge regarding energy conversion processes (Mechanical Energy into Electrical Energy and vice versa) and Energy Balance Equation also provides a detailed knowledge regarding electrical DC machines.

SECTION - A

Unit I : D.C. Machines

Construction, principle of operation, Emf equation, torque equation. Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation.

Unit II : D.C. Generators.

Types, characteristics and applications of d.c. shunt, series and compound generators.
Parallel operation of d.c. shunt, series and compound generators. Introduction for conducting and reporting the test on d.c. machines as per Indian standard.

Unit III: D.C. Motors

Characteristics, applications of d.c. shunt, series and compound motors, starting and speed control, losses, efficiency and testing.

SECTION - B

Unit IV: Single phase Transformer.

Heat run test, separation of core losses in to its component parallel operation, equivalent circuit. Autotransformer - construction, working, merits, demerits and application. Introduction for conducting and reporting the test on transformer as per Indian standard.

Unit V: Three phase Transformer:

Construction, working, types, connections, applications, testing, parallel operation, open delta, power transformer, distribution transformer construction.

Unit VI:

Three phase to single phase, two phase, six phase, twelve phase conversion. Three-winding transformer and tap changing transformer. Wave forms of no-load current and inrush current phenomenon.

BOOKS RECOMMENDED :

Text Book :

Electrical Machines by D.P.Kothari, I.J.nagrath TMH 4th edition, 2nd reprint 2011

Reference Books :

1) ELECTRIC MACHINERY and Transformer, 3E – Bhag S Guru Oxford University Press Advance

2) Electrical Technology By H.Cooton. 1999 Substation Equipment By Satnam and Gupta 2003.

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4EP02/4EL02/4EE02/4EX02 ELECTROMAGNETIC THEORY

Course Learning Objectives: Students will learn scientific, mathematical and engineering principles that enable them to understand forces, fields, and waves; know how devices work that use those principles and phenomena; and be familiar with the historical context in which development of knowledge and devices occurred.

SECTION-A

Unit I: Review of Vector Analysis: Cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculus. Line integral and multiple integrals. Gauss theorem.

Unit II: Electrostatics: Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III: Electrostatics fields in dielectrics: electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

SECTION-B

Unit IV: Magnetic fields: Biot-Stewart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar magnetic potential, electric current, J vector.

Unit V: Magnetic fields in materials: magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI: Maxwell equations and wave equations: Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration poynting vector.

Text-Book :

1. Dr. T. V. S. Arun Murthy, "Electromagnetic Fields (Theory & Problem)" (S. Chand Technical Publication).

Books Recommended :

1) Engineering Electromagnetic by W.H.Hayt, J.A.Buck, TMH 7th edition 2010.
2) Rohit Khurana, "Electromagnetic Field Theory" (Vikas Publication House Pvt. Ltd.)
3) Foundation of Electromagnetic Theory, John Reitz, F.J.Milford,R.W.Christy, PEARSON education 4th edition 2010
4) Elements of Engineering Electromagnetic, Nannapaneni Narayana Rao, PEARSON education 2006
5) Principles of Electromagnetic 4/e Mathew Sadiku Oxford University Press
6) Field Theory, D. Ganesh rao, C,K, Narayanapa PEARSON education , 2010.

4EX03 LINEAR INTEGRATED CIRCUITS

Course Learning Objectives :

To introduce the basic building blocks of linear integrated circuits, linear and non-linear applications of operational amplifiers also introduce a few special functions integrated circuits. And to empower students to understand the working of Analog filter, IC 555 and Voltage Regulator.

Unit I: Op-amp Fundamentals: Differential amplifiers, ac and dc analysis of differential amplifiers, Review of operation amplifier: block diagram representation, basic configurations, ideal op-amp, negative feedback, non – ideal closed loop characteristics.

Unit II: Basic op-amp Circuits: voltage follower, sign changer, adder, subtractor, I to V and V to I converters, difference amplifiers, instrumentation amplifiers and their applications, transducer bridge amplifier.

Unit III: Op-amp Parameters: Input bias and offset current, input offset voltage, input offset error compensation, slew rate, common mode rejection ratio, input and output impedance, frequency response, compensation techniques.

Unit IV: Non-linear Circuit Applications: Voltage comparator and its applications, Schmitt trigger and its application, precision rectifiers, limiters, analog switches, peak detectors, sample and hold circuits, integrator and differentiator, log/antilog amplifiers, practical log/antilog circuits, analog multipliers.

Unit V: Active Filters: Classification, Butter worth filters: low pass, high pass, band pass, band stop, notch and all pass.

Unit VI: Timer: IC 555, functional diagram, monostable and astable multivibrator.
Voltage regulators: Series op-amp regulators, IC voltage regulators, IC 723.

Text Book:

1) Op-amps and Linear Integrated Circuits Technology, R.A.Gaikwad, PHI publication, 1999

References :

1) Linear Integrated Circuits, D. Roy Chaudhari ,New Age International Publisher, 2005
2) Operational Amplifiers & Linear ICs by David A.Bell , Oxford University Press,2011.
3) OP- AMPs and Linear Integrated Circuits, Sanjay Sharma, S.K.Kataria & Sons, 2010 .

4EX04 SIGNALS AND SYSTEMS

Course Learning Objectifies:

To enable the students to acquire fundamental knowledge of convolution, engineering transform, sampling so as to study and analyze various aspects of Signals and Systems.

SECTION A

Unit I : Introduction to Signals and Systems: •Signals and Systems, Classification of Signals Classification of Systems, Some Ideal Signals, Energy and Power Signals, Discretisation of Continuous-Time Signals ,Analysis of Continuous-Time Systems, Time Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit II : Fourier series and Its Properties Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III : Analysis of LTI Discrete-Time Systems: Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

SECTION B

Unit IV : Sampling: Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit V: The Z Transform: The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI : Discrete Fourier Transform and Fast Fourier Transform Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform.

TEXT BOOK:

1) Signals and systems, Oppenheim and Schafer Prentice Hall India of India 2nd Edition 1997.

REFERENCE BOOKS:

1) PRINCIPLES OF LINEAR SYSTEMS AND SIGNALS,2E(international version) – Lathi B. P.Oxford University Press.
2) “Signals & Systems”, Smarajit Ghosh, PEARSON education, 2006.
3) “Signals & Systems”,D Ganesh rao, satish Tunga, PEARSON education 2010.
4) “Signals And Systems” , S.Haykin, 2nd Edition, John Wiley And Sons 1999 .

4EP05/4EX05/4EL05/4EE05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Course Learning Objectives:-

- To provide in depth knowledge about the various numerical methods for the solution of algebraic & transcendental equations, simultaneous algebraic equations , interpolation, numerical differentiation and integration, solution of ordinary differential equations, its numerical accuracy, numerical efficiency, numerical stability & its sturcutred programming.

SECTION A

UNIT I: Solution of Algebraic & Transcendental equations : Floating point number representation, errors, accuracy, stability of algorithms. Bracketing methods : bisection method and False Position method. Open methods: Newton-Raphson method, Secant method and Successive Approximation method. Comparison of different iterative methods. Implementation of these methods in C.

UNIT II: Solution of Simultaneous Algebraic equations : Iterative methods : Jacobi's method and Gauss-Seidel method. Direct methods: Gaussian elimination method & Matrix Inverse method. Finding Eigen values of a matrix, determination of largest Eigen value. Implementation of these methods in C.

UNIT III: Interpolation : Evenly spaced points : formation of forward & backward difference table, Newton's forward & backward difference interpolation formulae. Unevenly spaced points: divided difference table and Newton's divided difference interpolation formula, Lagrange's method. Implementation of these methods in C.

SECTION-B

UNIT IV: Numerical Differentiation and Integration : Numerical differentiation: Taylor's series method, numerical differentiation using interpolation polynomial (first & second derivative near the begining & end of the table). Numerical Integration :Trapezoidal Rule, Simpson's Rules, Romberg method, Gaussian quadrature method. Implementation of these methods in C.

UNIT V: Solution of ordinary differential equations : Initial value problem : Taylor's series method, Runge-Kutta methods - second & fourth order, Euler's method, Euler's modified method. Solution of simultaneous & higher order differential equations using Runge-Kutta fourth order method.. Boundary value problem : Finite difference method and Cubic spline method. Implementation of these methods in C.

UNIT VI: Principles of Object Oriented Programming : OOP paradigm, basic concepts of OOP, benefits of OOP, basic data types, users defined data types, derived data types, operators and control statements.

BOOKS RECOMMENDED:

Text Book:-Numerical Methods in Engg and Sci. with Programs in C & C++ by Grewal B.S., Khanna Pub.

Reference Books:

1) Balguruswami E. : Object Oriented Programming with C++, Tata McGraw Hill, New Delhi.
2) Introductory Methods of Numerical Analysis by Sastry S.S., Prentice-Hall of India Private Limited, 2006.
3) Numerical Methods with Programms in C by T. Veerarajan, T. Ramachandran TMH 2nd edn,, 6th reprint 2011..
4) Computer Fundamentals and Programming in C – Dey and Ghosh Oxford University Press 2008.

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NOTIFICATION

No. 50 /2018 Date : 7/06/2018

Subject :- Continuation of Prospectus No. 131741 prescribed for Sem. V & VI B.E. (CGS) for the session 2018-2019.

It is notified for general information of all concerned that the Prospectus No.131741 prescribed for Semester **V & VI B.E. (CGS)** for the session 2012-2013 and continued upto the session 2017-2018 shall be continued for the academic session 2018-2019 with the following substitutions (revised syllabi) for the examinations **B.E. Sem. V & VI (Civil) and B.E. Sem. V & VI (Electrical & Electronics**) as per **Appendices A & B** appended herewith as given below **:**

Sd
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SEMESTER - V : B.E. – (CIVIL)

5CE01: REINFORCED CEMENT CONCRETE – II

SECTION – A

Unit I :

1. Design of circular tanks with rigid and flexible base resting on firm ground by working stress method. (By IS code Method, IS 3370-2009)

2.Design of circular tanks with rigid base resting on firm ground by Limit State method. (By IS code Method, IS 3370-2009)

LIMIT STATE METHOD:

Unit-II :

1) Introduction to limit state method, basic concept of singly, doubly reinforced and flanged beams, shear and comparison with working stress method.

2) Analysis and design of one way single span and continuous slabs.

Unit-III :

1) Analysis and design of two way solid slabs.

2) Staircases, Design of Dog legged type staircase only.

SECTION-B

Unit-IV:

Transfer of load from slab on beams. Analysis and complete design of beams, rectangular and flanged sections for bending moment and shear.

Unit-V:

1) Transfer of load from beam on column. Analysis and design of columns for axial load, uniaxial and biaxial bending. (Problem on uniaxial bending only)

2) Design of Isolated footings: Square and rectangular footings of uniform depth subjected to axial load only.

Unit-VI:

1) Design of grid slab by I.S. code method.

2) Detailing for earthquake resistant construction. Introduction, Cyclic behaviour of concrete and reinforcement, significance of Ductility, Ductile detailing for beams, Columns, joints & shear walls.

BOOKS RECOMMENDED:

1. Jain A.K.: Plain & Reinforced Concrete, Vol. I & II
2. Sinha S.K. & Roy S.K.: Fundamentals of RCC.
3. Pillai&Menon: RCC Design.
4. Dr.Shah V.L. &Karve S.R.: Limit State Design.

5CE02: FLUID MECHANICS-II

SECTION – A

Unit-I:

Turbulent flow through pipes: Karman-Prandtl’s equation (No Proof), Nikuradse's experiment, Velocity distribution laws & universal resistance laws, Hydrodynamically, smooth & rough pipes, Moody’s diagram, Commercial pipes.

Unit –II:

Uniform flow, Open channel flow, Types of flow, geometric elements of rectangular & trapezoidal sections, Chezy's & Mannings equations, most efficient rectangular & trapezoidal section, Energy & momentum principles, Normal & critical depth, specific energy diagram, discharge diagram, specific force diagram.

Unit-III:

Gradually varied flow, Dynamic equation of G.V.F. with proof, Analysis of Surface profiles, single step method. Rapidly varied flow; Hydraulic jump in horizontal rectangular channel, elements of jump, relation between conjugate depth, elements of jump.

SECTION - B

Unit-IV:

Dimensional Analysis ; Buckingham's Pie theorem, it's application, similitude, Dimensionless numbers, Re, Fr, We, Predominant forces & their ratio, Model Analysis - Geometrically similar models, Reynolds law, Froude's law, Model study of spillways, distorted models, analysis of ship model.

Unit-V:

Impact of jet on stationary & moving plates, symmetrical, asymmetrical curved vanes; Moment of momentum equation (statement only), velocity diagrams. Elements of Hydroelectric Plant, Hydraulic turbines; classification of turbines, Description of Pelton wheel, Francis turbine & Kaplan turbine, calculation of work done, power & efficiency, specific speed.

Unit-VI:

Classification of pumps ; centrifugal pumps, main parts & working, velocity diagrams, work done, efficiency, priming of pumps, multi stage pumps, pumps in series & parallel.

Brief introduction of reciprocating pump, Jet pump, Submersible pump, Hydraulic Ram (No numerical).

BOOKS RECOMMENDED:

1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition, Standard Book House, New Delhi-6
2) Ranga Raju : Open Channel Flow.
3) Dr. Jain A.K. : Fluid Mechanics.
4) Subramanya K. : Flow in Open Channel.
5) Chow V.T. : Open Channel Hydraulics.
6) Garde & Mirajgaonkar : Fluid Mechanics.
7) Nagaratnam S.; Fluid Mechanics
8) Madan Mohan Das; Open channel flow
9) R.K. Rajput; Fluid Mechanics
10) Jagdish Lal Fluid Mechanics

5CE07: FLUID MECHANICS -II – Lab

PRACTICALS –

Minimum 8 practicals out of the list given below are to be performed: The practical examination shall consist of viva-voce based on theory & practicals.

1. Verification of momentum equation.
2. Determination of Chezy's coefficient.
3. Determination of coefficient of discharge of Venturiflume.
4. Study of Gradually Varied Flow.
5. Study of hydraulic jump, calculations of height of jump, length & energy loss.
6. Trial on Pelton wheel.
7. Trial on Francis turbine.
8. Trial on reciprocating pump.
9. Trial on Centrifugal pump.
10. Trial on Hydraulic Ram.
11. Study of Hot wire Anemometer, Laser Doppler Anemometer.
12. Study of CFD & its applications.

5CE03: BUILDING PLANNING AND CAD

SECTION – A

Unit- I: Introduction, importance of building drawing for Civil Engineering in construction & estimation, Methods of drawing, selection of scales for various drawings, types of line, methods of dimensioning in architectural drawing.

Abbreviations & graphical symbols used in Civil Engineering Drawing as per IS: 962. Combined first angle & third angle method of projection. Layout of sheet for civil engineering drawing, Requirements of drawing as per plan sanctioning authorities.

Unit-II: Concept of line plan & working drawings of the building. Developing working drawings of the building from the given line plan. Details to be incorporated in the working drawing. Necessity and use of working drawing. Concept of site plan, block plan and layout plan. Importance and details to be incorporated. Concept of foundation plan, importance and use. Developing working drawing and foundation plan for load bearing and framed structures. Plumbing & electric plan.

SECTION - B

Unit-III: Building rules and by laws for residential buildings, conversion to land to non agricultural lands, layout for housing project. Types of public building and their requirements, planning of public building. Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post office. Perspective drawing, stair case planning and drawing.

Unit-IV: Planning of residential building. Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement. Climate and design consideration. Orientation of buildings, requirement of the owner, alternatives of building types viz. individual bungalows, semidetached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building. Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Criteria for earthquake resistant planning of building

Books Recommended :

1. Shah, Kale & Patki, Building Planning & Drawing, Tata McGraw-Hill plubication
2. Dr. Kumar Swamy & Rao Swamy, Charotar publications
3. Chery R ,Auto cad Pocket reference, BPB Publication.

5CE08: BUILDING PLANNING AND CAD –Lab

1. Developing working drawing of single storied residential building from the given line plan.
2. Preparing line plan of residential building from the given data. Developing submission drawing of the above as per requirement of the plan sanctioning authority. (Separate data should be given to every student).
3. Developing working drawing of multistoried framed structures (Apartment building) from given line plan.
4. Developing line plans of public building from the given data (minimum 2 line plans)
5. Developing working drawing of single storied residential building from the given line plan by any drafting software.
6. Development of free hand sketches of components of building and elevation features of building such as chajjas, compound wall, steel grills and gates.

5CE04: SURVEYING-II

SECTION- A

Unit-I: Tachometry: Stadia methods-fixed hair and movable hair, tangential method, formulae for distance and reduced level determination. Theory of analytic lens, Beaman's stadia arc, Auto reduction tacheometer such as Jeffcot, Hammer fennel.

Unit-II: Curves: Classification, degree of curve, elements of circular and compound curves, theory and methods of setting out simple curves, Instrumental method of setting out compound curves.
Transition curves. : Ideal transition curves, characteristics methods of determination of length, Elements of different types and methods of setting out.

Unit-III :Triangulation : principles, classification of triangulation system, triangulation figures, their choice of station, phase of signals, towers, satellite station, reduction to center, field work, reconnaissance, Inter-visibility, angular measurements.
Basenet, extension of Basenet, adjustment of field observation, errors in observation, method of least square, weighted observations, figure adjustment (Triangle only).

SECTION – B

Unit-IV:Hydrographic surveying: necessity, controls, shore line surveys, gauges, sounding equipments and procedure of taking soundings, methods of location of sounding, three point problem in hydrographic surveying, analytical and graphical methods.
Underground Surveying: surface alignment, correlation of surface and underground surveys; Weisbach triangle, transferring levels and alignment underground.

Unit-V: Elements of photogrammetry: Basic definitions, terrestrial and aerial photography, scale of vertical photograph, Relief and relief displacements, heights from parallel measurements, flight planning, photographs required.
Remote sensing: Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics.

Unit-VI: 1.Field Astronomy : Elements of spherical trigonometry, Napier's rules of circular parts, celestial sphere, ecliptic, circumpolar stars, astronomical terms, Astronomical triangle, co-ordinate systems.
2. GIS & GPS: Components of geographical information system (GIS), advantages, function of GIS, advantages and disadvantages, Global positioning system (GPS) introduction, definitions, GPS receivers, antenna, advantages of GPS.

Books Recommended :

1. D. Clark. : Plane and Geodetic Surveying Vol II
2. T.P. Kanetkar & S.V.Kulkarni : Surveying and Levelling Part II
3. B.C.Punmia : Surveying Vol. II and III
4. A.M. Chandra: Higher surveying, New Age International publishers.
5. B.C. Punamia, Ashok Jain, Arun k. Jain: Higher surveying, Laxmi publications (P), Ltd,
6. Dr. S. Kumar: Basics of remote sensing and GIS, Laxmi publications (P), Ltd,

5CE09: SURVEYING -II - Lab

Practicals –

Practicals from the list mentioned below shall be performed by each student and observations, calculation and relevant work shall be submitted as a term work.
Practical examination shall consist of field exercise and viva voce examination based on the above syllabus & practicals.

LIST OF EXPERIMENTS:

1. Finding out tachometric constants and Finding out height & distances by tachometry.
2. Ranging circular curve by offset from long chord.
3. Ranging circular curve by offset from chord produced.
4. Ranging circular curve by Rankine's method by using total station.
5. Ranging of transition curve
6. Triangulation by satellite station
7. Base line measurement in triangulation system
8. To Find horizontal distance and difference in elevation between two points by using Total station
9. Study on Stereoscope
10. Study on GPS.

5FECE05: FREE ELECTIVE-I (i) INTRODUCTION TO EARTHQUAKE ENGINEERING

SECTION A

UNIT I:

Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, Propagation of earthquake waves .

UNIT II:

Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph, accelerogram recording), Determination of magnitude, Epicenter distance, Ground motion and their characteristics, Factors affecting ground motions.

UNIT III:

Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings

SECTION B

UNIT IV:

Projections & suspended parts, special construction features like separation of adjoining structure, crumble section, stair case etc, twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking

UNIT V:

Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures.

UNIT VI:

Behavior of R.C. building in past earthquakes. Concept of earthquake Resistant design, Introduction to IS: 1893

Reference Books:

1 Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007
2 Amita Sinvhal; Understanding Earthquake Disasters, Tata McGraw Hill.

5FECE05: FREE ELECTIVE-I (ii) BASICS OF BUILDING CONSTRUCTION

SECTION –A

Unit-I: Introduction: Definition of building as per national building code, components of buildings and their function , Types of structure-load bearing structure and frame structures, their relative advantages and disadvantages, load bearing walls and partition walls. Types of foundation- Definition and necessity and types of foundations, precautions to be taken against failure of foundations

Unit-II :Stone Masonry- Technical term, general principles to be observed during construction, selection of stone masonry. Brick Masonry Construction- Technical term, general principles to be observed during construction, commonly used types of bonds such as Stretcher, Header, English bond Flemish bond and their suitability.

Unit-III: Floors- Types of floors-Basement floor, ground floor and upper floor. Types of upper floors-R.C.C. slab floor, R.C.C. slab and beam floor, R.C.C. grid floor, R.C.C. flat slab floor. Floor Finishes-Types of flooring material, Shahabad , Kota, Granite, Ceramic tiles, Plain tiles, mosaic tiles ,glazed tiles ,different types of floor finishes , their suitability. Method of construction, criteria of selection. Roofs-Flat and pitched roof ,steel roof trusses-types and suitability ,fixing details at supports ,types of roof covering ,AC and GI sheets, acrylic sheets, fixing details of roof covering.

SECTION –B

Unit IV: Door –Purpose, criteria for location, size of door, door frames and its types, method of fixing Windows-Purpose, criteria for location, size and shapes of windows, types of windows and their suitability. Ventilators – Types and their suitability. Fixtures and Fastening for doors and windows. Glass- Types of glass and their suitability. Arches and Lintels - Types and their suitability. Details of R.C.C. lintels and chajja, precast lintels and arches

Unit-V:Stairs- Function, technical terms, criteria for location, types of staircases and their suitability. Plastering and Pointing- Necessity, types, processes of different types of plastering, defects in plaster work Painting and Coloring – Necessity, types, processes of painting and coloring to the wall surface, wooden surfaces, iron and steel surfaces, types of paints and their uses Scaffolding- Purposes, types, suitability.

Unit VI: Special Aspects of Construction, Damp proofing-causes of dampness, its effects, various methods of damp proofing, material used for damp proofing. Fire proof construction- Points to be observed during planning and construction. Fire protection requirement for a multistoried building, Sound proof construction –Sound absorbents and their characteristic. Joints- Expansion and construction joints necessity, details of expansion joint at foundation level and roof level of load bearing structure and framed structure, Provision of construction joints in slabs, beams and columns.

Books Recommended:

- Deshpande R.S.. and Vartak C.V.: A Treatise on Building Construction .
- Sharma S.K. Kaul and B.K. :A.T.B. Building Construction ,S Chand and co.
- Gurucharan Sing : Building Construction Engineering, Standard Book House ,Delhi-06
- Sane L.S.: Construction Engineering, Manak Talas, Mumbai
- Chudley R.: Construction Technology ,Volume I.II.III. and IV,Longmans Group Ltd. ISE National Building code of India,1970.

5FECE05: FREE ELECTIVE-I (iii)

WATERSHED MANAGEMENT

SECTION-A

Unit I Engineering Hydrology: Definition and its importance, Hydrological Cycle, Hydrologic equation. Storages, concept of storages, the watershed
Water and Energy: Energy movement, quality of energy, geometry of energy. The energy budget, Instruments and limitations. The role of water in energy sphere.

Unit II Precipitation: Forms, Types. Factor affecting, Measurement
Evaporation: Processes, factor affecting, measurement and estimation
Evapotranspiration: Processes, factor affecting, measurement and estimation
Infiltration: Processes, factor affecting, measurement and infiltration indices

Unit III Run-off: Factor affecting, estimation of runoff, Rainfall-Runoff co-relation
Floods: Floods classification importance, estimation of flood, flood control techniques, Brief description of flood routing.

SECTION-B

Unit IV Common aquifer: Exploration of ground water hydraulics of ground water flow-Measurement of permeability of formations, flow net and their construction .
Boundary Conditions: Unconfined and confined, steady and unsteady flow in to wells and infiltration galleries.

Unit V : Watershed development management-Definition, Need and scope, characterization of watershed criteria survey, Basic data collection and interpretation, Establishment of watershed research stations.
Hydrographs: Typical flood Hydrograph, base flow separation, Unit hydrograph, S-curve hydrograph.

Unit VI Rain water harvesting: Necessity, method of rain water harvesting, water harvesting potentially, elements of typical water harvesting system, cost of water harvesting.
Roles of NGO's Government and Municipal Corporation Limitations, quality assurance of stored water.

Books Recommended:

1) Sharma R.K.: Hydrology and Water Resources Engineering .
2) Peter E.Black: Watershed Hydrology.
3) Dr. Reddy Jayarami P. :Hydrology, Laxmi Pub..Delhi.
4) R.N.Chaturvedi: Water Resources Systems,Planning and Management.
5) Raghunath H.M. :Hydrology,Wiley Eastern Ltd., New Delhi.
6) Subramanya S. : Hudrology, Tata McGRAW Hill

SEMESTER – VI

6CE01: NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION - A

Unit-I :
Spreadsheet software basics, Expressions, Mathematical Functions, Conditional Execution Functions like IF, COUNT,COUNTIF, SUM, SUMIF, AVERAGE, AVERAGEIF, VLOOKUP, HLOOKUP.Application to Civil Engineering Problems.

Unit-II :
1. Basic grammar of FORTRAN, use of library functions, FORTRAN coding sheet, input output statements, format for input output statement, flowchart.
2. Control statements: GO TO, computed GO TO, Assigned GO TO, arithmetic IF, logical IF, block IF, DO statement, implied DO loop

Unit-III :
1. Type declaration statement, DIMENSION statement, subscripted variables, DATA statement
2. Sub – programs: Statement function, function sub – program, subroutine sub program. Dummy and actual arguments.

SECTION-B

Computer Programming using FORTRAN 77
Unit-IV:
1. Matrix operations such as:
   a. Addition and substraction
   b. Multiplication
   c. Transpose
   d. Testing summary etc.
2. Fourth order, Runge - Kutta method for solution of first order, second order differential equations and two simultaneous equations.

Unit-V:
1. Solution of quadratic equation
2. Numerical integral using Trapezoidal and Simpson rule
3. Finding root of equation f (x) = 0 by Newton -Raphson,
Regula -Falsi and Bisection method.

Unit VI:
1. Centre of gravity, moment of inertia & radius of gyration of Tee section.
2. Bending moment and shear force ordinates for simply supported beam subjected to point and uniformly distributed load only.
3. Design of singly reinforced beam by limit state method.
4. Determination of coefficient of permeability in parallel and
perpendicular direction of bedding plane
5. Reduce level by height of instrument method.
6. Determination of Chezy's constant.

BOOKS RECOMMENDED:
1. Rajaraman, Computer Programming in FORTRAN
2. Schaum Series, FORTRAN Programming.

6CE07: NUMERICAL METHODS AND COMPUTER PROGRAMMING -Lab
PRACTICALS:
Preparation and execution of at least six computer programs using FORTRAN.Solution of at least two civil engineering problems using spreadsheet software.A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE02: DESIGN OF RCC & PRESTRESS CONCRETE STRUCTURES

SECTION-A

(DESIGN OF R.C.C. STRUCTURES BY LIMIT STATE METHOD)

Unit-I
1. Design of interior panel of flat slab by direct design method. (Problem on square panel only)
2. Design of cantilever retaining wall and Counterfort retaining wall.

Unit II:
1. Design of combined footing.
2. Complete design of simple, small structures like Canopies & Parking shed.

SECTION-B

PRESTRESSED CONCRETE:
Unit-III
1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress
2. Analysis of beams for flexure, under working load for Rectangular and flanged sections.

Unit-IV
1. Basic Design of rectangular sections for flexure by limit state method, Design of one way single span slabs.
2. Design of prestressed concrete circular water tanks by IS code method.

Students may be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:
1. Jain, A. K., Reinforced Concrete (Limit State Design)
2. Jaikrishna and Jain, Plain and Reinforced Concrete, Volume I and II
3. Sinham S. N., Reinforced Concrete (Limit State Design)
4. Edward G. Nawy "Prestressed Concrete- A fundamental Approach", Prentice Hall
5. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
6. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi)
7. Dr. Shah V.L. &Karve S.R.: Limit State Design.

6CE08: DESIGN OF RCC & PRESTRESS CONCRETE STRUCTURES – Lab

Practicals:
1. Candidates are required to prepare at least two designs based on theoretical course detailed workings are ecessary.
2. A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE03: WATER RESOURCES ENGINEERING – I

SECTION – A

Unit-I
Engineering Hydrology: Definition and its importance, Hydrologic Cycle, **Hydrologic data,** Hydrologic equation, **Precipitation**: Definition, Forms, Types, Measurement, Rain gauge Network, Estimation of Missing data, Consistency of data, Mean Areal Precipitation,

Unit II:
Evaporation: Process, factors affecting, measurement and estimation, control of evaporation. **Evapotranspiration:** Factors affecting, measurement and estimation **control of evapotranspiration**
Infiltration: Process, factors affecting, measurement, Infiltration indices.
Run-off: Factors affecting, estimation of runoff, Rainfall- Runoff co-relation.

Unit-III
Floods: Flood classification, importance, estimation of flood, flood control techniques, **Reservoir & channel routine.**
Hydrographs: Typical flood hydrograph, base flow separation, Unit hydrograph, S-curve hydrograph.

SECTION-B

Unit IV:
Irrigation Engineering: Necessity and advantages of irrigation, suitability of soils for different crops, standards for irrigation water.
Minor Irrigation Works: Necessity and general layout of Bandhara and percolation Tank, **design & construction of bridge cum bandharas, cement plus across nala in the water shed of the village**.
Lift Irrigation: Necessity and general layout, main components

Unit-V
Crop Water Requirements: Principal Indian crop seasons and water requirements for different crops, Duty and Delta, Consumptive use of water and its estimation, Irrigation efficien**cies**.
Irrigation methods: Comparative study of different irrigation methods, **basic of drip & sprinkler irrigation, its scope and applicapibility**

Unit VI:
Ground water: Aquifer parameters, Well hydraulics for steady **and unsteady** flow condition, safe yield and yield tests.
Water Harvesting: Definition, Need for water harvesting, water harvesting potentially, elements of typical water harvesting system, Methods of water harvesting, cost of water harvesting,

BOOKS RECOMMENDED :

Engineering Hydrology
1.Dr.Reddy Jayarami P. : Hydrology, Laxmi Pub., Delhi.
2.Subramanya S. : Hydrology, Tata McGraw Hill.
3.Raghunath H.M. : Hydrology, Wiley Eastern Ltd., New Delhi.
4.Sharma R.K. : Hydrology & Water Resources Engg.

Irrigation Engineering
1.Dr. Modi P.N. : Irrigation, Water Resources & Water Power Engg.
2.Punmia : Irrigation & Water Power Engg.
3.Garg S.K. : Irrigation & Water Power Engg.
4.Dahigaonkar J.G. : T.B. of Irrigation Engg., Wheeler & Co.
5. Dr. T.K. Sharma & R.K. Sharma, Irrigation Engineering
6. Dr. A.R. Arora, Irrigation & Water Power Engineering

6CE04: TRANSPORTATION ENGINEERING - II

SECTION – A

Unit-I

RAILWAY: Railway transportation, classification Railway surveying, track standard terminology, track sections in embankment & cutting, high speed trains. Traction and tractive resistance, hauling capacity and tractive effort of locomotives, different types of traction.

Unit-II
Permanent way: requirement, gauges, coning of wheels, components of permanent way, Rail types and functions, defects in Rails, Rail joints, Sleeper density, Rail fixtures & fastening. Geometric design of railway track, gauge, gradients, speed, superelevation, cant deficiency, negative superelevation, grade compensation, curves, Railway accidents and causes.

Unit-III

Points and crossing Left & right hand turnouts, design calculations for turnout & cross over, types of Track junction, long welded rails. Station and yards- types, function, facilities & equipment. Railway signalling and interlocking, objects, classification & types of signals, control & movement of trains.

SECTION - B

Unit-IV

AIRPORT: Development of air transportation in India, Agencies controlling national & international aviation, Various surveys to be conducted, airport site selection, Airport drainage, Aeroplane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, imaginary surfaces approach and turning zone Runway and Taxiway design: orientation of runway, wind rose diagram, basic runway length and corrections, runway geometric design standards.

Unit-V

Airport layout, Terminal area, Terminal area, unit terminal concept, Apron, Apron layout, Aircraft parking & parking system. Visual aids, Airport parking & lighting of runway, taxiway and other areas. Airport traffic control, need of control aids, instrumental landing systems, accidents in the air.

Unit-VI

TUNNELS: Tunnels necessity, types, tunnel economics, tunnel alignment, tunneling methods in soft soil & hard rock. Needle beam method, drift method. Size and shape of tunnels, Tunnel lining, drainage, ventilation & lighting of tunnels.

BOOKS RECOMMENDED :

1) Saxena & Arora : Railway Engineering.
2) Agrawal M.M. : Railway Engineering.
3) Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
4) Srinivasan : Tunnel Engineering.

6FECE05: FREE ELECTIVE-II (i) DISASTER MANAGEMENT

SECTION – A

Unit I

What is disaster, types, damage caused, pre-disaster preparedness, post-disaster preparedness, early warning strategies, National disaster management guidelines, role of NGO'S in disaster management, different phases of disaster management cycle.

Unit II

Principles of emergency management, crisis management, International organizations such as Red cross, United Nations, European Union, Indian organizations, Natural hazards in coastal states in India, what is Tsunami, its characteristics.

Unit III

Monsoon in India, its calculations, flood hazard in India. Regions of country prone to floods, flash floods, damages caused due to floods, Do's and Don'ts in Earthquake.

SECTION – B

Unit IV

Role of GIS, GPS and Remote sensing in disaster management, flood forecasting and warning in India, coordination of central water commission and Indian meteorological department, action plan for flood forecasting and warning.

Unit V

Disaster risk reduction programme, institutional strengthening and capacity building for DRR by Central Govt., State disaster management authority, its functions human resource support required at SDMA, need of psychosocial support and mental health in disasters.

Unit VI

Training of human resource in disaster risk reduction planning at state level, awareness among people, key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster, plan to counter, threats to water supply.

Books Recommended :

1. Cuny,Fred C; Disasters and management, oxford Uni. Press.
2. Alexander,David;Principles of emergency planning & management, Terra publishing, ISBN 1-903544-10-6
3. National Disaster Management Authority, Govt. of India, Report.
4. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994.

6FECE05: FREE ELECTIVE-II (ii) ENVIRONMENTAL MANAGEMENT

SECTION – A

Unit I : The nature, scope and components of environmental management.

Environmental impact analysis- need and importance, step involved methods of EIA, public participation and communication.

UNIT II: Environmental policy analysis- micro level and macro level, methods of policy analysis, steps involved. : Operational methods, quantitative methods, statical analysis public policy analysis resource allocation, environmental economics etc.

UNIT III: Environmental management plan (EMP): components of Environmental Management Plan, Preparation of Environmental Management Plan

SECTION – B

UNIT IV : Environmental Legislation and Acts: Water (prevention and control of pollution) Act1974,Air (prevention and control of pollution) Act 1981, Environmental protection Act (EPA) 986, Hazardous waste rules1989, Factory Act 1984 amendments in 1987, Environmental Management System: ISO 14000(EMS)

Environmental Audits: methods, components and preparation.

UNIT V: Various agencies for Environmental Managements in India: Ministry of environment and forest, central pollution control boards, state pollution control boards, local bodies, - their scopes, organizational and functional issues, their working etc.

UNIT VI: Basics of Data Base Management System (DBMS), Geographic Information System (GIS) and remote sensing in Environmental Management.

Information of software for EIA

Books Recommended :

1) Environmental Impact Analysis- a decision Making Tool: By R K Jain
2) Theory and Practice of Environmental Impact Assessment: By Abbasi AND Ramesh
3) Environmental Impact Assessment: By Shrivastava
4) Environmental laws and policy in India, Armin Rozencaranz, Sham Diwan Marhta L. Nobel, Tripathi publication.
5) Environmental Legislation: V Krishnamurthi.

6CE06: ESTIMATING AND COSTING

SECTION – A

Unit-I : General: Importance of the subject, purpose of quantity estimates, Modes of measurement and units of measurement as IS1200. Methods of cost estimating in general, various methods of stage-I (approximate) estimates. Specification: Purpose and principles of specification writing, types of specification writing and developing detailed specification of a few items related to building, Irrigation Work, Road work. Problem on Four rooms for measurement only

Unit –II: Cost Building-up: purpose and principles, importance of Schedule of Rates in cost estimates, factors affecting analysis of rates. Fixed, variable prime and supplementary cost, overhead costs and its allocation. Recommendations from N.B.O. for Task work, No. of workman etc., Schedule of rates, market rate analysis of some specific items including transportation cost. Workout quantities of various materials required for construction, such as cement, steel, bricks, aggregates, timber.

Unit-III : Cost & Quantity Estimate: Methods of detailed estimates, forms used, detailed estimates of Civil Engineering works, Building, Quantity estimates:

SECTION – B

Unit-IV : Earth work estimates in Roads including hill road. Earthwork calculations for earthen dam.

Unit-V : Valuation - Purpose of valuation, value and cost, market value, potential value, sentimental value, scrap value, etc.
Real estate, Guilt edged security. Net & gross return, tenure of land, free hold & lease hold property. Sinking fund, Depreciation, capitalized value, annualized value, of a old building.

Unit-VI : Organisation for construction industry specific to Govt. organisation. P.W.D.Organisation, Site administration, Labour contracts, BOT. Role of Govt. deptt. as a construction agency, Arranging Works: Methods of carrying out works, Arranging contract work, Tender Notices, acceptance of tender, essentials of contracts, types of contracts, contract documents, Indian contract law and Engineering contracts, land acquisition Act, Legal aspects of various contract provision. Cost accounting, various methods; classification of cost, direct & indirect charges, distribution of overheads, MAS account, issue rate of store account.

BOOKS RECOMMENDED :

1. R.H. Namavati. : Estimating and Valuation
2. B.N. Datta : Estimating & Costing – S. Datta Lucknow.
3. V.N. Vazirani, S.P. Chandola: C.E. Estimating & Costing, Khanna Publisher Delhi.
4. B.S. Patil: Estimating Costing – Orient Longmans.
5. P.W. & H. Deptt. Govt. of Maharashtra: Standard Specification
6. S.C. Rangawala: Valuation (Charotar Book Stall)
7. Dhanpat Rai: Text book of Estimates Costing – Anand & Sons, Delhi.
8. B.C. Chakraborty: Principles of Estimation & Costing.

6CE09: ESTIMATING AND COSTING –Lab

PRACTICALS –

The candidates submit the following :
Preference must be given to use of Spreadsheet softwarewherever possible
1) Detailed estimate of a, single story load bearing structure building (given plan)
2) Detailed estimate of any one of the following
   a) Compound wall of residential building with steel gate.
   b) Septic tank for a colony
   c) Culvert
3) Detailed estimate of bituminous road- one Km length
4) Detailed estimate R.C.C. single story building
5) Specification for 6 items as below.
   Building works 4 Items.
   Road Work 1 Items.
   Irrigation work 2 Items.
6) Rate analysis of any 8 building items.
7) Tender documents for the Building in problem No. 1
   a) Tender Notice.
   b) Tender.
   c) Schedule A and Schedule B.
   d) Conditions of contracts regarding time, labour payment, damages.
8) Valuation of building, existing Building.

NOTE:- Practical Examination shall consists of viva-voce and a test based on syllabus and sessional work.

6CE10: MINOR PROJECT

Any one Group Project in details.

1) Irrigation Project
2) Rehabilitation of Village / Town
3) Water Supply Project
4) Sewerage System
5) Bridge on River

Students should conduct a detailed survey in a seven day camp.

Data Analysis, Design & Submit Report & Drawing sheets.

SEMESTER - V : B.E. (ELECTRICAL & ELECTRONICS ENGG.)

5EX01 CONTROL SYSTEMS

Course learning objectives

- To introduce history, importance and components of control system engineering, concepts of automatic control, time response analysis, stability of system, frequency response analysis, and state variable analysis ,and current scenario of control system engineering.

SECTION-A

Unit I : Introduction to automatic control : open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graphs. Effect of feed back on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components : Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchors, potentiometers, tachogenerators, their functional analysis and operating characteristics and their application. Pneumatic controls devices.

Unit III: Time response analysis : time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series. Approximate methods for higher order system, proportional, derivative and integral control.

SECTION-B

Unit IV: Stability : stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability. Root Locus : construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V : Frequency response methods : frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer function from the frequency response., Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis.

Unit VI : State, state space and state variables; SISO/MIMO linear systems state variable models - differential equations, Transfer Functions, Block Diagrams and State Diagrams (Signal Flow Graphs); Transfer functions decomposition - Phase variable forms, Canonical forms and Jordan canonical form; Transfer function - state model;Transfer matrix; State equations solution - State transition matrix (STM); STM Computation – Laplace transformation, Canonical transformation and Cayley Hamilton theorem; Time response – SISO Systems. Concept - controllability and observability, Kalman & Gilbert test

Text Book :
1. Nagrath I.J., Gopal M. : Control System Engineering, “New age international publishers”.

Reference Books:
1. Control Engineering, D.Ganesh Rao, k.Chennavenkatesh, 2010.
2. Ogata K. : Modern Control Systems, Prentice Hall of India.
3. Control System Engineering, R Anandanatarajan, P Ramesh Babu,SCITECH Pub., Chennai, 2nd ed.,2010.

5 EX02 DIGITAL ELECTRONICS

Course objective :
Able to represent numerical values in various number systems and perform number conversions, design digital combinational circuits like decoders, encoders, multiplexers, and de-multiplexers including arithmetic circuits and to analyze sequential digital circuits like flip-flops, ROM, RAM, PROM.

SECTION-A

Unit-I : Number systems and codes: Binary Number System, Binary to decimal Conversion, Decimal-to-binary Conversion, Octal Numbers, Hexadecimal Numbers , The ASCII Code, The Excess 3 Code, The Gray Code. Unsigned Binary Numbers, Sign magnitude Numbers, 2’S Complement Representation.

Unit-II: Combinational Logic circuits: Boolean Laws And Theorems,Sum-of-products Method, Truth Table to Karnaugh Map,Pairs, Quads, and Octets, Karnaugh Simplifications Don’tcare Conditions, Product-of-sums Method , Productof- sums Simplification, Simplification by Quine-McCluskey Method, Hazards and Hazard Covers.

Unit-III: Data-processing circuits: Multiplexers, Demultiplexers, 1-of- 16 Decoder, BCD-to-decimal Decoders Seven-segment Decoders, Encoders, Exclusive-or GATES, Parity Generators and Checkers ,Magnitude comparator ,Read-only Memory .

SECTION-B

Unit-IV: Definitions for Digital Signals, Digital Waveforms, Digital Logic, Moving and Storing Digital information, Digital Operations, The Basic Gates—NOT, OR, AND, Universal Logic Gates—NOR, NAND AND-OR-Invert GATES, Positive and Negative Logic.

Unit-V: Arithmetic circuits: Binary Addition, Binary Subtraction, 2’S Complement Arithmetic, Arithmetic Building Blocks, The Adder-subtracter , Fast Adder, Arithmetic Logic Unit , Binary Multiplication & Division.

Unit-VI: Clocks and Timers: Clock Waveforms, TTL Clock, Schmitt Trigger. Flip-Flops: RS Flip-flops, Gated Flip-flops, Edge triggered RS Flip-flops , Edge-triggered D Flip-flops, Edge triggered JK Flip-flops , Flip-flop Timing, JK Master-slave Flip-flops, Analysis of Sequential Circuits.

Text-Book :
Jain R.P. "Modern Digital Electronics" (TMH).

Reference books:
1. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).
2. Taub & Schilling " Digital Integrated Electronics" (TMH).
3. Donald P Leach, Albert Paul Malvino,Goutam Saha, "Digital Principles & Applications" (6/e) (McGraw-Hill).

5 EP03/5EX03/5EL03/5EE03 ELECTRICAL MACHINES - II

Course Learning Objectives:-

This subject aims to educate students with basic laws governing the electrical machines. Analyze the behavior of the machines performance calculation of the machine; characteristics of the machine know the application of different electrical machines in industries.

SECTION-A

Unit I : Fundamentals of AC rotating machines. AC windings- integral slot, fractional slot and fractional pitch windings- distribution factor, pitch factor and winding factor-harmonic mmf of distributed windings, EMF equation.

Unit II : Synchronous Generators : constructional details, armature reaction-circuit models and phasor diagram of salient and non salient pole machines - determinations of parameters of the circuit models - methods of determining regulations and efficiency, transient and subtransient reactances.

Unit III : A) Synchronous Motors : principle of operation – torque equation - circle diagrams- V-curves - hunting and damping starting applications.
B) Methods of synchronization - synchronous machine on infinite busbars - parallel operation of generators.Introduction to conducting and reporting the test on synchronous machine as per IS.

SECTION – B

Unit IV : Three phase induction motor : rotating magnetic fields, principles of operation-constructional details - circuit models and phasor diagram, performance equations direct and indirect testing-circle diagram.

Unit V : Methods of starting and speed control of 3 phase IM-double cage motor-methods of braking-single phasing, cogging and crawling, scharge motor.

Unit VI : A) Single phase IM : different types - starting methods - characteristics and applications.
B) AC commutator machines-series motors - characteristics and applications.
C) Small machines-principle of operation, construction characteristics and applications of Printed Circuit Motor (PCM), Syn, ind motor, reluctance motor and hysterisis. Introduction to conducting and reporting the test on single phase induction motor as per IS.

Text Book:-
Electrical Machines by Smarajit Ghosh, Pearson Education- II edition 2008

Reference Books:-
1. Theory of AC Machines: A.S.Langsdorf (McGraw Hill)
2. Performance and Design of AC Commutator Motors - Openshov - Taylor (McGraw Hill)
3. Performance and Design of Alternating Current Machines: M.C.Say,
4. Electrical Machines - Nagrath, Kothari. (Tata McGraw Hill)

5EX04 ELECTRICAL POWER I

Course Objectives: To provide in depth knowledge about understanding the fundamentals of both electrical and mechanical components design aspects in power system**.**

Unit I : **Transmission line parameters :** Calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on capacitance, interference with communication lines.

Unit II : **Electrical characteristics of transmission line :** V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal Π and nominal T representations, Ferranti effect, corona phenomenon, effect of corona. **Representation of power systems:**per unit system and one-line reactance diagrams.

Unit III: **Voltage control and power factor improvement:**Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers. (10)

Unit IV: **Load flow studies:** Load flow problem, classification of buses, network modeling, Y-bus matrix, load flow equation, Gauss-Seidal and Newton-Raphson methods, and comparison of these methods. (10)

Unit V: **Mechanical design:**Materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Line supports for LV, HV and EHV, sag calculation.

Unit VI: **Underground cables:** Material used for conductor &insulation, different types of cables and their manufacture, parameters of underground cable, grading of cable.

Text Book:-

Power System Engineering by D.P.Kothari, I.J.Nagrath TMH 2nd edition, 9th reprint 2010.

Reference Books:-

1. Electrical Power Systems, C.L.Wadhwa, 6th Edition 2010, New Age International Pub.
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010.
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, Pearson Education.
4. Power System Analysis by Hadi Saadat TMH, 1st Edition reprint 2004.

5FEEP05/5FEEX05/5FEEL05/5FEEE05

FREE ELECTIVE- I (i) ENERGY AUDIT AND MANAGEMENT

Course Learning Objectives:-

To understand general energy problem, sector wise energy consumption, demand supply gap, scope for energy conservation and its benefits.

SECTION -A

Unit -I : **Energy Scenario & Management:** Indian energy scenario, Energy needs of growing economy, Energy pricing in India Energy sector reforms, various forms of energy, Primary and secondary energy, commercial and noncommercial energy, Global primary energy reserves, Energy and environment, Necessity of conserving energy, Energy strategy for the future, Electrical energy management, Concept of supply side management and demand side management, Methods of implementing Demand side management and advantages to consumer, utility and society.

Unit–II: Energy Audit: Definition, Need of energy audit, Preliminary and detailed energy audit. Procedure for carrying out energy audit, Instruments used for energy audit, Data Analysis-Energy–production relationship, specific energy consumption, Sankey diagram, CUSUM Technique, Bench marking energy performance, Recommendations for energy conservation, Action plan, Executive Summary.

Unit III: Economics of energy conservation: Cost factors, Budgeting, Standard costing and Sources of capital, Cash flow diagram and activity chart, Simple Payback period analysis, Time value of money, Net present value method, internal rate of return method, Profitability index for benefit cost ratio.

SECTION -B

Unit IV: Energy Conservation: Energy conservation in motive power, Illumination, Heating & cooling systems, Pumping systems, Thermal power stations and Transmission & Distribution Sector. Cogeneration &Waste heat recovery systems.

Unit-V: Energy Audit Case Studies: Energy Intensive Industries, Commercial, Industrial, Municipal and Agriculture Sector, IT industries, Hospitals.

Unit VI : Fundamentals of Harmonics: Harmonic distortion, voltage versus current distortion, Power systems quantities under non sinusoidal conditions- active reactive and apparent power, displacement and true power factor, harmonic phase sequences, triplen harmonics, harmonic indices- Total harmonic distortion(THD), Total demand distortion(TDD) , Harmonic sources from commercial and industrial load, Locating harmonic sources, Power quality monitoring.

Books Recommended :

Text Book :Electrical Energy Utilization & Conservation Dr. S.C. Tripathi, TMC

Reference Books :

1. Energy Coservation and Audit Thumman.
2. Energy Audit and Conservation TERI.
3. Guide book for national certification examn. for Bureau of Energy Efficiency energy managers & energy auditors.
4. Electrical power system quality systems Surya Santoso/ H. W. Beaty, TMH Publication.

6EX01/8EL03/8EP03/8EE03 DIGITAL SIGNAL PROCESSING

Course Learning Objectifies:
To enable the students to obtain essential understanding of Stability criteria, DFT,Sampling of Bandpass signals in order to design the various Digital filters.

SECTION A

UNIT-I : Introduction to DSP, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations.

UNIT-II : Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, decimation in time and frequency algorithm.

UNIT-III : Sampling of Bandpass signals-Representation of Bandpass signals, sampling of bandpass signals, discrete time processing of continuous time signal; Analog to digital conversion-sample and hold, quantization and coding, analysis of quantization errors, oversampling of A/D converter; Digital to Analog conversion-sample and hold, first order hold, linear interpolation with delay, oversampling of D/A converter

SECTION B

UNIT-IV : Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window.

UNIT-V : Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation.

UNIT-VI : DSP Processors and applications- DSP Microprocessors architectures, fixed point, floating point precision, algorithm design, mathematical, structure and numerical constraints, DSP programming, filtering, data conversion; Real time processing consideration including interrupts.

TEXT BOOK:
Digital Signal Processing, P Ramesh Babu,SCITECH Publications, Chennai, 4th edition,2010.

REFERENCE BOOKS:
1. Proakis&Monolakis D.G, 'Digital Signal Processing', PHI Publication.
2. Mitra S.K, 'Digital Signal Processing', TMH Publication.
3. Oppenhavm&Scheffer, 'Discrete Time Processing', John Wiley Publication.

6EX02 OPTIMISATION TECHNIQUES

Course Objectives: To Develops Students Analytical Power By Verious Mathematical Model Of Linear And Non Linear Programming, Analyze The Concept Of Project Management And Its Application To Electrical Engineering

SECTION A

Unit I: Introduction, engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem, optimization techniques. Classical optimization techniques - single and multi variable optimization with and without constraints.

Unit II : Linear programming I - standard form, definitions and theorems, graphical method, solution of system of linear simultaneous equations, simplex method, two phase simplex method, revised simplex method.

Unit III: Linear programming II - duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis, balanced transportation problems.

SECTION B

Unit IV: Non linear programming: Unimodal function, unrestricted search, Fibonancci search method and Golden section method, unconstrained optimization, direct search methods steepest descent method, conjugate gradient and variable metric method.

Unit V: CPM and PERT introduction - Network representation of project, critical path, optimum scheduling by CPM, crashing of project.

Unit VI: Dynamic programming: multistage decision processes, principle of optimality, sub optimization, conversion of final value problem into initial value problem, solution of linear programming.

TEXT BOOK: S.S.Rao : Optimization - Theory & Application, Wiley Eastern Ltd.

REFERENCE BOOKS:

1) L.S.Srinath : PERT and CPM Principles & Application, Affiliated East West Pvt. Ltd., New Delhi.
2) Fredrick S.Hiller Gerald J.L. Lieberman : Introduction Operations Research, Tata McGraw Hill Pub. Co., New Delhi.
3) H.A.Taha : Operations Research, PHI, New Delhi.
4) P.K.Gupta & D.S.Hira : Operations Research, S.Chand & Co. Ltd, New Delhi.
5) J.C.Pant : Introduction to Optimization, Jain Brothers, New Delhi

6EX03 ELECTRICAL POWER - II

Course Objectives: To provide in depth knowledge about understanding the fundamentals of symmetrical components & its significance.

Unit I : **Symmetrical components**
Definition and choice, Alpha operator, transformation matrices, sequence components, power invariance, line and phase sequence quantities relations, three phase delta/star transformer bank-sequence voltages and currents relationship; power system elements – sequence impedance and sequence networks ; Various three phase transformer connections – zero sequence rules.

Unit II : Symmetrical Fault Analysis
Transmission line transients, three phase symmetrical short circuit at alternator terminals, Power system fault calculations, short circuit MVA, Current limiting reactors, ring system and tie bar system, Circuit breaker rating calculation.

Unit III : Unsymmetrical Fault Analysis
L-G, L-L-G and L-L faults at unloaded generator terminals, Equivalent sequence network diagram, Fault impedance, Unsymmetrical faults through impedance, Power system faults on unloaded conditions.

Unit IV : Overvoltages
Causes – internal and external; Voltage surge, Basic insulation level, Protection – earthing screen, overhead ground wire, lightning arresters.

Unit V : HVDC Transmission
Basic principle, Transmission equipments, Comparison with AC links, Inverters – reactive power requirement; Converters, DC links, Circuit breaking, ground return, Economic distance, modern developments.

Unit VI : Flexible AC Transmission Systems (FACTS)
FACTS concept, Elements, Controllers, Comparison with Conventional AC Transmission system.

Text Book:-

1.Electrical Power Systems, C.L.Wadhwa, 6th Edition 2010, New Age International Publishers.

Reference Books:-

1. Power System Engineering by D.P.Kothari, I.J.nagrath TMH 2nd edition, 9threprint 2010
2. Power System Analysis, N.V.Ramana, PEARSON education, 2010
3. Power System Analysis, Arthur R. Bergen, Vijay Vittal2nd Edition, 2009, PEARSON Education
4. Narain G. Hingorani and Lazlo Gyugyi – "Unerstanding FACTS: Concepts and Technology of Flexible AC Transmission Systems.

6EX04 MICROPROCESSORS & MICROCONTROLLERS

Course Learning Objectives: To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

SECTION-A

Unit I : 8085 : architecture, register structure, addressing modes, instruction set of 8085, timing diagrams.

Unit II : Assembly Language Programming of 8085, counters and time delays, stack and subroutines, Memory mapped I/O and I/O mapped I/O, address decoding techniques. Interrupt system of 8085 (software and hardware interrupts). Data transfer schemes, serial data transfer through SOD and SID line.

Unit III : Interfacing devices (I) : internal architecture and programming of PPI (8255), PIC (8259), USART (8251).

SECTION-B

Unit IV : Interfacing devices (II) : architecture and programming of programmable interval timer (8253), floppy disc controller (8272), programmable CRT controller (8275), DMA controller (8237). Introduction to architecture 8086.

Unit V : Microprocessors applications : hardware & software developments : signal conditioning & data acquisation system components. Measurement of pulse width using parallel port, SID lines, interrupts and timer and counter. Magnitude measurement techniques : rectification, sampling etc. Measurement of fundamental quantities (voltage, current, frequency, speed) and derived quantities (resistance, inductance, capacitance, phase angle, power factor).

Unit VI : **Introduction to microcontroller:** 8051 architecture , 8051 Internal resources, pin diagram, I/O pins, ports and their internal logic circuits, counters, serial ports, interrupt structure, SFRs and their addressing, watch-dog timer, internal code memory, data memory, stack pointer, flags, bit addressable memory, comparative study 8051 families by different manufacturers, study of instruction set of 8051.

TEXT BOOK :

1) Microprocessor Architecture, Programming, and Applications with the 8085 , Romesh Gaonkar PHI Pub. - 2006

REFERENCE BOOKS :

1. An Introduction to Microcomputers Volume 1 Basic Concepts, Adam Osborne Osborne-McGraw Hill, Berkely California, 1980.
2. The 8051 Family of Microcontrollers Richard Barnett Prentice-Hall, Inc -2005.

6FEEP05/ 6FEEX 05/ 6FEEL05/ 6FEEE05 FREE ELECTIVE – II POWER SUPPLY SYSTEMS

Course Learning Objectives :

To enable the student to acquire fundamental knowledge of structure of power system, the function of different component in generation ,transmission and distribution system, various power generating station and working of various of power plant.

SECTION-A

Unit I:
Structure of Power System –
Generation, transmission and distribution. Power generating stations – different types.
Steam power stations: Main parts and working, types of boilers and their characteristics. Characteristics of steam turbines and alternators. Main flow circuits of steam power station. Power station auxiliaries, cooling system of alternators. Starting up and shut down procedures of thermal units.

Unit II:
Gas-turbine power stations- Main parts, plant layout and Bryton cycle operation. Combined cycle generation & Cogeneration. Nuclear power stations- Layout of nuclear power station, types of power reactors, main parts and control of reactors, nuclear waste disposal, radioactivity and hazards.

SECTION B

Unit III:
Hydroelectric stations: Arrangement and location of hydroelectric stations, principles of working, types of turbines and their characteristics, Pumped storage plants. Coordination of operation of different power stations .

Unit IV:
Substation - Classification of substations, Major equipments in Substation ,Selection & location of site for substation, Main Electrical connections, Graphical symbols for various apparatus & circuit elements in substation, connection diagram, Key diagram for typical substation, Busbar layouts. Auxillary supply, substation earthing.

Unit V:
Power distribution system: Primary and secondary distribution, types of conductors in Distribution system, comparison of distribution systems. Distributor design, radial and ring main, current and voltage profiles along a distributor, economics of feeder design.

Unit VI:
Electrical wiring and installation - Domestic, commercial and industrial wiring, estimation of main, submain and sub circuit wiring. Earthing practice. Testing of installation. Special lighting connections. Conductors, Fuse and disconnecting devices.

BOOKS RECOMMENDED :

TEXT BOOK : Principles of power system by V.k mehta & Rohit mehta. S chand.

REFERENCE BOOKS :

1. A Course in Power Plant Engineering, by Arora Domkundwar, Dhanpat Rai.
2. Elements of Electrical Power Station Design, by M.V.Deshpande, Wheeler.
3. Electrical Installation Estimating & Costing by J.B.Gupta.
4. Transmission & Distribution, by H.Cotton .

6EX05 POWER ELECTRONICS - I

SECTION-A

Unit I : SCR, triac, diac-construction, characteristics & applications, two transistor analogy for turning ON-OFF SCR, turn ON mechanism, different methods of turning ON-OFF SCR, turn OFF mechanism, thyristor firing circuits, introduction to GTO, power transistor, power MOSFET & IGBT & their construction & characteristics.

Unit II : Series -parallel operation of SCRs, firing ckts. for series and parallel operation, static & dynamic equalising ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, protection of SCRs against di/dt, dv/dt, radio freq. interference, over voltage, over current.

Unit III: Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters.
Three phase half controlled bridge and fully controlled bridge rectifier. (only descriptive approach)

SECTION-B

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, out put voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter.

Unit V: Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper, step-down chopper and AC chopper. Basic principle of cycloconverters, single phase to single phase cycloconverter, voltage regulators.

Unit VI: Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, speed control of three phase induction motor by stator voltage control, v/f control . Static ckt. braker, UPS, fan speed regulator, Zero voltage Switch.

Text Book : M.D.Singh & K.B.Khanchandani : Power Electronics, Tata McGraw Hill, New Delhi

Reference books :

1.M.H.Rashid : Power Electronics Circuits Devices and Application, PEARSON Education., 3rd edn. 2004.
2.3) Principles of Popwer Electronics, J.G.Kassakian,M.F.SchlechtG.C.Verghese, PEARSON Education 2010
3.G.K.Dubey, S.R.Doradia, A.Joshi, R.M.Sinha : Thyristerised Power Controllers, New Age Intern., New Delhi.

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NOTIFICATION

No. 53/2019 Date : 06/06/2019

Subject :- Continuation of Prospectus No. 181711 prescribed for Sem. VII & VIII B.E. (CGS) for the session 2019-2020.

It is notified for general information of all concerned that the Prospectus No. **181711** prescribed for Semester **VII & VIII B.E. (CGS)** for the session 2013-2014 and continued upto the session 2018-2019 shall be continued for the academic session 2019-2020 with following substitutions for the examinations B.E. Sem. **VII & VIII** (Civil) and B.E. Sem. **VII & VIII** Electrical (E &) and B.E. (Electrical & Electronics) as per **Appendices A & B** appended herewith as given below **:**

Sd/-
Registrar
Sant Gadge Baba Amravati University

Appendix – A

7CE01: THEORY OF STRUCTURES – II

SECTION - A

Unit-I :

1. Moment distribution method, application to portal frames with sway. Multibay, multistoried, symmetrical frames subjected to symmetric loads only.
2. Slope deflection method: Application to portal frames with side sway.

Unit-II :

1. Kani's method: Continuous beams and single bay single storey portal frames with side sway.
2. Multi- bay, multi storeyed frames subjected to symmetric loads.

Unit-III :

1. Castigliano's second theorem, principle of least work, Analysis of redundant frames. (up to two degree redundancy).
2. Analysis of redundant trusses (up to second degree of redundancy).

SECTION - B

Unit-IV :

1. Muller - Breslau's principle, Influence linediagrams for continuous beams, upto two spanwith simple end supports.
2. Tension coefficient method & its applications to simple space trusses.

Unit-V :

1. Flexibility method, static redundancy, flexibility coefficients, compatibility condition application to beams.
2. Introduction to plastic analysis of steel structure, shape factor, plastic section modulus,upper and lower bound theorems, collapse loads for beams, single bay, single storey portals.

Unit-VI :

Stiffness method, kinematic redundancy, stiffness coefficients, direct stiffness approach, application to continuous beams and single - bay, single - storey portal frame.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures
3. Reddy. C. S., Basic Structural Analysis, Tata McGraw Hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Analysis

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7CE02: GEOTECHNICAL ENGINEERING – II

SECTION – A

Unit I :

Exploratory Programme : Field exploration, objectives and methods of exploration planning of exploration programme soil boring , hand augers, percussion boring, rotary wash boring, collection of sample, split spoon sampler, disturbed and undisturbed samples and their criteria SPT test, field vane shear test, geophysical methods, electrical resistivity and soil refraction methods. Soil log bore presentation and interpretation exploration data.
Ground Improvement : Methods of soil stabilization use of admixture (lime, cement, flyash) in stabilization) Mechanism of reinforced soil, use of Geo synthetics material and itôs function, vibroflotation, sand drain and preloading techniques.

Unit II :

Bearing Capacity of Shallow foundation :- Concept of local and general shear failure, Different theories: Terzaghiôs Skemptonôs, Meyerhofôs, BIS method for bearing capacity , determination bearing capacity of granular soils based on SPT value. Concept of raft foundation and floating foundation.
In situ methods of evaluation of bearing capacity, plate load test, static cone penetrometer, pressure meter test, contact pressure distribution diagram below the base of footing.

Unit III :

Earth pressure: Earth pressure at rest, & plastic equilibrium of soil, Rankineôs and Coulombôs theory of active and passive earth pressure on retaining wall. Influence of surcharge, water table, Rebhannôs and Culmannôs simple graphical methods. Introduction to sheet pile and bulkhead and their classifications,(No design criteria) Cofferdam purpose, various types and their suitability.

SECTION – B

Unit IV :

Pile foundation : Classification of piles and their uses, static analysis, formula for determination of pile capacity for driven and bored pile in sandy and in clayey soil , dynamic pile formula Negative skin friction, factors affecting it, piles in group and their capacity, group efficiency, factors affecting group efficiency, behaviour of group of pile in sandy and in clayey soil, pile load test, effect of pile cap. Criteria for spacing and depth of piles. BIS design criterion for undereamed Pile in clays and sands.

Unit V

Settlement Evaluation: Immediate, primary and secondary settlement for footing resting on homogenous isotropic, cohesive and cohesion less soils related to single footing, combined footing, & raft foundation etc., concept of differential settlement factors and causes for differential settlement, BIS requirement for total as well as differential settlement, service loads, proportioning of footing for uniform settlement, Computation of total and differential settlement of a single pile and group of piles in sandy and clayey soil.

Unit VI
Well foundation: Component & their function, sinking of well, types of force system, and their computation, design criteria for various components of wells, tilting and shifting Bearing capacity of well as per BIS.
Stability analysis : Stability analysis of infinite and finite slope, causes of failure of slopes, Stability analysis of infinite and finite slope in cohesive and non cohesive soils, Taylorôs stability number, Friction circle method and Swedish circle method.

BOOKS RECOMMENDED :
1) Craig : Soil Mechanics.
2) Bowles J.E. : Foundation Design Analysis.
3) Hanson : Theoretical Soil Mechanics.
4) Peck and Hanson : Foundation Engineering.
5) Tomlinson : Foundation Engineering.
6) Leoner : Foundation Engineering.
7) Bramha : Foundation Engineering.
8) Prakash S. : Analysis and Design of Foundation and Retaining Structure.
9) Kasmalkar : Foundation Engineering.
10) Arora K.R. : Foundation Engineering.
11) Venkataramiah : Soil Mechanics and Foundation Engineering.
12) Rao G.V. : Engineering with Geosynthetics.
13) S. K. Garg : Soil Mechanics and Foundation Engineering.
14) P. P. Raj : Geotechnical Engineering.

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7CE03: DESIGN OF STEEL STRUCTURES

(Steel structures by Limit State method using IS 800: 2007)

SECTION A

Unit I : 1. Introduction to WSM, LSM & plastic analysis.
2. Design of bolted & welded connections subjected to axial loading.

Unit II : 1. Design of compression & tension member subjected to axial loading.
2. Design of roof truss.

SECTION B

Unit III : 1. Design of simple & compound columns for axial & eccentric loading.
2. Design of column bases (Slab base & Gusseted base) subjected to axial load.

Unit IV : 1. Design of simple Beams.
2. Design of compound Beams.

Books Recommended:

1. Duggal, S. K., Design of Steel Structures, Tata McGraw Hill Pub. Company Ltd.
2. N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.
3. Shah & Karve, Design of steel structures.
4. Sheyakar, Design of steel structure.
5. Bhavikatti, Design of steel structure.

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7CE04: ENVIRONMENTAL ENGINEERING – I

SECTION - A

Unit-I : Quantity Estimation of water: Demand of water. Consumption for various purposes. Fire Demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population.
Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.

Unit-II : Water quality: Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis- physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works.
Intakes- type, location, requirement & features.

Unit-III: Aeration: Purpose, types of gravity aerators & spray aerators.
Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, Flocculation, clarrifloculator. Design criteria for sedimentation tanks, surface loading, simple problems on design of sedimentation tanks.

SECTION – B

Unit-IV: Filtration :- Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters.

Unit V: Disinfection :- Requirement of good disinfectant, methods of disinfection. Chlorination: Methods, prechlorination, post chlorination. Break point chlorination and super chlorination, forms of chlorine. Use of bleaching powder - Simple problems.
Introduction to tertiary treatments-Softening and Defloridation.

Unit-VI: Distribution system: - Types of supply: Continuous, and intermittent. Types of system: Gravity, Pumping and combined gravity and pumping, Layouts of distributions system. Maintenance of distribution system. Equalising storage, Type of storage reservoirs, capacity.Types of conduits, joints, appurtenances. Pipe laying and testing.

Books Recommended:

1. Steel E. W., ñWater Supply and Sewerageò, Mc-Graw Hill.
2. Kshirsagar S. R., ñWater Supply Engineeringò, Roorkee Pub house, Roorkee.
3. Birde G. S. , ñWater Supply and Sanitary Engineeringò, Dhanpat Rai and Sons, Delhi.
4. Punmia B. C. ñwater Supply Engineeringò.

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7CE05 PROF ELECT: – I (i) ADVANCED WATER TREATMENT

SECTION-A

Unit I : Requirements of water treatment facilities different unit operations and unit processes.
Coordination of unit operations. Common attributes of water affected by conventional unit operations and processes.
Aeration: rate of gas absorption and desorption, objectives of aeration, gravity aerators and spray aerators, governing factors, design of aerators, removal of methane, C02,H2S taste, design and odour.

Unit-II : Objectives of flocculation, chemical coagulation, concept of surface charge, coagulating effects of electrolytes, zeta potential, coagulants and coagulant aids, factors affecting coagulation.
Perikinetic and orthokinetic flocculation - mixing and stirring devices, flash mixing flocculators, construction and operation of flocculators, problems on design of flocculators. Pebbled bed flocculator.

Unit-III : Sedimentation: objectives, theory of sedimentation discrete settling and hindered settling, settling of floucculant suspension. Ideal settling basin and its efficiency. Design, construction and operation of sedimentation tanks. Inlet and outlet hydraulics, sludge, removal and disposal, tube and plate settlers. Problems on design of sedimentation tanks.

SECTION-B

Unit-IV : Filtration: objectives, design, construction and operation of rapid and slow sand filters, filtering sand, grain size and size distribution, preparation of filter sand, hydraulics of filtration. Hydraulics of fluidized beds. Scour intensification, high rate, declined rate, upflow biflow, dual media, diatomaceous earth filters.

Unit-V : Disinfection : objectives, different disinfectants, chemical disinfection, theory, factors governing, and kinetics. Disinfection by Ozone. Disinfection by chlorine; free available and combined. available chlorine, break point chlorination, chemical technology and other uses of chlorine, manageable variables.
Unit-VI : Miscellaneous methods of treatment : Water softening: limesoda and zeolite process, split treatment problems on calculation of dose of lime and soda ash. Iron and Manganese Removal : Fluoridation and defluoridation. Desalination. Taste and Odour Removal.

BOOKS RECOMMENDED :

1) Fiar, Geyer & Okun : Water and Waste Water Engg., John Wiley & Sons.
2) Mark J. Hammer : Water and Waste Water Technology, John Wiley & Sons.
3) Steel E.W. & Ghee M.C. : Water Supply & Sewerage, McGraw Hill Co.

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7CE05: PROFESSIONAL ELECTIVE – I (ii) ADVANCED GEOTECHNICAL ENGINEERING

SECTION-A

Unit I : Clay mineralogy: Introduction, atomic bonds, classification and nomenclature, structure of clay mineral, Kaolinite. Illite and Montmorillonite groups, physical properties, clay-water relations, diffused double layer, thixotropy, base exchange capacity formation of different structure in soil deposites, electrical effects, electroosmosis, electrophoresis, stemming potential, zeta potential, clay mineral identification,DTA analysis, X ray diffraction method.

Unit II :
Seepage : Flownet for anisotropic soil media, construction of flownet for hydraulic structure on non- homogenous soil, directional variation of permeability in aniosotropic medium. Numerical analysis of seepage in layered soil computation of seepage force, seepage through earthen dam resting on confined and unconfined medium entrance discharge and Transfer condition of line of seepage through earth dam.

Unit-III : Three dimensional consolidation. Equation, solution of 3dimensional consolidation equation, consolidation by vertical sand drain and its design aspect, free strain consolidation with no smear, effect of smear zone on radial consolidation. Calculation of the degree of consolidation with radial drains and solutions of problems based on this.

SECTION – B

Unit IV : Expansive soils: orgin of soil, intensification of expansive soil, swelling potential, factors affecting the swelling, different systems of classification, concept of swelling pressure and its measurements in the laboratory, special constructional measures adopted for the construction on expansive soils, special foundations adopted for the construction in expansive soils, concept of cohesive non-swelling techniques and its effect on expansive soil.

Unit V : Soil stabilization concept of mechanical stabilization, physical and chemical stabilization with organic and inorganic material like line, cement, lime, fly ash and mechanisms, various factors affecting stabilization, determination of bearing capacity of stabilized soil, laboratory and field methods of stabilization, On various properties of soil.

Unit VI : Geotextile: types, specifications, functions and various applications in the field of Geotechnical engineering. Reinforced earth, mechanism of reinforced earth, various constructional methods and its effect towards altering, the properties of soil, field situations for application of this techniques. Theory of Arching, effect of arching, design of yield strip, computation of vertical stresses.

BOOKS RECOMMENDED :

1) Scoth R.F. : Principles of Soil Mechanics.
2) Das B.M. : Advanced Soil Mechanics.
3) Terzaghi : Theoretical Soil Mechanics.
4) Proceedings of Indian Geotechnical Conference, Dec. 22-24, 2013, Roorkee
5) Proceedings of first Indian Geotextile Conference, Dec. 08-09, 1988, IIT, Bombay.
6) Soil Mechanics for Road Engineers, AMSO Series.

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7CE05: PROFESSIONAL ELECTIVE – I (iii) WATER POWER ENGINEERING

SECTION - A

Unit I: **Water Power:** Introduction**,** sources of energy, importance of water power, estimation of water power potential, primary and secondary power, load factor, pondage and pondage factor, load curve, numericals.
Type of hydropower plants:- low and high head, run of river, valley dam, diversion canal, high head diversion, pumped storage underground, general description, layout, topographical requirements of each of above.

Unit-II: Penstocks: general classification, design criteria, economical dia, anchorages and accessories.
Water hammer : - meaning, rigid and elastic water column theory, Allievi's charts, numericals.

Unit-III: **Surge tanks**: Necessity, types, function, location, effect of sudden load change, Hydraulic design of simple surge tanks, stability of surge tanks, numericals.

SECTION – B

Unit-IV: **Intakes:** types, locations, requirements, trashrack and other components, control gates, emergency gates, Air Entrainment.

Unit-V: **Hydel Channel:-** power canal and forebay, general principles of alignment and capacity, balancing tank.
Turbines:-types, hydraulic features, size, general description of components and layout, specific speed, choice and selection of turbines, approximate costs, numericals on specific speed only.

Unit-VI : **Power house**:- types, general layout and approximate dimensions, advantages and disadvantages of underground power stations.
Non conventional sources of energy: - tidal power, wind power, geothermal power, solar power, elementary principles and description, application of water power in drilling and blasting of rocks.

Note : Technical visit to nearby hydro power station is compulsory.

BOOKS RECOMMENDED :

1) Dandekar M.M. & Sharma : Water Power Engineering, Vikas Pub. House, Delhi.
2) Brown J.G., Blackie and Practice : Hydro Electric Engg., Vol. I, II & III, W. Sons, London.
3) Mosonyi E. : Water Power Development, Hungarian Academic Sciences, Budapest.
4) Deshmukh M.M. : Water Power Engineering.
5) Davin C. and Sorenson K.C. : Hand Book of Applied Hydraulics, McGraw Hill.
6) Barrows H.K., Water Power Engineering, McGraw Hill.

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7CE05 PROF. ELECTIVE – I (vi) ADVANCED CONCRETE TECHNOLOGY

SECTION – A

Unit-I: Admixtures and construction chemicals: Introduction, admixtures, plasticizers (Water reducers), action of plasticizers, dispersion, retarding effect, superplasticizers (High range water reducers), site problems in the use of plasticizers, retarders, accelerators, air-entraining admixtures, pozzolanic or mineral admixtures, fly ash, silica fume, rice husk ash, metakaolin, ground granulated blast furnace slag (GGBFS), damp and water proofing admixtures, protective materials and their properties as moisture barrier systems, above-grade and below grade water proofing of concrete structures, thermal protection coating, IS code provisions for admixtures.

Unit-II: Durability of concrete: Introduction, strength and durability relationship, volume change in concrete, significance of durability, impact of water cement ratio on durability, factors affecting durability, methods of predicting durability, IS code provisions for durability of concrete. Interaction between permeability, volume change and cracking.

Unit-III: Deformation in concrete: Introduction, deformation of concrete in Indian climate, permeability, interaction between permeability, volume change and cracking, factors contributing cracks in concrete, sulphate attack, alkali aggregate reaction, corrosion of embedded steel, controlling measures, corrosion inhibitors, coatings to embedded reinforcement, corrosion resistant steels, cathodic protection systems.

SECTION – B

Unit-IV: Special concrete and concreting techniques: Introduction to special concrete, Lightweight, aerated, no-fines, high density, fibre reinforced, polymer, prepacked, self-compacted (self leveled), and high volume fly ash (HVFA) concrete. Introduction to special concreting techniques, Gunite or shotcrete, ferrocement, roller compacted concrete, and ready mix concrete casting and applications.

Unit-V: Repairs and rehabilitations: Introduction, need for repairs, crack width, construction chenuicals- curing compounds, surface hardners, polymer modified mortar, bond aid for plasters, guniting aid, silicon based water repellent materials, protective and decorative coatings, injection grout for cracks, coatings for embedded reinforcement, concrete repair systems, stages of repair works.

Unit-VI: Non-destructive testing of concrete: Introduction, rebound hammer, limitations, rebound number and strength of concrete, penetration technique, pullout test, resonant frequency, pulse velocity method, corrosion analyser, rebar locators.
Introduction to precast concrete, materials and their characteristics, features, Precast concrete structure, type of structure, various precast element and their uses, types of connection.
Students must be shown video CD, slides, transperencies and photograph of actual structures.

BOOKS RECOMMENDED :

1. Concrete Repair and Maintenance : Peter H Emmons and Gajanan M. Sabnis, Galgotia Publication.
2. Repairs and Rehabilitation - Compilation from Indian Concrete Journal - ACC Publication.
3. Guide to Concrete Repair and Protection, HB94-2006 A joint publication of Australia Concrete Repair Association, CSIRO and Standards Australia.
4. CPWD hand book on Repair and Rehabilitation of RCC buildings published by DG (Works),CPWD. Government of India (NirmanBhawan), http://www.cpwd.gov.in/handbook.pdf
5. Guide to Concrete Repair, Glenn Smoak, US Department of the Interior Bureau of Reclamation, Technical Service Center, http://books.google.co.in
6. Management of Deteriorating Concrete Structures: George Somerville, Taylor and Francis publication.
7. Concrete Building Pathology: Susan Macdonald, Blackwell Publishing.
8. Testing of Concrete in Structures: John H. Bungey, Stephen G. Millard & Michael G. Grantham, Taylor & Francis Publication.
9. Durability of concrete and cement composites: C.L. Page & M.M. Page, woodhead Publishing.
10. Lea, F. M.: The Chemistry of Cement and Concrete, Edward Arnold(Publishers) Ltd.
11. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
12. Neville, Brooks : Concrete Technology, ELBS
13. Orchard, D. F. : Concrete Technology, Applied Science Pub Ltd.
14. Shetty, M. S. : Concrete Technology, S. Chand
15. Varshney, R. S. : Concrete Technology, Oxford Pub. House.
16. Krishna Raju : Design of Concrete Mixes, McGraw Hill.
17. Shah and Kale : Reinforced Cement Concrete Design,
18. SushilKumar :Treasure of Reinforced Cement Concrete.

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7CE05 PROF. ELECT I (vii) ENVIRONMENTAL POLLUTION & RURAL SANITATION

SECTION-A

Unit I : General components of environment. Nature and scope of Environmental pollution, population growth, Degradation due to human activity. Episodes of Environmental pollution.

Unit-II : Water pollution-sources of water pollution, effects on water bodies, D.O. sag curve, pollution control measures, water pollution act.
Noise pollution: sources of noise pollution, human tolerance levels, levels of exposure due to various sources, preventive and curative methods.

Unit-III : Report of field visit to municipal waste water treatment plant/ Industrial Effluent treatment plant.

SECTION-B

Unit-IV : Land pollution: solids its effect on the environment, various methods of collection, treatment and disposal of solid waste, Hazardous waste and risk analysis.
Unit V : Environmental Impact assessment : Need for EIA, elements of EIA, Environmental attributes, Nature of Impact -Primary, Secondary, Tertiary, Short Term & Long terms, Local & Regional.

Unit-VI : 1) Rural Sanitation ï Collection & disposal of night soil, Sanitary Latrines.
2) Biogas plant - Capacity & Design.

BOOKS RECOMMENDED :

1) Mishra P.C. : Fundamentals of Air & Water Pollution.
2) Mohan I. : Environmental Pollution & Management, Ashish Pub. House, New Delhi-110026
3) Gilbert M. Masters : Introduction to Environmental Engg. & Science.

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7CE06 COMPUTER AIDED ANALYSIS AND DESIGN – Lab.

1) Analysis of simple structures (2D) like portal frames, Beams (1D) with different support conditions. Correlations of the same manually as well as by readymade software like STAAD Pro., SAP, ETABS, ANSYS etc.
2) Calculation of deflection and stresses in truss by using readymade software like STAAD Pro., SAP, ETABS, ANSYS etc.
3) Analysis and design of 3D (G+2) structure by using software like STAAD Pro., SAP, ETABS, ANSYS etc.

7CE07: GEOTECHNICAL ENGINEERING- II – Lab.

List Of Experiments: (Any six)

1.To determine the shear strength by conducting Field Vane shear test.
2. To identify the subsoil strata by conducting soil resistivity / seismic refractivity method
3. To determine the soil characteristics by conducting standard penetration test
4. To determine the bearing capacity of soil by conducting standard penetration test
5. To determine the soil properties by conducting the static cone penetration test.
6. Computation of bearing capacity by analytical approach to verify with field test
7. To determine the soil characteristic with respect to soil log bore

Compulsory: Introduction to Geotechnical Software, determination of bearing capacity , earth pressure etc. professional this software.

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7CE08: DESIGN OF STEEL STRUCTURES – LAB.

Practicals :
1. Candidates are required to prepare at least two designs of steel structures based on theoretical course detailed workings are necessary.
2. A compulsory site visit for studying the various aspect and prepare a report.
A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

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7CE09: PROJECT & SEMINAR

Seminar based on Project shall be delivered in Seventh Semester only. 50 marks shall be given through the internal evaluation done by three member committee one of them will be guide.
Seminar shall be delivered with POWER POINT presentation.

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SEMESTER – VIII

8CE01: WATER RESOURCES ENGINEERING - II

SECTION-A

Unit-I : **Reservoir Planning** : Investigations, selection of site, fixing control levels, Reservoir Capacity, Reservoir Sedimmentation, Calculation of life of Reservoir. Reservoir & Channel routing.
Dams: Definition, Classification, Site selection, factors governing the selection of types of dam.
Earth Dams: Types of dams, causes of failures, design of earth dam, phreatic line, stability analysis, seepage control measures.
Unit II: **Gravity Dams:** Types of dams, forces acting, modes of failure, Elementary and practical profile, Stability analysis method, Galleries, foundation treatment, Earthquake and its effect on dams.

Unit-III Diversion Head Works: Selection of site, components of diversion head works, design of weirs on permeable foundations.
Spillways: Necessity, Requirements, Components, Types of spillway, Spillway crest gates.
Energy dissipators- meaning, JHC & TWRC curves, stilling basins, bucket type energy dissipators.

SECTION-B

Unit-IV : Canal Irrigation: Types of canals, Canal alignment, Design of unlined and lined Canals, Balancing depth, cross section of canal, canal linings, water logging and drainage.

Unit-V : Canal Masonry Works: Types and only design principles and description of -
1. Regulation works: Canal fallôs, Head Regulator, Cross regulator, Canal escapes and canal outlets.
2. Cross drainage works: Aqueduct, Syphon aqueducts, super passage, canal siphon, level crossing

Unit-VI : Water Management:Water management and distribution, co-operative water userôs organization, warabandi, conjunctive use of water, rehabilitation of irrigation project.
Water shed Management: Need of water and soil conservation, integrated watershed development, village as a unit for watershed development.
River Training Works: Need and types of river training works.

BOOKS RECOMMENDED :
1) Dr. Modi P.N. : Irrigation, Water Resources & Water Power Engg.
2) Punmia : Irrigation & Water Power Engg.
3) Garg S.K. : Irrigation & Water Power Engg.
4) Dahigaonkar J.G. : T.B. of Irrigation Engg., Wheeler & Co.
5) Varshaney R.S. : Theory of Irrigation Structures, Vol. I & II, Nemchand, Roorkee.
6) Birdie G.S., Das R.C. : Irrigation Engg., Dhanpatrai & Sons.
7) Michael A. M. : Irrigation (Theory & Practice)
8) Dr. K.R. Arora, Irrigation, water power & Water Resources Engineering.

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8CE 05: WATER RESOURCES ENGINEERING – II – Lab

TERM WORK: Five problems from the following to be worked out by the students, whenever necessary scale drawing on half empirical size must be drawn:
Practical examination shall consist of viva ï voce.

1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components;
   Details of drainage of downstream casing.
3. Design and Drawing of elementary and practical profile of gravity dam.
4. Design and drawing of diversion weir on permeable foundation.
5. Design and Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any four canal structure (No design)
8. Technical Field visit.

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8CEO2: ENVIRONMENTAL ENGINEERING – II

SECTION –A

Unit-I

Quantity of storm water, DWF, variation of sewage, flow systems of sewerage - separate combined and partially combined, layouts of sewerage system, capacity of sewers design of sewers Laying out of circular sewers-Boning rod and sight rail method, Testing & maintenance of sewers.

Unit-II

Waste water characteristic, sampling of sewage, physical chemical and biological examinations, B.O.D. and C.O.D., B.O.D. equation, problems on B.O.D Pollution due to domestic and industrial waste. Treatment of sewage - purpose of treatment, preliminary treatment, primary treatment and secondary treatment. Flow diagram for conventional sewage treatment plant. Preliminary Treatment:- Screening, Grit chamber, detritus tank. Primary Treatment:- Sedimentation of sewage.

Unit-III

Biological treatment: Trickling filters, low rate & high rate tricking filters, construction details, Re- circulation Modification of trickling filters Activated sludge process - Process description, Methods of aeration, loading rates, Different modified forms of A.S.P.,MLSS & SVI, F/M.

SECTION –B

Unit-IV

Low cost waste treatments - Oxidation ponds, Aerated Lagoon, Treatment and Disposal of sludge - Digestion of sludge, sludge disposal Septic tank, working and design, Disposal of septic tank effluent Disposal of sewage on land and in stream. Effluent standards for disposal on land, into stream and into sewers. MINAS. Self purification capacity of stream

Unit-V

Characteristics of solid waste:- Physical, chemical, biological Analysis.
Collection of solid waste:- Types of collection system and services, frequency of collection, methodology involved in setting up collection bins Disposal of solid wastes:- Different methods, sanitary land fill, composting, incineration.

Unit-VI

Air pollution: Introduction to air pollution, various pollutants their sources and their effects on man and material, prevention or air pollution at sources, introduction to control devices electrostatic precipitator & cyclones only human tolerance level Introduction to EIA and Environmental Audit.

Books Recommended :

1) Kshirsagar S.R. : Sewerage and Sewage Treatment, Roorkee Pub House, Roorkee.
2) Steel E.W. Steel : Water Supply & Sewerage, McGraw Hill Book Co.
3) Birdie G.S. : Water Supply and Sanitary Engineering, Dhanpat Rai & Sonôs.
4) Garg S.K. : Waste Water Engineering.
5) Dr. Bhide A.D., Sunderson B.B. : Solid Waste Management in Developing Countries.
6) Rao H.V.N. : Air Pollution.
7) Stern, Wohlers, Boobel, Lowry : Fundamentals of Air Pollution, Academic Press, 1973.

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8CE03: PROJECT PLANNING & MANAGEMENT

SECTION-A

Unit-I :Project, Project Stakeholders, Project life cycle - Conceptual Phase, Planning Phase, Execution Phase, Termination phase.
Conceptual Phase - Concept of feasibility study, Budgeting, Cash Flow, Risk assessment plan.
Project planning- Steps, work break down structure, Scheduling. Project Monitoring & Controlling- Concept of Tracking, Reviewing and Rescheduling.
Planning Tools: Basic concept of Gantt Chart, Bar Chart, Mile stone chart ,their advantage , limitations and overcoming measures ,

Unit II: Networking ï Activity ,Event, dummy Activity, Fulersonôs numbering rule, Geometrical consideration. Critical Path Method: Concept, technique, Critical path, Numerical on Time and Floats computation, concept of Updating Network and its numerical for computation.

Unit III: PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, S.D, Variance, Probability factor, crash programme, normal and crash cost, normal and crash time, cost slope, Numerical on Probability computation, crashing .

SECTION – B

Unit–IV: Concept of resource smoothening and leveling, Cost Curves, Numerical of it. Introduction to Planning softwares. Various stages and process for Work Breakdown structure, planning, scheduling and resource allocation for project by software. One Compulsory assignment for planning, scheduling and resource allocation for construction project using software.

Unit-V: Management- Feyolôs Principal of Management, Functions of management, organization definition, type line, line and staff, functional organization, quality control, ISO. Safety management, construction hazards in multistage building, method of prevention of accident, injury rate, injury severity rate, injury index, National safety council, its role, recommendation, Material management, Objective, Functions, Inventory, Need for inventory, ABC, EOQ analysis.

Unit VI: Equipment Management:

- Power shovel: Construction, working, Output, factors affecting, cycle time, Problem on Output, payback period of equipments
- Dragline: Construction, working, output, factor affect ting output, cycle time , Problem on output .
- Concrete mixer, Tilting and non-tilting type construction working.

Project appraisal : study of project feasibility report, detail project report.

BOOKS RECOMMENDED :

1) Peurifoy R.L.: ñConstruction Planning, Equipment & Methodò.
2) Srinath L.S.: ñPERT & CPMò.
3) Punmia & Khandelwal: ñPERT & CPMò.
4) Khanna S.K.: ñIndustrial Organization & Managementò.
5) Satyanarayan: ñOperations Reserachò.

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8CE04: PROF. ELECTIVE – II (i) ADVANCED DESIGN OF STEEL STRUCTURES

SECTION - A

(By Limit State Method)

Unit-I : (a) Design of foot bridge (N-Truss or Pratt)
(b) Analysis and design for transmission tower lines

Unit-II : (a) Design of self supporting steel chimney and its foundation.
(b) Design of through type truss bridge member for dead loadand equivalent live load including top, bottom bracings and open web girder bridges of pratt trusses and portal bracing.

SECTION – B

Unit-III : Design of industrial buildings including gantry girder, gantry column.
Unit-IV : a) Design of north light trusses and lattice girder.
b) Design of elevated, square pressed steel tanksand staging

Books Recommended:

1.Ramchandra, Design of Steel Structure, Volume - I and II.
2.Arya, Ajmani, Design of Steel Structures.
3.Duggal, Design of Steel Structures by Limit state method.
4.N. Subrramanyam, Design of Steel Structures, Oxford University Press,2008.
5. Shah and Gore, Design of Steel Structures by Limit state method.

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8CE04: PROF ELECT – II

(ii) ADVANCED WASTE WATER & INDUSTRIAL WASTE TREATMENT

SECTION - A

Unit-I

1. Physical unit process: screening, mixing, flocculation, sedimentation, floatation.
2. Design of Grit Chambers and Screens.
3. Chemical Unit Processes: precipitation, gas transfer, adsorption

Unit-II

Biological Unit Process: fundamentals of biological treatment. Design of trickling filter & activated sludge process.

Unit-III

1. Low cost waste water treatment: design of oxidation pond and aerated lagoon.
2. Oxidation ditch. Design of Secondary Settling Tank.
3. Methods of disposal of industrial wastes. Equalization tank, Neutralization.

SECTION – B

Unit-IV

General : Effect of discharge of industrial wastewaters on streams, land and environment. Importance and scope. Problems involved in treatment. Variation in quality and quantity of industrial wastewaters. Standards & Criteria
Indian standards for discharge of treated waste water on land, into municipal sewers and natural water courses.
Sampling of Waste Water : Representative sampling. Grab and composite samples.

Unit-V

General Approaches to Planning of Industrial Wastewater Treatment and disposal. Equalization and proportioning Neutralization. Treating different effluent streams separately. Including/ excluding domestic wastewater along wish the industrial waste. Treating industrial wastewater along with town waste.

Unit-VI

Process flow diagram, characteristics and treatment of various industrial wastes. Industrial wastes of pulp and paper, textiles, tannery, food, canning, sugar mills, distillery, dairy, Pharmaceutical, Electroplating etc. Case study of any one industry.

Books Recommended :

1) Matcalf and Eddy : Waste Water Treatment, Disposal and Reuse, McGraw Hill Pub. Co., New Delhi.
2) Rao and Datta : Waste Water Treatment, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi.

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8CE04: PROF. ELECTIVE – II (iii) FINITE ELEMENT METHOD

SECTION - A

Unit- I

Continuum structures, discretisation, finite elements, nodes, variational principle, minimum potential theorem, relation to Rayleigh-Ritz method.

Unit-II

Interpolation, Lagrangian shape functions, natural coordinates, area and volume coordinates, coordinate and derivative transformations.

Unit-III

2-D plane stress and plane strain analysis, constant strain triangle, rectangle. 3D analysis, tetrahedron & parallelepiped elements.

SECTION - B

Unit-IV

Isoparametric elements, plane stress, plane strain and solids, numerical integration.

Unit-V

Beam straight with C^0 and C^1 continuity, numerical integration to cater for membranes, bending and torsion combination.

Unit-VI

Programming aspects, geometry, connectivity, code numbers alternate data types, half band data preparation, flow charts, typical subroutine for assembly, shape functions, solution of equations, stiffness matrix.

BOOKS RECOMMENDED:

1.Desai, C. S., Abel, Introduction to Finite Element Method
2.Cook, Concept and application of Finite Element Method
3.Patwardhan, N. R. Illustrated Finite Element Method
4.Krishnamurthi, C. S., Finite Element Analysis ï Theory andProgrammingn
5.A. S. Meghre & K. N. Kadam, Finite Element Method in Structural Analysis, Khanna Publications, New Delhi.

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8CE04: PROFESSIONAL ELECTIVE – II (iv) DAM ENGINEERING

SECTION – A

Unit- I: Introduction to Dam Engineering : Different classification for dams, relative advantages and disadvantages of various dam selection or types of dam, Investigation of dam sites, Engineering surveys, geological investigation, subsurface exploration programme, economic height of dam, Construction machinary, material, money, inventory.

Unit-II: Rockfill dam : Introduction, general characteristics, materials and testing of rockfill material, foundation of rockfill dam, design, rockfill placement, examples.

Unit-III: Arch dam :- components, types, methods for design.
Buttress dam : components, types, forces acting, Buttress spacing, Master curve for economic spacing, preliminary design Solid Gravity dams : Analysis & Design of gravity dam.

SECTION –B

Unit-IV: Spillways: choice of types, crest gates, hydraulic design, comparison, approach and tail channel, J.H.C. & tail water rating curve Energy Dissipaters: types, components, design of hydraulic jump type, basins, ski-bucket type, roller bucket.

Unit- V: Head Regulators : requirements, types, foundation treatment including uplift consideration, Bank connection, energy dissipation, hydraulic design of opening and barrel, ventilation, types of gates.
Approach Channel, case study for one on rock foundation and one on permeable foundation.
Model Studies: scales design principles, materials, scale effects for model of dams spillways.

Unit-VI: Instrumentation : In earth dam and solid gravity dams, piezo meters, settlement, gauges, (surface monuments, base plate, cross arm) strain meters joint meters, thermometers, stress meters, pore pressure cells, plumb-bob Seismograph. Water level gauges (description, object, location, working, installation of each, design not expected)
Special problems: increasing height of masonry and concrete dams, strengthening, repairs and maintenance, leakage, evaporation controls. evaporation controls.

Books Recommended :
1) Sharma H.D : Concrete Dams, Metropolitan Book Co, Delhi.
2) Varshney R.S. : Concrete Dam, Ox IBH, Mumbai.
3) Sherard et al : Earth and Rockfill Dam, John Wiley, New York.
4) USBR : Design of Small Dams.
5) USBR : Design of Large Dams.
6) Peurifoy R.L. : Construction, Planning and Equipments, McGraw Hill Book Co.
7) Satyanarayanan : Construction, Planning & Equipment, Standard Pub.
8) USBR : Design of Gravity Dam.

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8CE04 : PROF. ELECTIVE – II (v) ADVANCED ENGINEERING GEOLOGY

SECTION – A

Unit I : A) Geology & engineering characters of Basalts & other rock formations : study of rock formations of Maharashtra older than Deccantrap from Civil engineering point of view, field characters of basalt flows and older formations which are significant from dam foundation, tunnelling work, watershed development including percolation tanks and construction material.

(B) Geology of dam & reservoirôs : bearing capacity & water tightness of different types of rocks occruing in Maharashtra from construction of gravity dam with important case histories of different dam sites in Maharashtra whose geological problems were encountered and remedial measures were adopted. Set of geological conditions which lead to tail channel erosion with case histories of different dam sites.

(C) Geology of tunnel alignment : geological factors responsible for overbreaks & percolation of water, various geological structures which affects the tunnelling works. Case histories of tunnels & hydro-electric projects, roads, railways & canals driven through different types of Basalts & other rocks occur in Maharashtra.

Unit II: (A) Seismological studies : factors to be to safeguard gravity dams. Detailed studies of active & dead faults. Type & design aspect of the dam to be constructed in seismic zone with cace histories.

(B) Percolation tanks : importance of geological studies for the selection of sites for percolation tanks, geological studies of watershed development projects in Maharashtra including Raleganshindi & Vidarbha region.

(C) Ground water studies : water bearing characters of different types of Basalts. Soil & water preservation techniques of civil engineering significance and under ground bandhara. Exploration of tubewells n alluvium and sandy ï alluvium substrata for drinking water oses procedures and need thereof. Deciding acquifers for tubewell exploration & development of tubewells conducting yield tests of tubewell.

Unit III: (A) Geology of soil formation : geological factors which govern the engineering characters of soils. Soil derived from different types of rocks which can be used for casing & hearting of earthen dams. Nature of river alluvium in Maharashtra. Problem water logging & its remedial measures.

(B) Construction material : properties of different types of rocks that can be used as rubble for masonry, road metal, railway ballast, concrete aggregates etc. Problem of alkali aggregate reaction. Scaricity of sand in Deccan trap region, suitability of compact & gdaloidal basalt as a substitute of sand after crushing.

(C) Geology of cut-off trench: geological logging and mapping of cut off trench of irrigation projects. Applicability of grouting in irrigation projects & different grouting techniques.

SECTION - B

Unit IV: (A)Drilling and logging : different methods of drilling. Precautions to be taken during drilling, preservation of cores. Recording of drilling data. Geological logging of the drill & its interpretation. Methods of water intake tests.
(B) Aerial photo interpretation : interpretation of aerial photos from the point of view of rock types, geological structures, selection of dam sites and alignment of roads, railways & ghat interpretation of lineaments for groundwater.
(C) Town planning : role of geology in town planning. Important case histories of the old town planning.

Unit V: Geophysical principle of electrical resistivity survey, its utility in determining the depth of overburden, foundation grade rocks, gullies & other geological structures by having case histories of dams & tunnels, significance of electrical resistivity survey in ground water studies, brief introductory ideas regarding seismic, magnetic and gravity surveys and their applications in various fields.

Unit VI: (A) Rock Mechanics : Engineering properties of rocks, general properties, strength of rocks, elasticity of rocks. Residual stresses in rock masses, classification system in rock engineering - Terzaghiôs load classification, Lauffer-Pacher classification. Rock quality gnation (RQD), rock structure rating (RSR), concept of Wickham et.al (1972)

(B) Environmental Geology : role of geology in environmental engineering, geo-environmental : soils as resources, wind erosion, erosion by moving water, predicting & controlling erosion, soil erosion & land use decisions, problem soils. Reactivation of pre faults, earthquakes in Peninsular India, intensity & magnitude, assessment, Himalayan earthquakes, landslides - characterisation, landslide analysis, dimensions of landslide hazard, landslide potential, case histories, subsidence, response to subsidence prediction, costs of subsidence, case histories.

Books Recommended :

1) P.W.D. Hand Book, Chapter No. 6.
2) Geological Survey of India - Engineering Geology Case Histories, Parts I & II.
3) Auden J.B. : Indian Society of Engineering Geology, Commemoration Volume.
4) Wahlstrom E.E. : Tunnelling in Rocks.
5) Wahlstrom E.E. : Dams, Dam Foundations and Reservoir Sites.
6) Goodman R.E. : Introduction to Rock Mechanics.
7) Bieniawski Z.T. : Rock Mechanics Design in Minning and Tunnelling.
8) Lama R.D. & Vutukuri V.S. : Hand Book of Mechanical Properties.
9) Gupte R.B. : AText Book of Engineernig Geology, Pune Griha Prakashan.
10) Miller : Principles of Remote Sensing.
11) Pandey S.N. : Text Book of Photo Geology.
12) Lundgren L. : Environmental Geology, Prentice Hall Pvt. Ltd.
13) Patwardhan A.M. : The Dynamic Earth System, Prentice Hall Pvt. Ltd.

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8CE04: PROF. ELECTIVE – II (vi) MATRIX COMPUTER ANALYSIS OF STRUCTURES

SECTION - A

Unit- I : Solution of simultaneous algebraic equations, Gaussian elimination method, Half-band matrices, computer programme.

Unit-II : Finite difference method, application to plate deflection problems for fixed and simply support conditions.

Unit-III : Flexibility method, static redundancy, flexibility coefficients, compatibility conditions, application to continuous beams, single-bay single story portals, pin joined plane trusses.

SECTION-B

Unit-IV : Stiffness method, kinematic redundancy, equilibrium equations, member stiffness matrix and structure stiffness matrix, assembly procedure, application to continuous beams, pin jointed plane truss, numerical examples up to three unknowns.

Unit- V : Stiffness matrix of plane frame member with axial deformation (6x6), Grid member (6x6), transformation of forces and displacements, member and global coordinate system.

Unit-VI : Data and program organization for stiffness method, various coding systems, member-joint and joint-coordinate relations, member-displacement relations, code number approach, methods of introducing boundary conditions for restrained displacements.

Books Recommended:

1. Gere, Weaver, Analysis of framed structures
2. Rubinstein, M. F., Matrix computer analysis of structures
3. Matrin, M. C., Introduction to matrix methods of structural analysis.

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8CE04: PROF. ELECTIVE – II (viii) ROCK MECHANICS

SECTION - A

Unit I: Introduction, properties and testing, Introduction to Rock Mechanics and its field applications, identification of common rocks, physical & mechanical characteristics of rock material. Field & Laboratory testing of rocks. Classification of rock masses for engineering purpose.

Unit II: Rock excavation : Blasting - objectives, blasting materials, blasting methods, open cut blasting. control blasting operation, precautions. Drilling, braking & cutting. Machines used for rock excavation.

Unit III: Rock reinforcement & Grouting : Rock bolting ï bolting methods & materials.
High capacity of rock anchors - types of rock anchors, anchor grouting, civil engineering applications. Bolted & anchor supports. Rock grouting - objectives, types of treatment, grouting material, grouting methods, quality control & monitoring of grouting.

SECTION-B

Unit IV: Rock strength & deformability : modes of rock failure, stress- strain behaviour in compression, Mohr- Coloumb failure criteria, Griffths crack theory, empirical criteria for failure, effect of size on strength. Plane of weakness in rocks, joint orientation & roughness. Deformability of rocks - elastic & non- elastic behaviour, influence of time on rock deformation, viscous behaviour & creep.

Unit V: Rock foundation & slope stability : rock foundation ï allowable bearing pressures, stress & deflection in rock under footing, failure mechanisms, subsiding & swelling rocks, base heave
& remedies, foundation anchoring. Rock slopes - modes of failure, factors affecting, analysis of slopes.

Unit VI: Underground opening : types of boring machine, cutting tools, muck handling. Opening in competant rock, horizontally layered rocks & rock with inclined layers, plastic behavior around tunnels, time dependent behaviour of tunnels, underground opening in blocky rocks - Block theory. Review of design methods of tunnels - Empirical & semi-empirical methods. Support & stabilisation.

Books Recommended :

1) Goodman R.E. : Introduction to Rock Mecanics.
2) Franklin J.A., Dusseault M.B. : Rock Engineering.
3) Franklin J.A., Dusseault M.B. : Rock Engineering Applications.
4) Stagg K.G., Zienkiewicz O.C. : Rock Mechanics in Engineering Practice.

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8CE04: PROF. ELECTIVE - II (ix) ADVANCED DESIGN OF R. C. C. STRUCTURES

SECTION - A

[BY LIMIT STATE METHOD]

Unit-I :
1) Design of Portal frame up to two bay two storied symmetricalframe for symmetrical loading.
2) Design of circular slab for uniformly distributed load only.

Unit-II :
1) Design of a footbridge and simply supported slab deck bridgefor I.R.C.class A loading.
2) Design of RCC girder (T beam) bridge for I.R.C.class A loading.

SECTION – B

Unit-III :
1) Structural response to earth quake, Analysis of multistoried frame by seismic coefficient method.
2) Design of square bunkers using Rankine theory. Design of Silos.

Unit-IV :
1) Design of R.C.C. Intze tanks.
2) Design of staging for Intze tanks with raft foundation.

BOOKS RECOMMENDED:

1. Suhil Kumar, Treasure of R. C. C. Design
2. Jain, A. K., Reinforced Concrete (Limit State Method)
3. Shah, Karve, Design of R. C. C. Structures
4. N. Krishna Raju, Advanced R. C. C. Design
5. Rajgopalan, K., Storage Structures.

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8CE04: PROF. ELECTIVE – II (x) LATERAL LOAD ANALYSIS

SECTION-A

Unit-I :

Interior of earth, Engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, Propagation of earthquake waves, Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph, accelerogram recording), Determination of magnitude, Epicental distance, focal depth, etc. Ground motion and their characteristics, Factors affecting ground motions, Inertia forces, horizontal & vertical shaking.

Unit-II :

Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings, continuity of construction, projection & suspended parts, special construction features like separation of adjoining structure, stair case etc, twisting of building, seismic design philosophy for building.

Unit-III :

Importance of flexible and ductile structures, Effect of earthquack on RCC Building, How Beam, Column & Beam Column joint resist earthquack, Effect of open ground story, Effect of short column, Use of shear wall, latest technique used to reduce earthquack effect on building (Base Isolation). Behavior of R.C. building in past earthquakes.

SECTION-B

Unit-IV :

Introduction to IS:1893:-

Soft Story, Weak Story, Story Drift, Design Horizontal Acceleration, Zone factor, Importance factor, Response Reduction Factor, Natural Time Period, Base Shear, Earthquake eccentricity, Earthquake load combination, Diaphragm, Centre of mass & rigidity, Seismic mass & weight, P-æ Effect, Calculation of nodal loads due to earthquake.

Unit-V : Intoduction to Structural Dynamic:-

Sources of vibration, types of excitations, Spring action and damping; Degrees of freedom; Application of Newtonôs laws, DôAlembertôs principle, Single degree of freedom systems; Mathematical model of physical systems; free vibrations, damped free vibrations, critical damping, and response, periodic loading expressed in harmonics, dynamic load factor.

Unit-VI :

Wind load Calculation for Multy-story Building as per IS 875-Part-3.

Books:

1) Duggal S.K. Earthquake Resistant Design of Structures , Oxford University Press 2007.
2) PankajAgrawal , Manish Shrikhande Earthquake resistant design of Structures, Prentice Hall India.

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8CE04 PROF. ELECTIVE -II (X) : ARCHITECTURE AND TOWN PLANNING

SECTION A

Unit I:

Elements of Design: Line direction. Shape, size, texture, value and colour, balance, scale and proportion. Focal point, vista, image ability, visual survey, figure-background relationship.

Unit II:

Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions. Barrier Free Design : Concept of housing; neighbourhood concept; site planning principles; housing typology; housing standards; housing infrastructure.

Unit III:

The Industrial Revolution: The age of revivals, the emergence of engineer, new materials and techniques and the evolution of balloon frame and steel frame. Indian Indus valley, Vedic, Buddhist, Indo-Aryan, Dravidian and Mughal periods; European Egyptian, Greek, Roman, medieval and renaissance periods- construction and architectural styles; vernacular and traditional architecture.Origin of Modern Architecture: definition and concept of modern architecture, various pioneers of modern architecture.

SECTION B

Unit IV

Town Planning: Definition and meaning, age of planning, scope and motives of planning, brief history of town planning ï its origin and growth, historically development of town planning in ancient valley civilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planning.

Unit V

New Concepts: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburm, La-cite industrille, Radiant city to present day planning.
Planning Principles: Types of town and their functions, types of town planning ï Grid Iron, Radial, Spider webs, Irregular and Mixed, their advantages and disadvantages. principles of Ekistics; rural-urban migration; urban conservation; urban renewal; Five-year plan; structural and sectoral plan. Eco-city concept; sustainable development. Smart Cities Concept.

Unit VI

Planning Practice and Techniques: Zoning ï its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan ï Meaning, preparation and realization, the scope of city planning ï city rehabilitation and slum clearance. statistical methods of data analysis; application of G.I.S and remote sensing techniques in urban and regional planning; d

Books Recommended:

1. Barrister Fletcher History of World Architecture, Taraporwalas Publishers.
2.Cherry, Gordon,òUrban Planning Problemsò,Board Hill, London,1974.
3. Sundaram,K.V.,òUrban and Regional Planning in Indiaò Vikas Publishing house(P) Ltd.,New elhi,2000.
4. Gallion A B.,Eisner S., ñThe Urban Patternò Van Nostrand reinhold,New York,1993.
5. Jon Lang,òA concise history of Modern Architecture in Indiaò,Permanent Black Publishers,New York,1998.
6. Taurus Parke,òA City with view Florenceò, I.B.Taurus Publishers, New York, 1994.
7. S C Rangwala : Architecture & Town Planning, Dhanpatrai & Sons
8. C.Rangwala, Town Planning, Charter Publishing House,
9. Braodbent, Theory of Architecture, John Willey & Sons.

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8CE 05: WATER RESOURCES ENGINEERING - II - Lab

TERM WORK: Five problems from the following to be worked out by the students, whenever necessary scale drawing on half empirical size must be drawn:
Practical examination shall consist of viva-voce.

1. Fixing control levels of Reservoir from given data.
2.Cross section, plan, L-section of Earth darn showing all components;
Details of drainage of downstream casing.
3.Design and Drawing of elementary and practical profile of gravity dam.
4.Design and drawing of diversion weir on permeable foundation.
5. Design and Drawing of ogee spillway with energy dissipaters.
6.Computer Aided design of unlined and lined canal.
7.Drawing of any four canal structure (No design).
8.Technical Field visit.

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8CE06: ENVIRONMENTAL ENGINEERING – II- Lab.

1) Analysis of waste water (any four) ï BOD (for domestics waste), COD (for industrial waste), Solids (Volatile), SVI, Nitrogen, Chlorides.
2) Air sampling & Analysis of SPM.
3) Physical characteristic of solid waste.
4) Sketches of sewers appurtenances ï Manholes ï different types storm water inlets, overflows, inverted siphons, automatic flushing tanks, ventilation in sewers.
5) Report of Field visit to Municipal wastewater treatment plant/Industrial Effluent treatment

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Appendix – B

B.E. (ELECTRICAL & ELECTRONICS) SEMESTER – VII

7EX01 UTILISATION OF ELECTRICAL ENERGY

Course Learning Objective: This subject gives a comprehensive idea in utilization of electrical power such as drives, electric heating, electric welding and illumination, electric traction, electrolysis, refrigeration air conditioning and automobile electric system.

SECTION A

Unit I : Concept of electrical drive, classification, advantages of electrical drive, selection criterion for electrical motor, size, specification and type of motor, mechanical features of motor, transmission of drive, industrial application, Textile mill, Paper mill, Cement mill, Coal mining, Sugar mill.

Unit II: Types of duties, continues, intermittent and short time, heating and colling of motor, rating calculations for these duties, use of fly wheel and fly wheel calculations.

Unit III: Characteristics of DC motors, three-phase induction motors, single-phase induction motors. Starting methods, different methods of speed control, braking of motors, plugging, rheostatic and regenerative braking.

SECTION B

Unit IV: Requirement of ideal traction system, system of track electrification and their comparison, speed time curves, energy consumption calculation, calculation of tractive efforts.

Unit V : Traction motors, general features and types, characteristics, control of locomotive motor coaches, series-parallel control. Overhead equipments, collector gear for overhead equipments.

Unit VI: Nature of light-units, luminous efficiency, Glare production of light, Polar curves, control of light by reflection, refraction and diffusion. Lighting calculations, flood lighting, street lighting.

TEXT BOOK : J. B. Gupta : Utilization of Electric Power and electric Traction, s. K. Kataria & sons.

REFERENCE BOOKS :

1) S.K.Pillai : A First Course in Electrical Drives, published by New Age International.
2) C.L.Wadhwa : Generation Distribution and Utilization of Electrical Energy, published by New Age International Pvt. Ltd.
3) E.O.Taylor : Utilization of Electric Energy in SI Units, published by Orient Longman Ltd.

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7EX02 ELECTRONIC COMMUNICATION

Course Learning Objectives:

To introduce the concepts and techniques associated with Wireless Cellular Communication systems.

Unit I :

Signal and Noise : - Bandwidth, bandwidth requirement for different types of signals such as telegraph, telephone speech, music and video Noise: External and internal noise, noise figure, signal to noise ratio, noise figure measurement.

Unit II: Modulation Techniques : - Amplitude modulation theory, Frequency spectrum representation of AM, Modulation index side bands, power relations, current relations and voltage relation in the AM wave. Frequency modulation and phase modulation, frequency deviation, modulation index, frequency spectrum.

Unit III:

AM Transmitters : - Principles of DSB-FC, DSB-SC, SSB-SC modulation and their comparison, Details of DSB-FC transmitter, Generation of DSB-SC by using balanced modulators (FETs), DSB-SC transmitter. Generation of SSB-SC by phase-shift method.

Unit IV :

AM Receivers: - TRF receiver, superhetrodyne receiver, details of each block such as RF amplifier, Oscillator, IF amplifier, Diode detector, audio amplifier. Mixer: Principle, Need and type of AGC, Practical radio receiver circuit with AGC, characteristics such as selectivity, sensitivity, and fidelity communication receiver.

Unit V :

FM Transmitter: - Circuits for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow band and wide band FM, their comparison, de-emphasis and pre-emphasis. FM transmitter.

Unit VI :

FM Receivers :- Details of FM receiver, blocks such as RF amplifier, local oscillator, IF amplifier, Mixer, audio Ampl. AGC, limiter, FM discriminator, single slope and balanced slope detector, analysis of Foster seeley and ratio detectors.

Text Book : Kennedy G.: Electronics Communication System, Tata McGraw Hill Co.New Delhi.

Reference Books :

1.Young P.H.: Electronics Communication Techniques, A Bell and Howell Co. Indiana.
2.Martin James. : Telecommunication and the Computer, Prentice Hall Inc. New Jersey.
3.Roddey D. Coolen S.: Electronics Communication, Prentice Hall India Pvt. Ltd.
4.Beck, Robert and J.Schoen: Electronics Communication, Modulation and Transmission, A Bell and Howell Co.

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7EX03 COMPUTER ORGANISATION

Course Learning Objectives: A student should grasp the basic concepts of computer architecture and organization, and understand the key skills of constructing cost-effective computer systems. A student should learn how to quantitatively evaluate different designs and organizations, and provide quantitative arguments in evaluating different designs.

Unit-I: Basic strucutre of computer: Hardware & software.Addressing methods. Program sequencing. concept of memory locations & address. Main memory operation. Instructions & instruction sequencing. Addressing modes. BasicI/O operations. Stacks. Queues & subroutines.

Unit-II: Processing Unit: fundamental concepts. execution of a comlete instruction. hardwired control, performance consideration. Microprogrammed control; microinstructions, microprogram sequencing, microinstruction prefetching, emulation.

Unit-III: I/O organizatiion: accessing I/O devices,interrupts, direct memory access:bus arbitration. I/O hardware:processor bus and interfacing circuiuts,standard I/O interfaces: SCSI bus, backplane bus standard.

Unit-IV: Memory Unit: basic concepts,semiconductor RAM memories,internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.Cache memories: performance considerations. Virtual memories, address translation,memory management requirements.

Unit-V: Arithmetic; number representation. design of fast adders,signed addition and subtraction. Multiplication of positive numbers, Boothsô algorithm, Integer division.Floating-point numbers and related operations.

Unit-VI: Computer Peripherals: Input-output devices like video displays,video terminals, graphics input devices,printers.Online storage devices: magnetic disks,magnetic tape systems, CD-ROM systems. Communication devies: Modems.

Text Book:
V.Carl Hamacher & S. Zaky ñ Computer Organizationò (4/e) McGraw-Hill(ISE).

References:
1. Stallings. W. ñ Computer Organization & Arcitectureò (5/e) (Pearson Education).
2. Tenanbaum A.S.ò Structured Computer Organizationò (5/e) (Pearson Education).
3. Hayes J.P. ñComputer Architecture & Organizationô (4/e) (McGraw- Hill).

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7EX04 POWER ELECTRONICS - II

Course Learning Objectives :

To enable the student to acquire fundamental knowledge of Electric Drive systems, classification of electric drives, DC drives, AC drives and their role in various applications and to making Electric Drives an enabling technology.

SECTION-A

UNIT I : Introduction to Electrical Drives: Concept, Classification and Advantages. Basic elements, Components of load torque, Torque equation, Equivalent values of drive parameters. Types of mechanical loads. Selection of motor and Controller, Classes of duty, Stability of an electrical drive. Comparison of AC and DC drives.

UNIT II :
Starting and Braking of Electrical Drives: Solid-state starters, soft starting, Calculation of starting/acceleration/ reversal time and energy loss during starting. Types, advantages, limitations and purposes/objectives of electrical braking, braking of d c and induction motors.

UNIT III : DC Drive Control Basic machine equations, scheme of control, Single phase separately excited drives, singleï phase- series motor drives, power factor improvement, Three-phase separately excited drive, closed loop control, PLL control, microcomputer control.

SECTION-B

UNIT IV :
Chopper Control of D.C. Drives- Principle of operation and control techniques, motoring operation of separately excited and series excited motors, multi quadrant control of chopper-fed motors.

UNIT-V :
Ac drive control: Basic principle of operation, speed control of induction motor, stator voltage control, variable frequency control, Rotor resistance control, slip-power recovery scheme, Synchronous motor drive, Microprocessor controlled AC Drive.

UNIT-VI :
Study of electrical drives in rolling mills, paper mills, cement mills, sugar mills, textile mills, traction and machine tool applications.

BOOKS RECOMMENDED :

Text Book : G. K. Dubey, ñFundamentals of Electric Drivesò, 2nd Edition, Narosa Publishing House.

Reference Books :

1. V.Subrahmanyam Electric Drives-Concepts and Applications, TMH Pub,2004
2. B.K. Bose : Modern Power Electronics and AC Drive, Pearson Education
3. Power Electronics : M.H. Rashidï Pearson Education.
4. A first course in electrical drives: S. K. Pillai, Published by New Age international Publishers

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7EX05 Prof.Elect.-I(III) / 8EP02/8EL02/8EE02/

HIGH VOLTAGE ENGINEERING

Course Learning Objective:

- Able to describe the principles of generation and measurement of high voltage AC, DC and impulse voltages and also the fundamentals of breakdown and partial discharge in insulating solid and gas at high voltages. We can select appropriate hardware for certain applications in power system protection and high voltage engineering.

SECTION-A

Unit I: Breakdown in Gases Insulating materials Classification, Gases as insulating media, Ionization and decay process, Breakdown in gases, Townsendôs law, Streamer mechanism of spark pashanôs law, Corona discharge, Electronegative gases.

Unit II: Breakdown in Liquid and Solid Dielectrics, Breakdown in pure and commercial liquids, Sold dielectrics and composite dielectrics, High voltage bushings, Guarding, Shielding, Field plotting.

Unit III: Lightning and Switching over Voltage and Protection Lightning strokes to lines and towers; Mechanism, Characteristics and protection of transmission lines from lightning; Lightning arrestors, Insulation co-ordination of HV and EHV power system and substation.

SECTION-B

Unit IV: High Voltage and Current Generation, Generation of high D.C, A.C and impulse voltages, Standard impulse wave shapes, Switching surges, and High impulse generator.

Unit V: High Voltage and Current Measurement Peak voltage, Impulse voltage and High direct measurement methods, Nondestructive measurement and testing, high voltage dielectrics loss and capacitance measurement, Radio frequency and Partial discharge measurement.

Unit VI: High Voltage Testing and E.H.V.Lines Design. Basic terminology, Testing ï Insulators, Bushings, Cables, Transformers, Surge diverters and Isolators; Electric shock and threshold current, Capacitance of long objects, Electromagnetic interference, E.H.V. line insulation design based upon transient over voltage.

BOOKS RECOMMENDED :

Text Book: M.S.Naidu and V.Kamraju ï High Voltage Engineering, Tata McGraw Hill Pub. Company, New Delhi.

Reference Books:

1 Rokosh Das Begamudre- EHV AC. Transmission Engineering, Wiley Easter Ltd. New Delhi.
2 High Voltage Engineering by C.L. wadhawa New Age international (P) Ltd. Publications.

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SEMESTER : VIII

8EX01/7EP02/7EL02/7EE02

POWER SYSTEM OPERATION AND CONTROL

Course Learning Objective:
Able to create equivalent circuit of a given power system for power flow analysis, Economic dispatch controller and solution of coordinate equation by iteration method, generation and absorption of Reactive power and the methods of voltage control and also Knowledge of modern control application and natural torsional oscillatory modes in power system.

SECTION A

Unit I: **Economic Operation – Part I:** Meaning of optimum scheduling, UCP and LSP; Input ï Output characteristics, Heat rate characteristic, Incremental fuel rate, Incremental fuel cost; Methods of obtaining incremental fuel costs; Conditions for incremental loading; Optimum scheduling of generation between different units (Only Two plant system without transmission loss).

Unit II: Economic Operation – Part II
Transmission loss as a function of plant generation; Calculation of loss co-efficient (Two plant system); Incremental transmission loss; Optimum scheduling of generation between different plants including transmission loss; Concept and significance of penalty factor; Automatic load dispatch: Operation and Functions.

Unit III: A. Generator Control Loops
Concept of real and reactive power; Effect of real and reactive power on system parameters; Philosophy of real and reactive power control; Basic generator control loops.

B. Automatic Voltage Regulator (AVR)
Functions of AVR; Types of Exciter; Brushless AVR loop: Exciter modeling, Generator modeling, Transfer function block diagram representation, Static performance, dynamic response, Stability compensation, Effect of generator loading.

SECTION B

Unit IV: Automatic Load Frequency Control
Automatic generation control (AGC); Speed governing system; Transfer function modeling: Governor, Hydraulic valve actuator, Turbine, Generator, Load; Transfer function representation of an isolated generator; Static performance of speed governor; Closing of ALFC loop.

Unit V: Control Area
Meaning; Primary ALFC Loop: Static response, Dynamic response, physical interpretation of results; Secondary ALFC loop; Integral Control; Pool operation; Tie-line Modeling; Two area system ï Dynamic response; Tie-line bias control.

Unit VI: Steady-State Instabilities
Natural torsional oscillatory modes in power system; Natural mode of a single generator operating onto infinite bus; Effect of damper winding; Effect of changing excitation; Power system stabilizer; Introduction to modern control application.

Text Book:
O. L. Elgerd ï Electric Energy Systems Theory: An Introduction ï Second edn., McGraw-Hill Book Comp. N. Y. 1987.

Reference Books:

1) Power System Operation & Control, N.V.Ramana, PEARSON education, 2010.
2) I. J. Nagrath, D. P. Kothari ï Modern Power System Analysis ï Second edition, Tata Mc Graw Hill Publishing Company, New Delhi
3) P. S. R. Murty ï Power System Operation and Control ï Tata Mc- Graw Hill Publishing Company, New Delhi.

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8EX02 SWITCHGEAR & PROTECTION

Course learning objective: To develop an ability and skill to design the feasible protection systems needed for each main part of a power system in students.

SECTION-A

Unit I Circuit Interruption Circuit breaker control circuit, Fault clearing process, Auto-reclosure, Arc phenomenon-maintenance and interruption theories; AC circuit breakers- current interruption, transient recovery voltage (TRV), rate of rise of TRV, factors affecting TRV, ratings; Inductive and Capacitive current interruptions, current chopping.

UnitII : A. Fuses Types, Constructional features, operation, Characteristics and Applications
B.Circuit Breaker (Part ï I) Air break, Air blast, Bulk oil and minimum oil-types, constructional features, operation and application.

Unit III Circuit Breaker (Part ï II) SF_6 , Vaccum, Miniature, Earth leakage and Moulded Case ï types, Constructional features, operation and application; Testing, Instalation and Maintenance.

SECTION-B

UnitIV A. RelayingPrinciple Components, Essential features, Characteristics, Terminology, CTôs and PTôs, Relay classification.
B. ElectromagneticRelays Overcurrent, Directional, Distance and Differential ï types, constructional features, operation, characteristics and application.

Unit V : Protection of Transmission Lines
Relaying schemes ï overcurrent, earth fault, directional, distance and differential; Parallel feeders and ring mains protection, Carrier current relaying, Overload and Power swing.

Unit VI : A. Other Power System Elements Protection Transformers, Motors, Generators and Buses.
B. Static Relaying - Basic concepts, equipments, comparators, Characteristics realization ï overcurrent, directional, differential and distance relay. Microprocessor based relay introduction.

Text Book:- Sunil S. Rao ï ñSwitchgear and Protectionò Khanna Publications New Delhi

Reference Books: -

1 C. R. Mason ï ñThe Art and Science of Protective Relayingò .
2 Badri Ram and B. N. Vishwkarma ï ñPower System Protection and Switchgearò Tata Mc-Graw Hill Publishing Company Limited, New Delhi.
3 B.Ravindranath and M Chander ï ñPower System Protection and Switchgearò Wiley Eastern Ltd, New Delhi.

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8EX03 EMBEDED SYSTEMS

Course Learning Objectives: To introduce students to the modern embedded systems and to show how to understand and program such systems using a concrete platform built around

Unit-I : Introduction: Embedded systems design, Embedded system architecture, Embedded systems model, An Overview of Programming Languages and Examples of Their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II: Embedded Hardware Building Blocks and the Embedded Board, powering the hardware, Instruction Set Aarciteture (ISA) architecture model, internal processor design and its performance.

Unit-III: Memory: ROM, RAM and auxiliary memory, Memory Management of Extemal Memory , Performance of memory .I/ O : Managing Data: Serial vs. Parallel I/O , Interfacing the I/O Components ,I/O performance.Buses: arbitration, timing and performance.

Unit-IV: Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management ,.

Unit-V: Embedded OS : I/O and File System Management ,OS Standards: POSIX, OS Performance Guidelines. Middleware :meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture. Implementing the Design. Quality Assurance and Testing of the Design.

Text Book: Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newnes Publication.

Reference Books:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Jane W. S. Liu óReal Time Systemsò, Pearson Education.

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8EX04 PROF. ELECTIVE II (iv) POWER QUALITY

Course Learning Objective: To study and understand, various power quality problems, their mitigation and measuring techniques.

SECTION A

Unit I **Introduction** Power Quality Definition, Need for Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers,

Unit II **Power Quality Characteristics** Power Quality Theory, Types of power Quality Problems, Voltage Swells, Long-Duration Over voltages, Under voltages, Interruptions, Transients, Voltage Unbalance, Voltage Fluctuations, Harmonics, Electrical Noise, Sources of Power Quality Problems, Utility Side of the meter, End-User Side of the meter, Effects of Power Quality Problems, Power Quality Problem-Solving Procedures, Power Quality Solutions,

Unit III **Power Quality Standards** Power Quality Standards Organizations, Institute of Electrical & Electronics Engineers (IEEE), American National Standards Institute(ANSI), International Electrotechnical Commission(IEC Other International Standards Organizations, Purpose of Power Quality Standards, Types of Power Quality Standards, Voltage Sag (Dip) Standards, Transients of Surges, Voltage Unbalance, Voltage Fluctuation or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding and Wiring Standards, Sensitive Electronics Equipments Standards, Trends in Power Quality Standards.

SECTION-B

Unit IV Power Quality Solutions , Reduce Effects on Sensitive Equipment, Reduce or Eliminate Cause, Reduce or Eliminate Transfer Medium, Install Power Conditioning Equipments, , Surge Suppressors, Noise Filters, Isolation Transformers, Line-Voltage Regulators, Motor-Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCs), Uninterruptible Power Supply (UPS), Solid-State Switches, Harmonics Solutions, Selection of Appropriate Power Conditioning Equipment, Grounding and Wiring Solutions

Unit V Wiring and Grounding Wiring Principles, Grounding Principles, Power System, Utility Power System Grounding,Telecommunication System Grounding, End-User Power System Grounding, Wiring and Grounding Problems, Ground Loops, Electromagnetic Interference (EMI) Noise, Loose Connections, Grounding for Lightning and Static Electricity, Attack of the Triplens, Solutions That Cause Problems, Wiring Solutions, Separation, Selection of Wire and Cables, Shielding, Grounding Solutions, Ground Rods, Ground Ring, Ground and Reference Signal Grids, Other Grounding Systems, Isolated Grounds, Multipoint Grounding, Separately Derived Source Grounding, Reference

Unit VI Power Quality Measurement Tools & Power Quality Surveys Kilowatt-Hour Meter, Multimeters, Average-responding versus True RMS Meters, Crest Factor and Bandwidth, Other Selection Considerations, Oscilloscopes, Disturbance Analyzers, Harmonics Analyzers, Purpose of a Power Quality Surveys (Checkup or Examination), Planning a power Quality Surveys.

Text Book : Barry W. Kennedy: Power Quality Primer, McGraw-Hill.

Reference Books :

1. Electrical Power System quality by R.C.Dugan, M.F.McGranghan, S.Santoso, H.W.Beaty TMH 2nd Edition, 2011.
2. G.T. Heydt: Power Quality Stars in a circle Publication, Indiana, 1991.

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SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Saturday, the 31st August, 2019

NOTIFICATION

No. 111 /2019 Date : 31/08/2019

Subject :- Implementation of new syllabi of Semester I & II of B.E./B.Text. E. /B.Tech. (Chem. Engg.)/ B.Tech.(Chem.Tech.) Polymer(Plastic) Tech. for the session 2019-2020 as per A.I.C.T.E. Model Curriculum.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi as per A.I.C.T.E. Model Curriculum of Semester I & II (Group A & B)of B.E./B.Text.E./ B.Tech.(Chem. Engg.)/ B.Tech. (Chem.Tech.) Polymer(Plastic)Tech. from the academic session 2019-2020 and onwards in phase wise manner as per **Appendix – A** :

Moreover, It is notified for general information of all concerned that the authorities of the University have accepted Induction Program as per A.I.C.T.E. Guidelines for Semester I as per **Appendix – B.**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

Syllabus of B.E./B.Text.E./ B.Tech.(Chem. Engg.)/ B.Tech. (Chem.Tech.)Polymer(Plastic) Tech.
Sem. I & II
Group - A

1A1 ENGINEERING MATHEMATICS-I

Aim :

The aim of this course is to familiarize the prospective engineers with techniques in differential calculus and equations. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Objectives:

1. To identify algebraic problems from practical areas and obtain the solutions in certain cases
2. To understand maxima and minima concept.
3. To solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.

Course Outcomes:

On completion of the course the students will learn:

- Able to understand Rolleôs Theorem and its applications to Engeering Problems.
- Able to understand maxima minima concept.
- Able to apply Demoiverôs theorem in various concepts of complex number.
- Able to solve differential equations of certain types that they might encounter in the same or higher semester.

SECTION - A

Unit I : Differential Calculus :

Successive Differentiation, Leibnitzôs Theorem, Rolleôs Theorem, Mean value theorem, Expansions of function using Taylorôs and Maclaurinôs theorems; Indeterminate Forms Using LôHospital Rule. (8)

Unit II: Multivariable Differential Calculus :

Partial differentiation, total differential coefficients, exact differential, Eulerôs theorem on homogeneous function, Maxima & Minima of a function of several connected independent variables (Lagrangeôs multipliers). (8)

Unit III : Complex Numbers :

Demoiverôs theorem and its applications, Hyperbolic and inverse hyperbolic functions, separation of real and imaginary parts, Logarithm of complex numbers. (8)

SECTION –B

Unit IV: - First order and First Degree Ordinary Differential Equations :

Ordinary differential equations of first order and first degree in various Forms, (Variable separable, linear differential equation, homogeneous differential, exact differential equation) and reducible to above forms, methods of substitution. (8)

Unit V : **First order and Higher Degree Ordinary Differential Equations :**

Solution of differential equation of first order and higher degree by various methods.

Applications of Ordinary Differential Equations :

Applications of differential equations of first order and first degree to the problems on orthogonal trajectories and Electrical engineering. (8)

Unit VI :**Sequences and Series**

Convergence of Sequence and Series, Test for Convergence, Comparison Test, Ratio Test, Root Test, Raabeôs Test, Range of Convergence. (8)

Text / Reference Books :

i) Wartikar P.N . , Wartikar J.N. ï A text of applied Mathematics, Volume I, II, Pune V.G. Prakashan , Pune.
ii) Grewal B. S. ï Higher Engineering Mathematics, (latest Edition), Khanna Publishers .
iii) Kreyszig E.K. ï Advanced engineering Mathematics, John Wiley.
iv) Ramana B. V. - Higher Engineering Mathematics, (TMH).
v) Singh R.R. And Bhatt M. - Higher Engineering Mathematics, (TMH).
vi) N.P.Bali and Manish Goyal ï A text book of Engineering Mathematics, Laxmi Publications.
vii) Veerarajan T. Engineering mathematics for first year,(TMH).

I A 2 ENGINEERING PHYSICS

Aim:

To enable the students to correlate the theoretical principles of fundamentals of modern aspects in Physics with application oriented studies of engineering.

Objectives:

At the end of the course the students would be exposed to fundamental, knowledge in:

- Electromagnetic phenomena and wave propagation.
- Interferometric techniques in metrology, communication.
- Application of quantum physics to optical & electrical phenomena.
- Application of lasers and Fiber Optics in Engineering and Technology.
- Conducting, superconducting and dielectric materials.
- Semi conducting and new engineering materials.
- Physics of Modern engineering materials.
- Application of ultrasonicôs, acoustics.

SECTION-A

Unit I: Solid State Physics: Classification of solids on the basis of energy band diagram, Covalent bonds, bound & free electrons, holes, electron and hole mobilities, Intrinsic and Extrinsic semiconductors, energy band diagram for semi-conductors. Fermi and Impurity levels, semi-conductor conductivity with derivation, Law of mass action (only statement), P-N junction diode, Zener diode, Light Emitting Diode. Hall effect. (9)

Unit II: Modern Physics: Planckôs hypothesis, properties of Photons, Compton effect, De-Broglieôs concept of matter waves, wave particle duality, Heisenbergôs Uncertainty Principle (only statement), applications of uncertainty principle (electrons cannot exists in the nucleus and binding energy of electron in atom), wave function and its significance, time independent Schrodinger equation. (7)

Unit III : Electric and Magnetic Fields : Motion of electron in uniform transverse electric field and transverse magnetic fields, velocity selector (energy filter), positive rays, Bainbridge mass spectrograph, Cathode ray oscilloscope : block diagram and working of each block. (7)

SECTION-B

Unit IV: Interference and Diffraction: Fundamental condition of interference, thin film interference due to reflected light, Newtonôs ring; equation for radius of bright and dark rings, determination of wavelength, R. I. of medium using Newtonôs ring. Fresnel and Fraunhoffer class of diffraction, single slit diffraction, plane transmission grating; construction and determination of wavelength of light using grating, dispersive power of grating. (7)

Unit V: Fibre Optics and LASER: Principle and construction of optical fibre, acceptance angle and acceptance cone numerical aperture, types of optical fibres and refractive index profile, attenuation in optical fibres, different mechanisms of attenuation, application of optical fibres.; LASER: spontaneous and stimulated emission of radiation, Pumping, Optical Pumping, Ruby LASER (Construction and Working), Characteristics & Applications of Laser in Industrial, Medical and Scientific field. (7)

Unit VI: Acoustics: Sound waves, reflection of sound waves, defects due to reflected sound (echo and reverberation), absorption of sound, Sabineôs formula for reverberation of time, Factors affecting architectural acoustics and its remedies.
Ultrasonics: Ultrasonic waves, Production of Ultrasonic waves (piezo-electric and magnetostriction methods), properties of Ultrasonic waves and applications. Fluid dynamics: Viscosity, Stokeôs law, liquid flow (streamline and turbulent), flow of liquids through a capillary tube (Poiseuilleôs equation), Continuity equation, Bernoulliôs theorem (only derivation). (7)

I A 6 ENGINEERING PHYSICS – Lab.

Practicals :

1) Determination of Band gap energy of semiconductor.
2) To study the forward and reverse characteristics of P-N junction diode.
3) To study the reverse characteristics of Zener diode.
4) To study the forward characteristics of Light Emitting Diode.
5) To determine the wavelength of monochromatic light by Newtonôs Rings method.
6) Determination of wavelength of spectral lines using diffraction grating.
7) Determination of grating element of a diffraction grating using LASER beam.
8) Study of Hall Effect
9) Amplitude and frequency measurement of ac signal using CRO
10) Study of CRO
11) Determination of unknown frequency of ac signal using Lissajious spattern
12) To determine resolving power of telescope
13) Determination of Planckôs constant using photocell
14) To determine the coefficient of viscosity of water by capillary flow.
15) To determine the specific charge (e/m) of electron by Thomson method.
16) Experiment on the basis of Non Destructive Testing.

(Note: Minimum 08 experiments shall be conducted)

Text Books:

1) M.N. Avadhanulu & P. G. Kshirsagar: Engineering Physics, S. Chand Pub., 2008
2) Dr. (Mrs.) S. D. Wakde & J. S. Bakare: Engineering Physics, SSGMCOE, 2004

Reference Books:

1) R. K. Gaur & S. L. Gupta: Engineering Physics, Dhanpat Rai & Sons.
2) Hitendra K. Malik & A. K. Singh: Engineering Physics, Tata McGraw Hill
3) Beiser: Mordern Physics, Tata McGraw Hill
4) Mani & Mehta: Mordern Physics, Affiliated East- West Press
5) N. Subrahmanyam, Brijlal, M. N. Avadhanulu: A Text Book of Optics, S. Chand & Company.

1A3 ENGINEERING MECHANICS

Course Objectives :

Students will be taught -

1. Concepts related to Forces and its effects, resolution and composition of coplanar forces.
2. Application of principles of statics to the system of rigid bodies.
3. Analysis of simple structures like trusses and beams.
4. Concepts related to friction, its application.
5. Concepts related to centroid, moment of inertia, radius of gyration and product of inertia and its application.
6. Concepts related to kinematic and kinetic equations, and its applications to various types of motion.
7. Concepts related to conservation of momentum and laws of impacts.

Course Outcomes :

At the end of course students will be able to -

1. Compose and resolve the forces along with its effect.
2. Apply principles of statics to the system of rigid bodies and analyse simple structures.
3. Calculate frictional forces for simple contact, wedges and belt friction.
4. Locate centroid and calculate moment of inertia.
5. Calculate various kinematic quantities.
6. Solve the problems using different kinetic equations related to direct and interconnected particles.
7. Apply principle of conservation of momentum and laws of impact.

SECTION - A

UNIT-I (STATICS) :

Resultant: Concept of a force, force systems, moment of a force about a point, couple, resolution and compositions of coplanar forcesystem.

Equilibrium: Free-body diagrams, equations of equilibrium, problems ofequilibrium involving co-planar force system acting on a particle,rigid body and system of rigid bodies. (09)

UNIT-II (STATICS) :

Trusses: Definitions, assumptions, types, Analysis of simple plane perfect trusses by method of joints and method of section.

Friction: Definitions of friction, types, angle of friction, angle of repose, cone of friction, Coulombôs laws of friction. Applications to simple contact friction, wedges and belt friction. (09)

UNIT-III : Centroid, First Moment of Area, Problem on Centroid of composite sections, Second Moment of Area, Radius of Gyration,product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Definition of principal axes and principal moment of inertia. (07)

SECTION - B

UNIT-IV (DYNAMICS - KINEMATICS) :

Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components(involves Problems on calculation of total acceleration, radius of curvature and projectile motion). (06)

UNIT-V (DYNAMICS – KINETICS) :

Kinetics of rectilinear, curvilinearand rotatory motion of a particle actedupon by a force system, Application of DôAlembertôsprinciple, concept of dynamic equilibrium, rectilinear motion ofseveral interconnected particles, and rotation of rigid body about a fixed axis. **(**07)

UNIT-VI (DYNAMICS – KINETICS) :

Application of work-energy equation and impulse-momentum equation, law of conservation of momentum for aparticle and a system of particles in a rectilinear translation,direct central impact, collisionof two particles, coefficient of restitution.

TEXT BOOKS :

1) Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
2) Bhavikatti, S. S. and Rajashekarappa, K. G., Engineering Mechanics, New Age International Publishers, New Delhi.

REFERENCE BOOKS :

1) Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore
2) Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C.,Auckland.
3) Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
4) Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

1A7 ENGINEERING MECHANICS – Lab.

Course Objectives :

Students will be taught -

1. Performance of practicals based on concepts related to engineering mechanics.
2. Working of Lifting Machines

Course Outcomes :

Students will be able to -

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.
3. Perform graphical analysis of force systems and simple structures.

PRACTICALS:

(Two compulsory graphical solutions to the problems of statics)

1. Law of Polygon of forces
2. Reactions at the supports of simple beam.
3. Forces in members of Jib crane.
4. Determination of coefficient of friction on inclined plane.
5. Determination of Coefficient of coil friction.
6. Determination of law of machine for screw jack/differential axle wheel /single and double purchase crab (for any two machines).
7. Determination of mass moment of inertia of fly wheel
8. Determination of gravitational acceleration by compound pendulum.

1A4 COMPUTER PROGRAMMING

Aim: The course is aimed at impart knowledge to analyze, solve, design and code real-life problems using C language

Course Outcomes: At the end of course, the students will be able -

- To explain fundamental concepts of computer and computing.
- To test and execute the programs and correct syntax and logical errors.
- To implement conditional branching, iteration and recursion.
- To use arrays, pointers and structures to formulate algorithms and programs.
- To recognize various problem solving techniques and computer applications.
- To apply programming concepts to solve real life problems.

UNIT I: **Fundamental of the Computer and Computing Concepts** : Generation of computers, Classification of computers, Basic Anatomy of Computer System, Input Devices, Processor, Output Devices, Memory Management, Types of Computer Software, Overview of Operating system, Networking Concepts, Microsoft Office, Number systems: Decimal, Binary, Hexadecimal, Octal, Conversion of Numbers, Binary Arithmetic Operations, Programming Languages, Logic gates (8)

UNIT II: **C Fundamentals :** Introduction, Importance of C, Basic Structure of C Programs, Program execution, Basic programs based on C such as Printing Message, Adding two numbers, Interest calculations, Use of subroutines, math function. C tokens, Keywords and Identifiers, Character set, Data Types, Constant and Variables, Declaration of Variables, Declaration of Storage Class (8)

UNIT III: **Operators, Expression and Input-Output operation** : Operators, Types of Operators: Arithmetic, Relational, Logical, Assignment, Increment-decrement, Conditional, Bitwise, Special. Arithmetic expression, Evaluation of Expression, Precedence of Arithmetic Operators, Input-Output Operation: Reading and Writing Character, Formatted Input, Formatted Output. (8)

UNIT IV: C Control constructs : Decision-making using if, if-else, nested if, else if ladder and switch-case statements, ?: Operator, Goto Statement, Loops using for, while, do-while statements, break and continue statements, Jumps in Loops, Concise Test Expressions. (8)

UNIT V: Array, Strings and Structures: Introduction to array, One Dimensional Array: Declaration & Initialization, Two Dimensional: Declaration & Initialization, Multi Dimensional, Strings: Declaration and Initialization, Reading String from terminal, Writing String to Screen, Putting Strings together, Comparison of Two Strings, String-Handling Functions, Table of Strings, Other features of String, Structures ï Define, Declaration, Accessing the members of a structure **(8)**

UNIT VI: User Defined Functions, Pointers and File Management : Functions, Need for User defined Functions, Multi Function Program, Elements of User Defined Functions, Return Values and their types, Function Calls, Function Declaration, and Categories of Functions. Definition and uses of pointers, Accessing the address of a variable, Introduction to File Management, Defining and Opening File, Closing File, Input/output Operations on File. (8)

TEXT BOOK : E Balagurusamy: Computing Fundamentals & C Programming‖ ï Tata McGraw-Hill, 2nd Edition .

REFERENCE BOOKS:

1. Pradeep Dey and Manas Ghosh, ñ Computer Fundamentals & Programming in Cò Oxford University Press 2006.
2. K R Venugopal and S R Prasad,ñMastering Cò Tata-McGraw Hill.
3. Seymour Lipschutz, ñData Structure Using Cò, Tata-McGraw Hill.
4. Herbert Schildt - C Complete Reference (Tata-McGraw Hill).

1A8 COMPUTER PROGRAMMING- LABORATORY

Based on the Syllabus of 1A4 Computer Programming ï Minimum Eight (8) experiments be performed preferably covering all the Units.

1A5 WORKSHOP PRACTICE

Course Objectives :

ÅTo give students ôhands on experienceô of craftsmanship.
ÅTo make students familiar with different work trades.
ÅTo develop quality & safety consciousness amongst the students.
ÅTo develop awareness of fire safety amongst the students.
ÅTo develop respect towards labor work amongst the students.
Å To develop skill sets for creating entities from primitive engineering materials
ÅTo develop skill sets for establish in connections through wires and cables.
ÅThis exercise also aims at inculcating respect for physical work and hard labor in addition to some value addition by getting exposed to interdisciplinary engineering domains.

Course Outcomes :

- Upon completion of this course, the students will gain knowledge of different manufacturing processes which are commonly employed in industry.
- Upon completion of this course, the students will be able to fabricate the components using various manufacturing techniques.
- The students will be conversant with the concept of dimensional accuracy and tolerances.

PERFORMANCE:
Students should perform minimum six jobs out of following :

I) SMITHY: Introduction to smithy operations like upsetting, drawing ,bending, Forming; Tools- hammer, hot and cold chisels, swages ,drifts, flatters, tongs, anvils and various smithy tools & equipments ,their use. Forging Principle, forge welding, use of forged parts.

One job on smithy: Job involving upsetting, drawing down, flattering. Change of cross sectional area like round to rectangular or making a ring from a round bar, S ï Hook, forming such as a square / hexagonal headed bolt, hook etc.

II) FITTING: Introduction to different fitting tools. Use and setting of fitting tools for marking, center punching, chipping, cutting, filing, drilling, their use, different measuring tools, Files ï Material and Classification.

One job on fitting: involving operations like marking, filing, hacksaw cutting, drilling and tapping, making simple assemblies like a male-female type pair

III) TAPS & DIES: introduction to Taps & Dies, Different sizes of Taps & Dies their uses, holding instruments of taps & dies.

One job on taps & dies: Job involving, External and internal threads on plate or pipe, marking, center punching, cutting, filing, drilling

IV) SHEET METAL: Introduction to sheet metal tools, their use, different sheet metal joints, soldering, surface development. Specifications of metal sheets, Surface coatings; Operations like cutting, bending, folding, punching, riveting ; Joining by brazing and soldering.

One job on sheet metal: Job involving soldering operation like marking ,cutting, bending, joining operations of small sheet metal parts. Typical examples: sheet metal tray, funnel, dustbin, etc.

V) WELDING : Classification & brief introduction to welding processes- Arc, Gas and Resistance. Definition of welding, brazing and soldering processes, and their applications. Oxy-Acetylene Gas welding process, Equipment and Techniques, Type of flames and their applications. Manual metal arc welding technique and equipment, AC and DC welding Electrodes, constituents and functions of Electrode coating. Welding positions. Type of welding joint. Common welding defects such as cracks, undercutting, slag inclusions, Porosity

One job on welding: Job consisting of edge preparation for arc welding of different parts like lap welding of two plates, butt welding of two plates and welding to join plates at right angles.

VI) CARPENTRY : Brief study of various hand tools like chisel, saw ,planer. Timber, definition, engineering applications, seasoning and preservation, plywood and ply boards. Use of marking tools & hand tools such as marking gauge, try squares, steel rules, saws, jackplane, etc. Use of power tools, safety precautions.

One job on carpentry: Job like preparing a wooden joint; involving operations like wood sizing, planning, marking, sawing, chiseling and groove making. Use and setting of hand tools like hack saw, jack plane, chisels and gauges for construction of various joints like T ï Lap joint, Bridle joint ,Corner mortise joint, Dovetail / butt joint such as a tray, frame etc.

VII) MACHINE TOOLS AND PROCESSES: Introduction to different machining tools, different measuring tools.

One job on Lathe: Job involving marking, metal removing showing basic operations like plain turning, facing, step turning etc.

VIII) FOUNDARY : Molding sand , preparation of molding sand, pattern, core, runner ,riser cope & drag box.
One job on molding : Preparation of sand mould with pattern, core with runner riser

IX) PRINTED CIRCUIT BOARDS : PCB etching and drilling, tinning and soldering techniques. Assembly of Electronic components on the printed circuit board (PCB).

One job of PCB design: Job involving development of PCB for electronic circit which comprises of layout design , masking, etching , drilling, tinning & component soldering.

X) PLASTIC INJECTION MOULDING: Introduction, principle, equipment & its operation, mould introduction & setting, Safety precautions and demonstration of plastic injection molding process (Demonstration)

REFERENCES :

1. B. S. Raghuvanshi, A Course in Workshop Technology, Vol ï I,Dhanapat Rai and Sons.
2. Hajara Choudhari, Elements of Workshop Technology, Vol ï I, Media Promoters.
3. Gupta and Kaushik, Workshop Technology, Vol ï I, New Heights.
4. Chapman, Workshop Technology, Vol ï I, The English Language Book Society.
5. H.S.Bawa, Workshop Technology, Vol.-I, TMH Publications, NewDelhi.
6. S.K.Hajra Choudhary ,Elements Of Workshop Technology ,Media Promoters &Publishers Pvt.Ltd,
7. Workshop Technology, Vol I, II and III, Chandola S.P., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
8. K.T. Kulkarni, Introduction to Industrial Safety ,K.T .Kulkarni ,Pune Reference Books
9. Hwaiyu Geng, Manufacturing Engineering Handbook ,McGraw Hill Publishing Co.Ltd.
10. Lawrence E.Doyle, Manufacturing Processes and Materials for Engineers ,Prentice Hall Inc.

NOTE : Journal should be prepared and submitted based on information of tools and equipments used, jobs prepared by using various tools, equipments, machines in the above trades of performance sections. The term work shall be assessed based on a) the record of attendance, b) Term work done, c) the written/ practical / oral tests on the term work to decide the depth of understanding. The term work is to be assessed weekly.

PRACTICAL EXAMINATION:
Practical examination will consists of actual preparation of one job from any of the above performance sections. Duration of examination will be 3 hrs. Total marks are 25, out of which 15 marks are for job preparation and 10 marks for viva voce which should be conducted when the students are on job.

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Sem. I & II
Group B

I B 1 ENGINEERING MATHEMATICS-II

Aim:

The aim of this course is to familiarize the prospective engineers with techniques in integral calculus, algebra. Also to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Objectives:

1. To find solution of simultaneous equations by matrix method.
2. To familiarize the prospective engineers with techniques in integral calculus.
3. To understand the expansion of Fourier series.
4. To understand double and triple integration and enable them to handle integrals of higher orders.
5. To deal with functions of several variables that is essential in most branches of engineering.

Course Outcomes:
On completion of the course the students will be able to:

1 The essential tool of matrices and linear Algebra in a comprehensive Manner.
2 Evaluation of Integrals by Reduction Formulae, Gamma and Beta Function
3 Use the tool of Fourier series for learning advanced engineering mathematics.
4 Use new techniques DUIS to evaluate Integrals and Tracing of Curves
5 The Mathematical tools needed in evaluating Multiple Integrals and their usage.

SECTION-A

Unit I : Matrices :
Inverse by Partitioning, Rank of a matrix, Rank-nullity theorem(without proof), System of linear equations; Eigen values and Eigen Vectors, Cayley-Hamilton Theorem **.** (8)

Unit II : **Fourier series:**
Periodic function, Fourier expansion of periodic function in (C, C+2L), half range Fourier series, Parsevalôs Theorem, Harmonic Analysis. (8)

Unit III: Integral Calculus :
Reduction formulae, Beta and Gamma function, Evolutes and involutes. (8)

Section - B

Unit IV: (a) Rule of differentiation under integral sign.
(b) Tracing of curves (Cartesian, Parametric and polar forms)
(c) Rectification (Cartesian, Parametric and polar forms). (8)

Unit V: Multivariable Integral Calculus I :

Double Integrals, Cartesian, Change of Order of Integration, Change of Variables (Cartesian to polar coordinates), Evaluation of area by Double Integration.. (8)

Unit VI: Multivariable Integral Calculus II :

Triple integrals, Cartesian, transformation to spherical polar coordinates, Volume by Triple Integration, Mean and RMS Value Theorem. (8)

Text / Reference Books :

i) Wartikar P.N . , Wartikar J.N ï A text of applied Mathematics, Volume I, II Pune V.G. Prakashan, Pune.
ii) Grewal B. S. ï Higher Engineering Mathematics, (latest Edition), Khanna Publishers .
iii) Kreyszig E.K. ï Advanced engineering Mathematics, John Wiley.
iv) Ramana B. V. - Higher Engineering Mathematics, (TMH).
v) Singh R.R. And Bhatt M. - Higher Engineering Mathematics, (TMH).
vi) N.P.Bali and Manish Goyal ï A text book of Engineering Mathematics, Laxmi Publications.
vii) Veerarajan T. - Engineering mathematics for first year, (TMH)

1B2 ENGINEERING CHEMISTRY

Aim:

To impart the sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering students.

Course Objectives:

1. To provide the fundamental background required for industrial setups.
2. To provide the exposure for conducting the experiments in view of engineering aspects.
3. To provide the knowledge about properties of materials and their applications.
4. To utilize the knowledge about polymer and engineering materials towards different applications
5. To provide the knowledge about importance of fuels and lubricants
6. To provide the knowledge about analytical techniques.

Coursd Outcomes:

1. Apply the knowledge of chemistry in softening processes involved in water technology.
2. Identify various types of corrosion and methods to protect the metallic structures form corrosive environment
3. Understanding of the energy storage system (battery) .
4. Apply the knowledge of useful engineering materials such as cement, lubricants, ceramics, refractories and nano materials based on their properties.
5. Develop the technique involved in the manufacturing process of cement
6. Apply the knowledge about the properties of chemical fuels for the generation of power.
7. Apply the knowledge of various polymeric material, their synthesis and applications.
8. Identify various phases of material at different thermodynamics variables.
9. Identification and analysis of materials by using advanced analytical techniques.

SECTION - A

Unit I: Water Treatment and Analysis: [8 Hrs.]

Hardness of water: Types of hardness, Unit of hardness, Determination of hardness of water by EDTA method. Disadvantages of hard of water, Boiler troubles: Scale and Sludge formation, Caustic embritlement, Priming & Foaming, Boiler corrosion. Softening of water by Zeolite process, Ion exchange process and Reverse Osmosis (RO). Numerical problems based on calculations of hardness and Zeolite process.

Unit II: Corrosion and Energy storage system: **[8 Hrs.]**

Corrosion: Introduction, Dry & Wet corrosion and their mechanism, Types of corrosion: Pitting corrosion, waterline corrosion, inter-granular corrosion, Galvanic and Stress corrosion. Pilling Bed worth rule.

Corrosion Control: a) Design and material selection b) Cathodic protection, c) Protective surface coatings- Hot Dipping (Galvanizing and Tinning).

Energy storage system: Basic principles of batteries & their types, Construction, working and applications of lithium- ion battery, Ni-Cd battery.

Unit III: Engineering Materials: **[8 Hrs.]**

Cement: Raw materials, Ingredients of cement and their functions, Wet process of manufacturing of cement, Properties of cement: Setting & Hardening, Heat of hydration & Soundness of cement.

Lubricants: Introduction, Functions of Lubricant, Classification of lubricant: Thick Film, Thin Film & Extreme Pressure lubrication. Physical Properties of lubricants (Definitions): Viscosity & Viscosity index, Flash & Fire point, Cloud & Pour point, Carbon residue.

Industrial Material: Definition, properties and Applications of ceramics & refractories, Nanomaterial.

SECTION- B

Unit IV: Energy Science: **[8 Hrs.]**

Introduction of chemical fuels its classification, Calorific value: Gross & Net calorific values, and its relation .Analysis of coal: Proximate & Ultimate analysis and their significance, Characteristic of Good fuel, Cracking of petroleum fractions, use of gasoline and diesel in IC engine. Knocking, octane number, cetane number. Numerical based on combustion (Mass to Mass, Volume to Volume and less air supplied type)

Unit V: Polymer chemistry: **[8 Hrs.]**

Introduction and Classification of polymers, Methods of polymerization: Addition polymerization:- Free radical, Cationic & Anionic mechanism of polymerization, Preparation, properties and uses of Polyethylene, Poly vinyl chloride, Teflon. Condensation polymerization: Preparation, properties and uses of Bakelite. Thermosetting & Thermoplastic, Rubber: Natural rubber, Drawbacks of natural rubber & Vulcanization. Synthetic rubbers: Preparation, Properties & Applications of - Styrene rubber, Nitrile rubber, Butyl rubber. Biodegradable polymers: properties and applications, Conducting polymers: Introduction, types of conducting polymer and their examples.

Unit VI: Phase rule and Spectrophotometric techniques : **[8 Hrs.]**

Phase rule: Gibbôs Phase rule, Explanation of the terms: Phase, Components and Degree of Freedom, Application of Phase rule to One Component System (Water System), Condensed phase rule and its application to two component system (Bi-Cd).

Spectrophotometric techniques :

Qualitative and quantitative analysis, Principles and instrumentation of spectrophotometry: U.V and.IR spectroscopy. Principle & instrumentation of NMR spectroscopy. Applications of spectroscopy technique. Surface characterization technique: X-ray diffraction.

TEXT BOOKS:

(1) ñA Text Book of Engineering Chemistryò-S. S. Dara. (S. Chand).
(2) ñEngineering Chemistryò-Jain & Jain. (Dhanpat Rai &Sons).
(3) A Text book of Engineering Chemistry Shashi Chawla.

REFERENCE BOOKS:

1 ñA Text book on Experiments & Calculations in Engineering Chemistry- S. S. Dara. (S.Chand).
2 ñText book of Engineering &Technologyò Vol I & II-Rajaram & Kuriacose.
3 ñA Text Book of Polymer Science &Techò-V Gowarikar.
4 Nanotechnology Fundamentals and Applications: Manasi Karkare, I K International Pub
5 Fundamentals of molecular spectroscopy : C. N. Banwell.

1B6 ENGINEERING CHEMISTRY - LABORATORY

Course Objectives:

To provide the practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skill to built technical competence.

Course outcomes :

After completion of this course the student shall be able to :

1. Understand the objective of their experiments.
2. Record and analyze the results
3. Follow the proper and safe procedure to get the accurate results.
4. Interpret the results through proper writing in journal.

LIST OF EXPERIMENTS :

1. Determination of alkalinity of water sample in given alkali mixture. (NaOH and Na_2CO_3)
2. Determination of hardness of water by EDTA method.
3. Determination of chloride ions in water sample.(Mohrôs Method)
4. Determination of chlorine in water sample. (Iodometry)
5. Determination of % CaO in given cement sample.
6. Preparation of phenol formaldehyde & Urea formaldehyde resin.
7. Determination of viscosity of lubricating oil by Redwood viscometer no. 1/no.2
8. Determination of flash point of lubricating oil by Pensky Martenôs Apparatus/ Abelôs apparatus
9. To carry out proximate analysis of coal.
10. Determination of acid value of lubricating oil.
11. Determination of Fe_2^+ and Fe_3^+ in given solution
12. Determination of Dissolved Oxygen in Water Sample.
13. Determination of conductivity of unknown sample by conductivity meter.
14. Determination of PH of unknown sample by PH meter.
15. Estimation of Nickel (Ni) by gravimetric method
16. Determination of Copper or Nitrate ion in water using UV-VIS spectrophotometer

(Note : Minimum 08 experiments shall be conducted)

1B3 BASIC ELECTRICAL ENGINEERING

Course Objectives:

1] To introduce students with different terminologies in electrical engineering and different theorems.
2] To understand magnetic circuits.
3] To study A.C. fundamentals.
4] Study of polyphase circuits.
5] To acquire the knowledge about electrical machines and transformer
6] To study different measuring instruments and electrical apparatus and safety (earthing).

Course Outcomes:

A student completing this course should able to do the following:
1] Explain the basic concepts of electric and magnetic circuits.
2] The students will be able to solve problems on AC fundamentals & three phase circuits
3] Explain the operating principles of various electrical machines and describe the working of various measuring instruments and importance of earthing

SECTION-A

Unit I: Basic concepts of Voltage, Current, Power, Energy and relationship between them Resistance, Resistivity, Conductivity, Temperature effect on resistance and temperature coefficient of resistance. Series and parallel circuits, Ohmôs law, Kirchoffôs laws, Superposition theorem, Theveninôs theorem, Star-Delta transformation (8 Hrs)

Unit II: Magnetic Circuit & Electromagnetism :Basic concept of Magnetic flux, Flux density, MMF, Reluctance, Magnetic field intensity and their relationship, Series and Parallel Magnetic circuits, Principles of Electromagnetic induction, self and mutual inductance, Leakage and fringing of flux, coefficient of coupling and Magnetization curves. (8 Hrs)

Unit III: A.C. Fundamentals, RMS, Average values, form factor, peak factor for Sinusoidal Wave form only, Single phase A.C. Series circuit with Resistance, Inductance and Capacitance, phasor Diagram. Single phase A.C. Parallel circuit with Resistance, Inductance and Capacitance, phasor Diagrams. Impedance Triangle, Active and Reactive power (8 Hrs).

SECTION-B

Unit IV: Polyphase Circuits, Balanced Three phase circuits, Production of three phase emf, Star and Delta connections. Relationship of Phase and line values of voltage and current for Star and Delta circuits, Star and Delta balanced load. (7)

Unit V: Electrical machines A) Single Phase Transformer, Construction and working (no load & on load), EMF Equation, Losses, Efficiency, Regulation and phasor diagram.

B) Electromechanical Energy Conversion, Working principle, Construction of D.C. Motors, types of dc motor, characteristics and applications of D.C. Motors (8 Hrs)

Unit VI: Electrical Apparatus and safety, Measurement of Current, Voltage, Power, Energy, Construction and working of PMMC, MI, Electro-dynamometer & Induction type Measuring Instruments. Necessity of earthing and types of earthing (Plate earthing & Pipe earthing) (7 Hrs)

TEXT BOOKS /REFERENCE BOOKS: - .

1. Basic Electrical Engineering , First Ed., Kulshreshtha D.C., TMH
2. D. P. Kothari & I. J. Nagrath, ñBasic Electrical Engineeringò, TMH Pub. Co. Ltd., New Delhi , 4th Edition
3. Basic Electrical Engineering, V. N. Mittle, TMH Publishing company Ltd
4. Basic Electrical Engineering, Fifth Edition, Fidzgerald A.E., TMH -2006.
5. Basic Electrical Engineering, First ed., R. Anand Natarajan & P. Ramesh
6. Principle of Electrical Engineering , 4th Edition, Del Toro V., PHI 2005
7. Basic Electrical Engineering ï First ed., T. K. Nagsarkar, OXFORD University Press, 2005
8. Electrical Technology ï Volume - I, B. L. Theraja, S. Chand & Co. Publication.

1B7 BASIC ELECTRICAL ENGINEERING – LAB.

List of experiments in Basic Electrical Engineering:

(Minimum (8) eight experiments based on above syllabus]

1. To verify KCL and KVL .
2. To verify Superposition theorem.
3. To verify Thevenin's theorem
4. To verify the effect of temperature on conductor and temperature coefficient of resistance.
5. To analyze series RLC circuit
6. To analyze Star connected resistive circuit
7. To analyze Delta connected resistive circuit
8. To perform load test on a single phase transformer
9. To study D.C. Motors
10. To study measuring instruments

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1B4 ENGINEERING GRAPHICS

Course Objectives:

1) To acquire and apply engineering graphics knowledge for communicating ideas, information and instructions, as well as to understand the conventions of engineering drawing
2) To understand the representations of 3D objects, their projections and sectional views
3) To understand the representations of orthographic and isometric views of 3D objects
4) To introduce students with the drafting commands of commercial graphics software

Course Outcome:

On successful completion of the course, the students will be able to attain following Course Outcomes:

1) Students will able to read/prepare/understand the engineering drawings
2) Students will able to create the projections and sectional views of 3D objects
3) Students will able to draw the orthographic and isometric views of 3D objects
4) Students will able to use graphics software to create Engineering drawings and represent engineering systems

SECTION A

Unit 1: Introduction to Engineering Drawing and Projection :
Use of various drawing instruments, concept of dimensioning and scales, geometric construction, projection of point, line and plane, projection on auxiliary plane.

Unit 2: Projection of Solids :
Projection of solids for prism, pyramid, cone and cylinder.

Unit 3: Section of Solids :
Section of solids for prism, pyramid, cone and cylinder.

SECTION B

Unit 4: Orthographic Projection :
Conversion of pictorial view of objects to orthographic projections by using first and third angle projection methods

Unit 5: Isometric Views and Projections :
Construction of isometric views and projection of given two dimensional views

Unit 6: Introduction to CAD Software :
Drafting environment and drafting screen, coordinate systems, drafting and dimensioning commands, editing commands, drafting of basic geometrical shapes, display commands, CAD software customization.

List of Books Recommended :

Text Books:

1. Bhatt N. D. & Panchal V. M. Engineering Drawing, 49th Edn., Charotar Pub. House, Anand, Gujrat, 2007.
2. Shah P. J. ï Engineering Drawing, S. Chand Publication, 2008.
3. Dhawan R. K. ï Engineering Drawing, S. Chand Publication, (5th edition, 2008).
4. Tickoo Sham ï AutoCAD, BPB Publications.

Reference Books:

1. Naraynan K. L., Kannaiah P. ï Engineering Drawing, Scitech.
2. Jolhe D. A. ï Engineering Drawing, Tata McGraw Hill Publication, 2008.

1B8 ENGINEERING GRAPHICS – LAB.

List of Practicals :

Every student will submit a set of at least SIX drawing sheets (from 1 to 7 listed below) and perform at least TWO practical (from 8 to 10 listed below) using CAD software. Examination will consist of viva-voce based on the syllabus.

1. Loci of points of various mechanisms
2. Projection of straight line
3. Projection of plane
4. Orthographic projection
5. Projection of solids
6. Isometric projection/view
7. Free hand sketches of simple machine elements, like :
   (a) Screw threads ISI profile
   (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts
   (c) Foundation bolts ï Rag, eye, lewis types
8. Drafting of basic 2D geometrical shapes using CAD software
9. Drafting of basic 3D geometrical shapes using CAD software
10. Drafting of 2D and 3D objects using surface modeling commands

ENGLISH COMMUNICATION SKILLS LABORATORY - 1B5

Teaching Scheme: Practical: 4Hrs. / week

Examination Scheme : Internal Test :25 marks External Practical examination : 25 marks

Course Outcomes:

- The learning outcome of students will be assessed through assignments, tests and final exams and most importantly through practical performances.
- Through these tests, it would be revealed that students are able to reproduce their understanding of concepts/principles of communication in English language.
- Students can present themselves well in front of large audience on a variety of topics. Moreover they get the knack for structured conversation to make their point of views clear to the listeners.

PRACTICALS:

Exercise 1: Types of communication, barriers to communication, effective communication
Exercise 2: Foundation of language: grammaticality and acceptability, word power, accuracy and appropriateness.
Exercise 3: Assignment on vocabulary building & Writing skill :nature of writing, stages of writing (pre, while and post), qualities of effective writing, what makes writing poor, the what, howand why of writing, drafting, summarizing, letter writing, writing reports.
Exercise 4: Speaking: pronunciation, stress, intonation and pauses, formal and informal expressions, conversation skills, presentation skills, business etiquette.
Exercise 5: Group Discussion- To study about group discussion technique.
Exercise 6: Interview skill- To study about personal interview.
Exercise 7: Planning and Mot- To study how to plan and execute an activity in a group.
Exercise 8: Seminar skill- To study how to conduct and deliver a seminar.
Exercise 9: Conference ï To study how to conduct conference.
Exercise 10: Interpersonal communication- Conduct an activity for social cause.
Exercise 11: Project- Writing class newsletter.

Reference Books:

1. S. Mishra & C. Muralikrishna, ñCommunication Skills for Engineersò, Pearson Education.
2. T.M. Farhathullah , ñCommunication Skills for Technical Studentsò, Orient Longman.
3. Saran Freeman, ñWritten Communication in Englishò, Orient Longman.
4. Raymond Murphy, ñEssential English Grammar (Elementary & Intermediate)ò, CUP.
5. Shirley Tailor, ñCommunication for Business: A Practical Approachò, Longman Developing .
6. Krishna Mohan &MeeraBanerji, ñ Communication Skillsò, Macmillan.
7. R. C. Sharma & Krishna Mohan, ñBusiness Correspondence and Report Writingò, Tata McGraw Hill.

Websites:

- http://www.englishpage.com
- http://www.english-4u.de/
- http://www.nonstopenglish.com/
- http://www.business-english.com
- http://www.breakingnewsenglish.com/
- http://www.elllo.org/

Appendix-B

A Guide to Induction Program

1 Introduction

*(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.*1 *This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)*

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond.

The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students.

The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

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1A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31 March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs.

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work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2 Induction Program :

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awarness, sensitivity and understanding of the self, people around them, society at large, and nature. 2

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

2Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gadhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

(1) IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

(2) IIIT Hyderabad was the first one to implement a compulsary course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

(3) Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and oneôs relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member. Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity :

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts :

Every student would chose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values :

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through doôs and dontôs, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.3

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

3The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary
Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules
This period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People
This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area
A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilties.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	***Activity***
Day 0	
Whole day	*Students arrive - Hostel allotment. (Preferably do preallotment)*
Day 1 *09:00 am - 03:00 pm*	*Academic registration*
04:30 pm - 06:00 pm	Orientation
Day 2 09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts. `
12:30 pm - 01:55 pm	*Lunch*
02:00 pm - 02:55 pm	Directorôs address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods within the Induction Program. We first show a typical daily timetable.

Sessn.	***Time***	***Activity***	***Remarks***
	Day 3 onwards *06:00 am*	*Wake up call*	
I	06:30 am - 07:10 am	Physical activity (mild exercise/yoga)	
	07:15 am - 08:55 am	*Bath, Breakfast, etc.*	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	III 11:00 am - 12:55pm	Universal Human Values / Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	*Lunch*	
IV	02:30 pm - 03:55 pm	Afternoon Session	See below.
V	04:00 pm - 05:00 pm	Afternoon Session	See below.
	05:00 pm - 05:25 pm	*Break / light tea*	
VI	05:30 pm -06:45pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	*Rest and Dinner*	
VII	08:30pm - 09:25pm	Informal interactions (in hostels)	

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Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	***Session***	***Remarks***
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For3 days-interspersed(e.g.,3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book Reading / Lecture)	IV	*For 3-5 days*
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	***Activity***
Last But One Day 08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentormentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a *student guide*, and for every 20 students, there would be a *faculty mentor*.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/disciplin e4.

Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentorôs home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters. It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, oneôs family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and metaskills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.

The *Induction Program* is designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The *Universal Human Values* component, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and

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4We are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept.

nature, and character to follow through. It also makes them reflect on their relationship with their families and extended family in the college (with hostel staff and others). It also connects students with each other and with teachers so that they can share any difficulty they might be facing and seek help.

References:

Motivating UG Students Towards Studies,
Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directorsô Secretariat, IIT Delhi.

Contact:

Prof. Rajeev Sangal
Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

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NOTIFICATION

No. 89/2020 Date : 26/10//2020

Subject : Implementation of new Syllabi of Semester III & IV of B.E. (C.B.C.S.) as per A.I.C.T.E. Model Curriculum…

It is notified for general information of all concerned that the authorities of the University have accepted to implement new Syllabi of Semester III & IV of B.E./B.Text. E./B.Tech. (Chem.Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2020-21 & onwards as per "**Appendix – A**" as given below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

SYLLABI OF B.E. SEM. III & IV (CIVIL ENGINEERING) [C.B.C.S.]

THIRD SEMESTER

3CE01 MATHEMATICS III

Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Compute the partial Differential Equations.
- Understand the computational details behind certain numerical methods.
- Compute the Analytic function.
- Compute and interpret the correlation coefficient.

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Partial Differential Equations.
4. Compute different Numerical Methods.
5. Apply the knowledge of Complex Analysis.
6. Demonstrate the basic concepts of probability and statistics.

SECTION-A

Unit I : Ordinary Differential Equations :

Complete solution, Operator D, rules for finding the complementry function, the inverse operator, Rules for finding particular integral. Method of variation of parameters, Cauchy's and Legendre's Linear Differential equations. Simultaneous linear differential equations with constant coefficients Applications to civil engineering. (7)

UnitII: Laplace transforms:

Definition and elementry properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary differential equation using Laplace transform of periodic functions. Application to problems of beams and fluids. (7)

UnitIII : Partial DifferentialEquations :

P.D.E. of first order and first degree of types i) f(p,q) = O ii) f(p,q,z)=0, iii) f(p,q,x,y)=O iv) f(p,q,x,y,z)=O i.e. (a) Lagrange's form Pp + Qq = R (b) Clairtut's form z=px+qy+f(p,q) v) Equations reducible to above standard types linear Homogeneous P.D.E. of nth order with constant co-efficients. (7)

SECTION-B

UnitIV: **Numerical Methods :-** (i) Solution of Algebraic and transcendal Equations by Newton Raphson method and by method of FalsePosition.

(ii) Solution of system of linear equations by Grout's method, Gauss Seidal method and Relaxation Method.

Numerical solution of differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method and Rungekutta forth order method. (7)

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation) (7)

UnitVI : Statistics :

Probability : Axioms, conditional probability, Baye's theorem, Mathematical Expectation and probability distributions (Binomial, Poisson and Normal). Curve fitting by method of least square only for line and parabola, Correlation, regression. (7)

TEXT BOOKS:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar. Poona Vidhyarthi Publisher
2. Higher Engineering Mathematics by B.S.Grewal. Khanna Publishers
3. Introduction to method of Numerical Analysis- S. S. Shastry, 2ND Edition, PHI Pvt. Ltd.,New Delhi.

REFERENCES:

1. A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
2. Advancing Engg. Mathematics, E.K.Kreyzig, John Wiley
3. Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

3CE02 – STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. To determine theMechanica lbehavior of the body and construction materials bydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel, Generalized Hook's law, factor of safety. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit II: Axial force, shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Unit III: Stresses in beams (Bending, Shear), i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section. ii) Shear: Distribution of shear stresses on beam cross sections, impact loads and instantaneous stresses.

SECTION – B

Unit IV: Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's formula.

Books Recommended:

1. E. P. Popov, "Mechanics of Materials", Prentice Hall of India, New Delhi.
2. S.Timoshenko and O. H. Young, 'Elements of Strength of Materials', East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, 'Strength of Materials', Harper and Row, New York.
4. Shames, I. H., 'Introduction to Solid Mechanics', Prentice Hall of India, New Delhi.
5. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3CE03 – BUILDING CONSTRUCTION & ENGINEERING GEOLOGY

Learning Objectives of Subject:

1. To understand various types and components of civil structure.
2. To learn about the type of infilling material, its features and construction methodology.
3. To understand various levels in building – floor, sill, lintel, roof levels and their need.
4. To understand the need and type of vertical and horizontal circulation.
5. To make aware of knowledge and importance of rock, soil and its impact for site selection.
6. To help one to understand the reason for Earthquake and its impact on soil / rock properties.

Course outcomes:

At the end of the subject the students will be able -

1. To understand Load bearing and Frame structure.
2. To recognize various types of construction material and its suitability
3. To recognize the various levels in building and its need.
4. To know types of staircase, doors, windows and other related fixtures.
5. To recognize types of rock and minerals and its construction properties.
6. To know reason for earthquake and seismic waves.

SECTION - A

Unit I: Introduction: Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing & framed structures. Foundation: Definition and necessity, loads of foundation, Bearing Capacity soil, field methods of improving bearing capacity. Types of foundation – shallow foundation and Types of Shallow foundation.Causes of failure of foundations and precautions to be taken.

Unit II: Masonry: Classification of bricks, manufacturing of bricks, tests on bricks, properties of burnt bricks, fly ash bricks, ALC Blocks. Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Formwork: Different types, their relative merits, demerits, period for removal of formwork for different members. Earthquake resistant bands in masonry- Types, location and application.

Unit III: Floors: Types of Floors – Basement floor, ground floor and upper floors, Floorfinishes – Types of flooring material, different types of floor finishes, suitability, method of construction, criteria for selection. Roofs – Flat, pitched roof, steel roof trusses – types and suitability, types of roof covering. Arches, lintels – Types and their suitability, details of R.C.C. lintels.; chajja, precast lintels arches.

SECTION - B

Unit IV: Doors: Purpose, criteria for location, size of door, door frames.; its types, methods of fixing, Types of door shutters and their suitability, Windows – Purpose, criteria for location, no., sizes; shapes of Windows, types of windows; their suitability. Ventilators – Types and their suitability. Fixtures & fastening for doors and windows. Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design.

Unit V: Plastering - Necessity, types, processes of different types of plastering, defects inplastered work. Scaffolding – Purpose, types and suitability. Special Aspects of Construction – Damp proofing – causes of dampness, its effects, various methods of damp proofing.Fire proof construction –Fire protection requirements for a multistoried building. Sound proof Construction – Sound absorbents and their characteristic. Expansion & construction joints in building.

Unit VI: Introduction - Different branches of Geology and importance of Geology in CivilEngineering.Folds, faults, joints in Geology. Geological studies related to site selection for dams and reservoirs. Petrology - rock cycle, rock weathering and soil formation, study of common rock types. Earthquake Engineering - earthquake waves, causes and effects, magnitudeand intensity, earthquake zones of India.

Books Recommended:

1. Mackay W.B.: Building Construction, Vol. I, II, III, Longmans.
2. Sushil Kumar: Building Construction, Standard Publishers Distributors.
3. Singh Parbin: General & Engineering Geology.
4. Mukherjee: A Text Book of Geology.
5. TuyrellG.W.: The Principle of Petrology.
6. WadiaD.N. : Geology of India.
7. Sane L.S.: Construction Engg. ManakTalas, Mumbai.
8. National Building Code of India, 2016.
9. Punmia B.C.: Building Construction.
10. A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

3CE04 – TRANSPORTATION ENGINEERING

Learning Objectives of Subject:

1. To learn about basics of Road construction like surveys, alignment principles, types of roads.
2. To study and understand various road studies for safe road design principles and essential geometry.
3. To learn about various road pavements its construction and maintenance procedure.
4. To learn about railway transportation and terms related to it.
5. To learn about construction concepts of Airport runway, Apron layout , various survey and terms related to Airport Transportation.
6. To learn about Tunnels and Bridges components types and related transportation study.

Course outcomes:

At the end of the subject the students will be able –

1. To identify type of roads and its utility.
2. To understand the application of various road studies at time of survey and actual construction.
3. To design the various types of road pavements.
4. To understand rules regulations, signals , type of gauges and railway sleepers density.
5. To recognize the Airport features and design concept of components for Aero plains movement.
6. To identify types and components of Tunnels and bridges and its design components.

SECTION-A

Unit-I Highway: Road Transport characteristics, classification of Roads, Road Patterns, Alignment principles, Survey for highway.

Unit-II Geometric Design: Cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, overtaking sight distance, Horizontal alignment, curves, superelevation.

Unit-III Pavement Design and Traffic Engineering: Components of Flexible and Rigid pavement, Design factor, Traffic Characteristics, Traffic Studies, Construction and Maintenance – WBM Surface dressing, bituminous roads and construction procedure. Road parking system, traffic control devicesand 3 E's of traffic

SECTION-B

Unit-IV:Railway: Railway transportation, track sections, embankment & cutting. Points and crossing Left &right hand turnouts. Objects, Permanent way, gauges, coning of wheels, components of permanent way, Sleeper density, Rail fixtures & fastening. Rail types and functions.

Unit-V: Airport: Agencies controlling national & international aviation, various surveys to be conducted, airport site selection, Aero plane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, wind rose diagram. Basic runway length and corrections, Apron layout, Aircraft parking & parking system.

Unit-VI: Tunnel and Bridges: Tunnels- necessity, types, tunnel alignment, Size and shape of tunnels, and Tunnel lining. Tunnel drainage, ventilation & lighting of tunnels. Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board, different structural form – culverts, types of foundation, abutments, piers and wing wall.

Books Recommended:

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transportation& Highway Engg.
3) Dr.KadiyaliL.R. : Traffic Engg. & Transport Planning.
4) BindraS.P. : Principles & Practice of Bridge Engg.
5) Saxena &Arora : Railway Engineering.
6) Agrawal M.M. : Railway Engineering.
7) Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
8) Srinivasan: Tunnel Engineering.
9) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
10) Duggal A.K. &Puri V.P. : Laboratory Mannual in Highway Engg.

3CE05 – CONCRETE TECHNOLOGY & RCC

Learning Objectives of Subject:

1. To understand basic construction material - Cement, its property and suitability tests.
2. To learn about meaning of concrete, strength of concrete, mixing proportion and suitability test.
3. To understand meaning of RCC and its need.
4. To learn various properties of concrete and use of different admixtures.
5. To learn about special concrete materials and methods.
6. To be able to perform mix design of concrete

Course outcomes:

At the end of the subject the students will be able -

1. To know need and composition of binding material, cement.
2. To recognize concrete and RCC and will be able to perform desired test for suitability,
3. To analyze RCC Components like slab and lintels.
4. To decide and utilize the admixtures as per the need of Concrete.
5. To understand importance of mix design.

SECTION-A

Unit I: Cement: Physical properties of Portland cement, laboratory tests on cement, types of cements. Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density.

Unit II: Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete. Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage.Durability of concrete,laboratory tests on concrete.

Unit III: Basic elastic theory and concept of reinforced concrete, types of reinforcement, Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, andchajjas.

SECTION-B

Unit IV: Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions. Construction chemicals: concrete curing compounds, polymer bonding agent, surface retarders, bond aid for plastering, protective and decorative coating.

Unit V: Special concrete: Ready Mix Concrete Light weight concrete, fiber reinforced concrete, Roller compacted concrete, self-compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete. Special concreting techniques: Guniting, grouting and shotcrete concrete, introduction & application of Ferrocement.

Unit VI: Introduction of mix design, factors governing mix design, IS Code method of mix design (IS: 10262 – 2019) and Ambuja method.

Books Recommended:

1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold (Publishers) ltd.
2. Neville, A. M.: Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks: Concrete Technology, ELBS
4. Gambhir, M. L. : Concrete Technology, Dhanpat Rai and Sons
5. Orchard D. F.: Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S.: Concrete Technology, S. Chand
7. Varshney, R. S.: Concrete Technology, Oxford Pub. house.
8. IS: 456 – 2000,
9. IS: 10262 – 2019,,
10. Krishna Raju: Design of Concrete Mixes, Mc – Graw Hill.
11. Ambuja Cement Concrete Mix Design- Ambuja Technical Literature series 79.

3CE06 – STRENGTH OF MATERIALS – LAB

List of Practical's in Strength of Material Lab (Minimum any eight practical from the list should be performed)

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

3CE07 BUILDING CONSTRUCTION & ENGINEERING GEOLOGY – LAB

List of Practical's in Building Construction & Engineering GeologyLab (Minimum any eight practical from the list should be performed)

1. Drawing of following building elements on A-2 size sheet.
   a) Paneled door, flush door, and glazed window.
   b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Fields visits to building under construction and its report writing including material of construction, construction processes, Human recourses required, and construction details.
6. Sketch book containing Free hand sketches of following:

Different types of foundations, Bonds in brick masonry, Types of floors. [Sections] Types of stairs. [Plans and side view], Line sketches of different types of steel roof trusses, Details of expansion joints, Details of damp proofing for basement, Fixtures & fastenings of doors & windows.

7. To determine shape and size of supplied bricks.
8. Field visit for different types of roof structures.
9. Field visit for studying building component in Load bearing and framed structure.
10. Megascopic study of silicate and non-silicate mineral, with special reference to physical properties of minerals and uses.
11. Megascopic study of the common igneous, sedimentary and metamorphic rocks, with special reference to engineering properties of rock and uses.

3CE08 TRANSPORTATION ENGINEERING – LAB

List of practicals in Transportation Engineering-Lab (Minimum eight experiments from the list should be performed)

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of Viscosity of Bituminous material
7. Determination of softening point of bituminous material.
8. Determination of ductility of bitumen.
9. Determination of marshal stability value

3CE09 CONCRETE TECHNOLOGY & RCC – LAB

List of Practicals in Concrete Technology & RCC Lab (Minimum eight practical from the list should be performed) :

1. Mix Design (Compulsory) by IS method.
2. Compulsory site visit and submission of site visit report.
3. Fineness of cement
4. Soundness of cement
5. Consistency and setting time of the cement
6. Compressive strength of cement
7. Sieve analysis of aggregate.
8. Bulking of sand (fine aggregate).
9. Silting of sand.
10. Workability by slump cone test compaction factor test
11. Admixture: Density, Compatibility Test
12. Workability by flow table method.
13. Compressive & Tensile strength of concrete.

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FOURTH SEMESTER

4CE01 BUILDING PLANNING DESIGNING & CAD

Learning Objectives of Subject:

1. To understand need of engineering drawings and methods to draw it.
2. To learn about various planning principles and able to apply on residential buildings.
3. To understand seasonal and climatic condition and corresponding provisions in structure.
4. To know regional rules regulation related to building construction.
5. To learn various types of plan – Block , Site , Line , Detail , Section etc.
6. To learn about smart buildings.

Course outcomes:

At the end of the subject the students will be able -

1. To make engineering drawings by First angle and Third angle method.
2. To apple building planning principles practically while developing projects.
3. To study the climatic conditions and decide the corresponding provision in structure.
4. To know about Bylaws, Town development authority rules and terms.
5. To draw various plans manually and computationally.

SECTION-A

Unit I: Importance of building drawing for Civil Engineering in construction & industry, estimation, Selection of scales for various drawings. Types of line and theirapplication. Methods of dimensioning in architectural drawing. Abbreviations and graphical symbols used in Civil Engineering Drawing as per IS: 962. Compare first angle and third angle method of projection. Layout of sheet for civil engineering drawing. Requirements of drawing and documents as per plan sanctioning authorities. Define FSI and TDR.

Unit II: Planning of residential building. Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement.

Climate of Indian and its influence on Building planning: Solar radiation, air temperature, wind, humidity, precipitation, earth & its motion, directions to their characteristics. Orientation of buildings: factors affecting orientation, sun, wind, rain. Requirement of the owner. Alternatives of building types viz. individual bungalows, semidetached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building. Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Criteria for earthquake resistant planning of building.

Concepts of Digitized / Smart Buildings, Internet of Things (IOT) in buildings and Green Buildings, Industrialized Buildings

SECTION -B

Unit-III: Building Bye-laws and Development Control Rules for D Class Municipal Corporations in the Maharashtra State under the provisions of the Maharashtra Regional & Town Planning Act, 1966. Conversion of land to non-agricultural lands, layout for a housing project.Types of public building and their requirements, planning of public building.

Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post-office. Free hand sketching of components of buildings and elevation features of building such as balconies, chajjas, etc.,Staircase planning & drawing.

Unit IV: Concept of line plan, working and submission drawings of the building. Details to be incorporated in the working drawing. Necessity and use of working and submission drawing. Concept of site plan, block plan and layout plan. Importance and details to be incorporated. Concept of foundation plan, importance and use. Developing working and submission drawings for load bearing and framed structures building from the given line plan(Develop plan, elevation, LHSV, RHSV, back side view, section, foundation plan, site plan and their detail). Plumbing ramp, Electric plan.

Books Recommended :

1. Shah, Kale &Patki, Building Planning & Drawing, Tata McGraw-Hill plubication
2. Dr. Kumar Swamy& Rao Swamy, Charotar publications
3. CheryR , Auto cad Pocket reference, BPB Publication.

4CE02 - HYDROLOGY & WATER RESOURCE ENGINEERING

Learning Objectives of Subject:

1. To study the different hydrological parameters.
2. To understand hydrological statistics and design.
3. To characterize and mitigate natural and man-made hazard.
4. To understand the various irrigation systems and its design.

Course outcomes:

At the end of the subject the students will be able -

1. Explain the hydrology and hydrological data.
2. To analyze the hydrological methods for runoff.
3. Evaluate the ground water hydrological problems.
4. Explain the need of irrigation systems and its alternatives.

SECTION – A

Unit I: Introduction - Hydrologic cycle, applications in engineering, sources of data. Precipitation- Forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).

Unit II: Abstractions from precipitation - evaporation process, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modeling infiltration capacity, classification of infiltration capacities, infiltration indices.

Unit III: Runoff - runoff volume, methods of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph. Ground water and well hydrology - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

SECTION – B

Unit IV: Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler, pipeline distribution network(PDN) and trickle / drip irrigation.

Unit V: Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Lining of canals, types of lining. Water logging problems, causes, effects and remedies.

Unit VI: Dams and spillways – Earthen dams: Classification, design considerations, selection of suitable site. Estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Economic height of dam, Spillways: components of spillways, types of gates for spillway.

Books Recommended:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. G L Asawa, Irrigation Engineering, Wiley Eastern

4CE03 SURVEYING

Learning Objectives of Subject:

1. To learn about the term surveying, various instruments and possible error.
2. To learn Linear Measurement methods and way of conduction.
3. To learn about the measurement at elevation and of Directions , contour development process.
4. To understand and learn performing Plane table surveying.

Course Outcomes:

At the end of the course the student will be able to:

1. Define principles of Surveying, Remote Sensing and Geomatics.
2. Describe different instruments, tools, applications and techniques to determine the positions on the surface of the earth, change detection.
3. To perform Liner measurement methods of surveying.
4. Differentiate the techniques for setting out alignments, curves, other layouts, modern survey systems etc.
5. To perform survey at elevation and conduct Plane Table survey.

SECTION-A

Unit I: INTRODUCTION: Geo-informatics- definition, disciplines covered, importance. Field Surveying- definition & objectives; concept of Geoids and reference spheroids, coordinate systems, plane and geodetic surveys. Methods of location of a point- classification of surveys; principles of surveying Errors in measurements- sources, types of errors and their treatment. Random error distribution, accuracy, precision and uncertainty. Surveying instruments- temporary and permanent adjustment concept, principle of reversal. Maps- types, importance, scales/CI, conventional symbols, and generalization; topographic maps projection systems, sheet numbering systems, map layout.

Unit II:LINEAR MEASUREMENTS: Direct and indirect methods; Chain and tape measurements- corrections to tape measurements; Optical methods- tachometers, sub tense bar; Electronic methods- EDMs, total stations.

Unit III: MEASUREMENT OF ELEVATIONS :Various terms; Methods of height determination; Spirit leveling- different types of levels and staves; booking and reduction of data, classification and permissible closing error; profile leveling and cross sectioning; curvature & refraction and collimation errors; reciprocal leveling. Contours- characteristics, uses and methods of contouring.

SECTION – B

UnitIV:MEASUREMENT OF DIRECTIONS: Bearings and angles; Compass surveying- magnetic bearings, declination, local attraction errors and adjustments.

Unit V: TRAVERSING: Purpose and classification of each; Compass and theodolite traverses, theodolites- different types, uses, methods of observation and booking of data, balancing of traverses, computation of coordinates, omitted measurements Gale's traverse table.

Unit VI: PLANE TABLING: Merits and demerits, accessories; orientation and resection; methods of plane tabling; three point problem and solutions; errors in plane tabling, least square principle, Engineering project surveys- requirements and specifications, various stages of survey.

Books Recommended:

1. D. Clarke: Plane and Geodatic Surveying, Volume I & II
2. T.P. Kanetkar& Kulkarni: Surveying & Levelling, Part I & II.
3. B.C. Punmia : Surveying I & II.
4. N.N. Basak : Surveying & Levelling.

4CE04 - GEOTECHNICAL ENGINEERING –I

Learning Objectives of Subject:

1. To understand the various types of soil and its classification.
2. To learn about the Index and Engineering properties of soil.
3. To make one understand the mechanics of compaction and factors affecting the compaction.
4. To understand the concept of permeability and factors affecting to it.
5. To learn about the concept of seepeage discharge and effective, neutral and total stress in soil mass.
6. To make one understand the stress distribution in soil mass& its engineering applications.

Course Outcomes:

At the end of the subject the students will be able –

1. To determine the Index properties and Atterberg limits for soil classification.
2. To understand the mechanics of compaction and quality control in field.
3. To explain permeability of soil and methods of dewatering.
4. To calculate the seepage discharge and design the graded filter.
5. To understand the concept of consolidation and stress distribution in soil mass.
   To calculate the shear strength of different soil.

SECTION - A

Unit- I History of development of soil mechanics, formation of soil, its significance to the field problems. Soilproperties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Index properties of coarse and fine grained soil BIS classification of fine grained & coarse grained soil.

Unit-II Concept of clay mineral, major soil minerals, their structural formation and properties. Mechanics of compaction, factors affecting compaction, Standard and modified Proctor test, their field Determination, zero air void line, concept of wet of optimum, and dry of optimum, different structures of soil, field compaction & their control. CBR test and CBR value for soak and unsoaked conditions.

Unit-III Absorbed water, surface tension, capillarity and its effect on Soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection Permeability, determination of coefficient of permeability laboratory and field methods. Permeability for stratified deposits. Drainage and dewatering of soil and it's various methods.

SECTION – B

Unit-IV Laplace equation, its derivation in Cartesian co-ordinate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design Terzaghi's criteria for graded filter, concept of piping and criteria of stability against piping.

Unit-V A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criteria, Mohr-Coulomb's theory and development of failure envelopes, Unconfined compression test, Laboratory measurement of shear strength for different drainage, conditions by direct shear test, Triaxial test for various drainage conditions, Merits and demerits of various shear strength tests. Concept of pore pressure coefficient shear characteristics of sand, NC and OC clays and partially saturated soil, Influence of soil structure and strain rate on shear strength.

Unit-VI State of stress at a point, stress distribution in soil mass, Boussinesq's theory and its applications, point load, uniformly loaded rectangular and circular area New-mark's chart, its preparation and use, equivalent point load Compression of laterally confined soil, concept of consolidation spring analogy, Terzaghi's theory of one-dimensional consolidation. e-p curve, compression index, swelling index, coefficient of compressibility, Consoledometer-test, determination of Cv Cassagrande's method for determination of pre-consolidation pressure.

Books Recommended:

1) Craig R.F.: Soil Mechanics,
2) Lambe T.W. & Whiteman R.V.: Soil Mechanics, John Wiley and Sons, 1969.
3) Terzaghi K. & Peck R.B.: Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
4) Gulhati S.K.: Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
5) Singh A.: Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
6) Venkataramiah C.: Soil Mechanics and Foundation Engineering.
7) B. M. Das, Advanced Soil Mechanics.
8) S. K. Garg: Soil Mechanics and Foundation Engineering.

4CE05 - STRUCTURAL ANALYSIS- I

Learning Objectives of Subject:

1. To understand the action and corresponding displacement in various type of structural elements.
2. To learn about statically determinate and indeterminate structures.
3. To analyze continuous, cantilever and propped cantilever beams.
4. To learn different analysis methods for analysis of beam, frames and trusses.
5. To learn analysis of 2 Hinge and 3 Hinge arches.

Course outcomes:

At the end of the subject the students will be able -

1. To decide what is required to be analyzed depending upon type of structural element.
2. To know about degree of freedom, Condition of equilibrium and determinacy of element.
3. To understand reason for failure and permissible limits for safety.
4. To apply the knowledge of beam analysis for practical analysis and design purpose.
5. To make application of various analysis methods for actual structural member analysis and design.
6. To know merits for utilization of suspension, 2 hinged and 3 hinged arches.

SECTION – A

Unit-I : 1. Classification of Structures, Concept of statically indeterminate Structures, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.

2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II : 1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.

2. Deflection in determinate trusses.

Unit-III : Influence line diagrams for reactions, bending moment and shear force for determinate beams. Rolling loads on simply supported beams concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION - B

Unit IV : 1. Analysis of Cables Suspension Bridge under Concentrated Load and UDL for Cables over pulleys and Cable provided with saddles.

2. Two & Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit V: Slope deflection method: 1. Analysis of continuous beams with and without sinking of support.

2. Analysis of portal frames without side sway.

Unit VI : Moment Distribution method: 1. Analysis of continuous beams with and without sinking of support.

2. Analysis of portal frames without side sway.

Books Recommended:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II.
2. Jain and Arya, Theory and Analysis of Structures .
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural analysis.

4CE06 BUILDING PLANNING DESIGNING & CAD – LAB

A. SKETCH BOOK :

1. Draw various types of lines, Graphical symbols for materials, doors, windows, sanitary and water supply installations, electrical installations, Abbreviations as per IS 962:1989, Location for bed, sofa, dining table with chairs, wardrobe, kitchen furniture, etc. Free hand sketches of Verandah, lobby, passage, corridor and balconies. Building layout plan with setback lines, sanitary and water supply lines. Loft and Mezzanine floor.

2. Collect one readymade drawing for residential building (1 BHKD or 2BHKD) Read various details shown on drawing. write summary of observations on the drawing itself such as orientation of rooms, placement of doors and windows, wall thicknesses, flooring in rooms and sanitary block, skirting, dado, kitchen platform-size, height etc; room height, chajja projections, staircase-rise, tread, landing etc. Attach these drawings with the sketch book.

3. Draw line plans for five Residential Buildings with minimum three rooms and staircase in each with WC and Bath.

4. Draw line plans for five Public Building- School Building, Primary Health Centre, Hospital Building, Bank, Post Office, Hostel, Canteen and Shopping Complex. Bar & Restaurant and Hotels, Saloon, Bus Station.

B. FULL IMPERIAL SIZE SHEET (A1)

AUTOCAD: Understanding basic concepts such as Absolute, relative & world Co-ordinates, Drawing units, drawing limits, extend, layers, line types, object snapping, and filter.

Drawing entities in AutoCAD/Felix CAD, various drawing commands, use of object snaps & filters, Editing the drawing different editing commands, Dimensioning commands, Text commands, Hatching commands viewing the drawing different views, view ports, zooming in & out, panning, saving & printing in different scales.

Draw sheet no. 1, 2 and 3 drawing in Auto-CAD or similar software.Prepare sheet no. 3 in Pre-DCR software.

1. SHEET NO. 1 : Submission drawing, **to the scale 1:100,** of single storied Load Bearing Residential Building (4 Room) with Flat Roof and staircase showing developed plan, elevation, section passing through Stair or W.C. and Bath, site plan (1:200), **foundation plan and section (1:50),** area statement, schedule of openings , construction notes.

2. SHEET NO. 2 : Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHKD) with attached toilet to 1 bedroom showing the position of European type WC pan) showing developed plan, elevation, section passing through staircase, site plan (1:200), foundation plan **and section** (1:50), area statement, schedule of openings. (Also Show the place for Washing machine, WHB, Pooja, store, bed, dining table with chairs, sofa, wardrobe etc.)

3. SHEET NO. 3: Submission drawing of Apartment / Multi storeyed building to the scale 1:100, showing developed plan, elevation, section passing through staircase or W.C. and Bath and Component Drawing of RCC Lintel and Chajjas. Shows detailed enlarge section.

Note: No identical plans and every student must have his/her own plans and drawings.

4CE07 - HYDROLOGY & WATER RESOURCE ENGINEERING - LAB

TERM WORK: Five problems from the following to be worked out by the students, whenever necessary scale drawing on half empirical size must be drawn:

Practical examination shall consist of viva – voce.
1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components.
3. Drawing of elementary and practical profile of gravity dam.
4. Drawing of diversion weir on permeable foundation.
5. Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any four canal structure (No design)
8. Technical Field visit.

4CE08 SURVEYING– Lab

List of Practical's in Surveying Lab (Minimum eight practical from the list should be performed)

1. Distance measurement by chain tape and EDM.
2. Finding RL of given point.
3. Profile and cross section leveling for road.
4. Measurement of bearings with prismatic compass.
5. Chain and compass traversing.
6. Local attraction detection- correction of bearings.
7. Measurement of Horizontal and Vertical angles using Theodolite.
8. Theodolite Traversing.
9. Plane table surveying- Radiation, Intersection and Resection method.
10. Engineering Project Surveys.

4CE9 GEOTECHNICAL ENGINEERING I – LAB

List of Practical's in Geotechnical Engineering- I Lab (minimum eight practical from the list should be performed)

Experiments:

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying method.

3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination of Atterbergs limits (LL, PL and SL)
6. Determination of Compaction properties (Standard Proctor Test)
7. Determination of permeability of soil by using falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial list of UU type
11. C.B.R. test. Determination of C.B.R. value by conducting CBR test on soaked sample.
12. Determination of Coefficient of consolidation by conducting consolidation.

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SYLLABUS OF B.E. [MECH.] SEM. III & IV {C.B.C.S.}

Semester-III
3ME01 MATHEMATICS - III

Course Learning Objectives :

1. To provide the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations
2. To understand the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation
3. To provide knowledge to apply False Position, Newton Raphson method to solve nonlinear & polynomial equations, Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations
4. To understand the Gradient, divergent and curl of vector point functions. To find the directional derivatives of scalar point functions. To discuss the Irrotational and solenoidal vector fields. To define line surface and volume integrals.

Course Outcomes :

Students will be able to -

1. Demonstrate the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations
2. Define the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation
3. Apply False Position, Newton Raphson method to solve nonlinear & polynomial equations Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations
4. Define Gradient, divergent and curl of vector point functions. Finds the directional derivatives of scalar point functions. Discuss the Irrotational and solenoidal vector fields. Define line surface and volume integrals

SECTION-A

UNIT-I : Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (10 Hrs)

UNIT-II: Laplace transforms : Definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function. Solution of Linear differential equations. (10 Hrs)

UNIT-III :a) Partial differential equation of first order of following form- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii)f (x,p)=g(y,q); (iv) Pp+Qq=R (Lagranges form); (v) z=px+qy+f (p,q) (Clairaut form)
b) Statistics : Curve fitting by method of least squares (Straight and parabola only), Correlation, Regression.
c) Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (10 Hrs.)

SECTION-B

UNIT-IV: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation), singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

Sant Gadge Baba Amravati University, Amravati

B.E Civil Engineering V & VI Semester Syllabus (C.G.P.A System)

V Semester

5CE01 : Design Of Reinforced & Prestressed Concrete Structures

Learning Objectives of Subject:

- To understand basic concept of limit state method.
- To understand behavior of slab under external loading.
- To understand behavior of staircase and retaining wall.
- To understand behavior of column and footing.
- To learn concept of grid slab and earthquake resistant construction.
- To introduce basic concept of prestressed concrete.

Course outcomes:

At the end of the subject the students will be able -

- To analyze and design of rectangular section.
- To analyze and design of slab.
- To analyze and design of staircase and retaining wall.
- To analyze and design of column and footing.
- To understand grid slab and ductile detailing.
- Explain the general behavior of PC sections under external load.

SECTION-A

Unit I:

1) Introduction to limit state method, basic concept and design of singly and doubly reinforced rectangular sections.

2) Analysis and design of flanged sections.

Unit II:

1) Analysis and design of one way continuous slabs

2) Analysis and design of two way slab.

Unit III:

1) Design of Dog legged staircase.

2) Design of cantilever retaining walls (Horizontal backfill only).

SECTION-B

Unit IV:

1) Analysis and design of columns for axial load, uniaxial and biaxial bending.

2) Design of isolated footings: square and rectangular subjected to axial load and uniaxial bending moment only (with uniform depth only).

Unit V:

1) Design of Grid Slab by I.S. code method.

2) Detailing for earthquake resistant construction. Introduction, Cyclic behavior of concrete and reinforcement, significance of Ductility, Ductile detailing for beams, columns, beam-column joint and footing.

Unit VI:

1. Introduction to Prestressed concrete: Materials and their characteristics, types of prestressing, Methods and various prestressing systems, Losses of prestress.
2. Analysis of Rectangular and flanged beams.

Notes:

1) Students should use IS 456:2000, IS 1343:2012, IS 1893:2016, IS 13920:2016.

2) Field visit on any RCC framed structure & report of the same.

3) Students must be shown video CD, slides, transparencies, and photograph of actual structures.

Books Recommended:

1. Ashok K Jain : Reinforced Concrete Limit state Design (Nem Chand & Bros Roorkee)
2. S.K.Sinha: Reinforced Concrete Design (M C Graw Hill Education India Pvt Ltd)
3. Devdas Menon, S. UnnikrishnaPillai :Reinforced concrete Design ;Third Edition; McGraw Hill Education
4. Dr.Shah V.L. &Karve S.R. : Limit State Theory & designof Reinforced concrete IS 456:2000(Structurs Publication)
5. Neelam Sharma :Reinforced Cement Concrete design (S.K.Kataria& Sons)
6. S.S.Bhavikatti :Design of R.C.C. Structural Element (R.C.C. Vol. I)(New Age International Publishers)
7. Lin, T. Y. and Burns N. H., Design of Prestressed Concrete Structures, John Wiley and Sons.
8. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi

5CE02: Surveying & Geomatics

Course Objectives:

- To prepare the student to understand applications of curves.
- To enable the students to establish accurate control for photogrammetric survey and to determine accurate locations of points in engineering works
- To equip the candidate with the art, science and technology of cartography and applications of GIS in Mapping Resources.
- To develop the skills in surveying and thematic mapping.

Course Outcomes:

Students will be able to

- Understand the use of different types of curves and their field implications.
- Understand the triangulation adjustment.
- Understand the hydrographic survey.
- Acquire skills in handling spatial data base warehousing and mining.
- Understand the surveying with advance instrument like remote sensing, GPS and GIS.

SECTION- A

Unit-I: Curves: Classification, degree of curve, elements of circular and compound curves, theory and methods of setting out simple curves, Instrumental method of setting out compound curves.

Unit-II: Triangulation: principles, classification of triangulation system, triangulation figures, their choice of station, phase of signals, towers, satellite station, reduction to center, field work, reconnaissance, Inter-visibility, angular measurements. Basenet, extension of Basenet.

Unit-III: Hydrographic surveying: necessity, controls, shore line surveys, gauges, sounding equipment's and procedure of taking soundings, methods of location of sounding, three-point problem in hydrographic surveying, analytical and graphical methods. Underground Surveying: surface alignment, correlation of surface and underground surveys; Weisbach triangle, transferring levels and alignment underground.

SECTION – B

Unit-IV: Elements of photogrammetry: Basic definitions, terrestrial and aerial photography, scale of vertical photograph, Relief and relief displacements, heights from parallel measurements, flight planning, photographs required.

Unit-V:1.Remote sensing: Introduction, definitions, remote sensing systems, advantages over conventional system, energy interaction in the atmosphere, Indian remote sensing satellite series and their characteristics 2. GPS: Global positioning system (GPS) introduction, definitions, GPS receivers, antenna, advantages of GPS.

Unit-VI: 1. Geographical Information System: Definition and history, Components of GIS, Data structure and formats, Spatial data models – Raster and vector, Data base design- editing and topology creation in GIS, Linkage between spatial and non-spatial data, Introduction to QGIS software. 2. GIS application: Application in Geological Investigations, water resources management, environmental studies, EIA based studies, Land use planning, soil studies and transportation planning.

Books Recommended:

1. D. Clark.: Plane and Geodetic Surveying Vol II, CBS Publishers & Distributors Pvt. Ltd,
2.T.P. Kanetkar & S.V.Kulkarni: Surveying and Leveling Part II, Pune Vidyapetth GrahaPrakashan.
3. B.C.Punmia: Surveying Vol. II and III, Tata McGraw-Hill Publishing Company Limited,
4. Kang-tsung Chang: Introduction to Geographic Information Systems, McGraw-Hill Book Company, 2006.
5. B.C. Punmia, Ashok Jain, Arun k. Jain: Higher surveying, Laxmi publications (P), Ltd,
6. Dr. S. Kumar: Basics of remote sensing and GIS, Laxmi publications (P), Ltd

5CE03: Numerical Methods and Computer Programming

Learning Objectives of Subject:

- To learn the basics of spreadsheets.
- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop skills in programming using C language.

Learning Objectives of Subject:

At the end of subject the students will able -

- To use spreadsheet software for solving civil engineering problems.
- To impart knowledge to analyze, solve, design and code numerical method problems using C language.
- To impart knowledge to analyze, solve, design and code civil engineering problems using C language.

SECTION – A

Unit-I:

Spreadsheet software basics, Expressions, Mathematical Functions, Conditional Execution Functions like IF, COUNT, COUNTIF, SUM, SUMIF, AVERAGE, AVERAGEIF, LOOKUP, HLOOKUP. Application to the Civil Engineering Problems.

Unit-II:

1. Basic structure of C program, use of library functions, input output statements, flowchart.
2. Decision Control structures and loop Control structures conditional loop and unconditional loop: WHILE, DOWHILE, FOR, IF, IFELSE, NESTEDIF, LADDER IFELSE etc.

Unit-III :

1. Type casting, single dimensional and multi-dimensional array, subscripted variables
2. Functions in C

SECTION-B

Computer Programming using C

Unit-IV:

1. Matrix operations such as:
    a. Addition and subtraction
    b. Multiplication
    c. Transpose
    d. Testing summary etc.
2. Fourth order, Runge - Kutta method for solution of first order, second order differential equations and two simultaneous equations.

Unit-V:

1. Solution of quadratic equation
2. Numerical integral using Trapezoidal and Simpson rule
3. Finding root of equation f (x) = 0 by Newton –Raphson , Regula -Falsi and Bisection method.

Unit VI:

1. Centre of gravity, moment of inertia & radius of gyration of Tee section.
2. Bending moment and shear force ordinates for simply supported beam subjected to point and uniformly distributed load only.
3. Design of singly reinforced beam by limit state method.
4. Determination of coefficient of permeability in parallel and perpendicular direction of bedding plane
5. Reduce level by height of instrument method.
6. Determination of Chezy's constant.

BOOKS RECOMMENDED:

1.E Balagurusamy, Programming in ANSI C
2.Yashavant P. Kanetkar, Let Us C
3. Pradeep Dey & Manas Ghosh "Computer Fundamentals &Programming in C" Oxford University Press 2006.
4. Herbert Schildt - C Complete Reference (Tata-McGraw Hill)
5. Gottfried – Problem Solving in C (Schaum Outline Series- McGrawHill)
6. Noel Kalicharan - C by Example (Cambridge University Press)

(Professional Elective I)

5CE04 : (I) Highway Construction and Management

Learning Objectives of Subject:

- To know the development of transport, various road development plans and policies in India and test procedures for highway materials.
- To understand the principles of highway geometric design as per IRC standards.
- To study the different types of pavement its construction, maintenance & design by different methods.
- To understand the Traffic engineering & different types of traffic control devices.
- To study the causes, preventions, better planning & design of highway to prevent accidents.
- To study various types of equipments, their working principles & limitations for flexible and rigid pavement.

Course outcomes:

At the end of the subject the students will be able –

- Explain the basic concepts about highway engineering
- To design geometric elements of the highway.
- To design the various types of road pavements with construction and maintenance of highway.
- To carry out traffic studies and implement traffic regulation and control measures and intersection design.
- To apply the knowledge to prevent the road accidents.

SECTION A

Unit I: Highway: Development and Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material and Testing. Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.

Unit II: Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, super elevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.

Unit III: Pavement Design: Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement, Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil .

SECTION B

Unit IV: Traffic Control Devices: Traffic signs, markings, islands and signals. Different methods of signal design; redesign of existing signal including case studies. Signal system and co-ordination. Evaluation and design of road lighting.

Unit V: Road Safety: Road accidents, Causes, scientific investigations and data collection. Safety in Road Design – Accident prevention through better planning and design of roads – planning road networks by land use planning. Traffic calming techniques and innovative ideas in road safety.

Unit VI: Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.

Books Recommended:

1. Kadiyali L.R., " Principles & Practice of Highway Engineering" Khanna Publisher
2. "Highway Engineering", Khanna & Justo, (Nem Chand & Poros, Roorkee.1997)
3. E.J. Yoder, "Principles of Pavement Design," John Wiley & Sons lnc., New York
4. Chakroborty P Das "Principles & Practice of Highway Engineering" (Khanna Publisher 2000)

REFERENCE BOOKS:

1. Highway Material Testing – S K Khanna- C.E.G. Justo, Nemchand Bros- Rookee, 2000
2. S.K.Khanna & Justo C.E.G., Highway Material Testing Manual
3. A.K. Duggal and Vijay P.Puri, "Laboratory Manual in Highway Engineering,"

5CE04: (ii) Repairs & Rehabilitation Of Structures

Learning Objectives of Subject:

- To learn various distress and damages to concrete and masonry structures
- To understand the importance of maintenance of structures
- To study the various types and properties of repair materials
- To assess the damage to structures using various tests
- To learn the importance and methods of substrate preparation
- To learn various repair techniques of damaged structures, corroded structures

Course outcomes

By the end of this course students will have the capability/knowledge of

- Various distress and damages to concrete and masonry structures
- The importance of maintenance of structures, types and properties of repair materials etc
- Assessing damage to structures and various repair techniques

SECTION A

Unit I : Introduction: General Consideration, Distresses monitoring, Causes of distresses, Quality assurance, Defects due to climate, chemicals, wear and erosion, inspection, Structural appraisal, Economic appraisal Structural Health, factors affecting health of structures, effect of leakage, age, creep, corrosion, fatigue on life of structure.

Unit II: Structural health monitoring, various measures, regular maintenance, structural safety in alteration. Quality control & assurance of materials of structure, durability of concrete, Factors affecting durability of concrete, Corrosion in structures, Testing and prevention of corrosion, fire safety.

Unit III : Structural Audit, Assessment of health of structure, study of structural drawings, nature of distress, visual observations, Collapse and investigation, limitations of investigator, tools for investigation, Various NDT Methods for assessing strength of distressed materials, investigation management, review of assimilated information, interviews and statements, evaluation and reporting, presentation of report, communication gap among client, architect, consulting engineer & contractor.

SECTION B

Unit IV: Retrofitting of Structures, parameters for assessment of restoration strategies, selection of construction chemicals during restoration, Specification for important items of work in restoration, Structural detailing for restoration, and various techniques of retrofitting. Waterproofing of RCC water retaining structures.

Unit V: Safety during construction, formwork and staging, material handling, Existing methods of formwork, Modular formwork, Structural aspects for formwork in buildings & bridges.

Unit VI: Demolition of Structure, study of structural system and structural drawings, need and importance for demolition, outline of various demolition methods and their evaluation, partial and controlled demolition, role of safety measures, temporary support structures in demolition. Recycling of demolished materials

Books Recommended:

1. Deananmmer: 'Handbook of Material Management'; McGraw Hills.
2. Gopalkrishnan: 'Fundamentals of Material Management'; Tata McGraw Hills.
3. M Y Khan and Jain: 'Financial Management'; Tata McGraw Hills
4. A M Neville: 'Properties of Concrete'; Longman
5. R N. Raikar: 'Durable Structures', R & D Centre, (SDCPL), RaikarBhavan, Sector 17, Vashi, Navi Mumbai.
6. R.N. Raikar: 'Learning from Failures', R & D Centre, (SDCPL), RaikarBhavan, Sector 17, Vashi, Navi Mumbai.
7. R.N. Raikar: 'Diagnosis and treatment of structures in Distress', R & D Centre, (SDCPL), RaikarBhavan, Sector 17, Vashi, Navi Mumbai.
8. Hanbook on Seismic Retrofit of building , Central public works Department & Indian Building Congress In Association with IIT - Madras

5CE04 : (iii) Sustainable Construction Methods

SECTION A

Learning Objectives of Subject:

- Student should learn about the present demand supply gap of various construction resources and resource forecasting.
- Student should be able to understand various pollutions and its impact, rules and regulation related to pollution control.
- Student should be able to understand the concept of Sustainability , strategy to achieve it .
- Student should turn aware about various organizations working for implementing sustainability , Green rating agency and process to achieve it.
- Student should be able to determine use of waste material by proper process and percentage.
- Student should learn about sustainable construction like – Green roofs, Green walls etc.
- Student should be able to understand thermo resistive property of construction material and its effect on utilization.
- Student should learn about sustainable Illumination , ventilation techniques .
- Student should know to manage domestic water resources.

Course outcomes:

At the end of the subject the students will be able -

- To understand present condition and need for replacement of non renewable resources.
- To understand concept of sustainability and strategy to achieve it.
- To understand various criteria's and considerations to achieve sustainable construction according to Green Rating Agencies.
- To decide application of sustainable methods in construction for Roof, Wall, thermo resistivity etc.
- To reduce water need and reuse of house hold waste water.

Section A

Unit I: Role of Construction sector in Global Resource Consumption, Resource like sand , water , aggregates , cement etc. demand supply gap analysis. Construction & Demolition waste. Environmental pollution related terms like Global warming, Carbon credit, Resource exploitation, Land pollution, Urban Heat Island, Air and water Pollution. Rules and Act related to waste management and pollution mitigation.

Unit II: Concept of Sustainability, Its origin, Legislation related to Sustainable construction , Reduce –Reuse – Recycle (3 R) Strategy , Various Green Rating Agency worldwide, Detail study of criteria's and process under GRIHA (Green Rating for Integrated Habitat Assessment), IGBC (Indian Green Building Council), LEED, India (Leadership in Energy and Environmental Design).

Unit III: Concept of Manufacturing cost, operational cost and life time cost, Payback Period. Thermo resistive property of construction materials and its importance. Implementation of Waste and recycled materials in construction – Case study of some projects like Use of Plastic in Road construction, recycled aggregate utilization and similar to this. Various types of Renewable Energy and its application.

SECTION B

Unit IV: Concept of Green/ Sustainable Roofs, Its types, geometry, material, methodology and Limitations. Concept, material & methodology and limitation of Green walls, various methods like implementation of Cavity wall, Rattrap bond wall, thermo resistive material wall, Green vegetative wall etc.

Unit V: Sick Room, Need and types of windows & ventilations, active and passive ventilation concept, Role of opening location and dimension in Ventilation and air circulation. Sustainable ventilation techniques.

Unit VI: Illumination terms :- Glare , Glare Index ,dark room, comfortable illumination , Lux value for various rooms as per utilization as in latest Building Code of India , Role of Solar direction, season and location for direction and provision of openings. Sustainable Illumination Techniques (Natural & Artificial methods) ,
Water Management – Re Use of domestic water, Grey water – Concept and some Grey water treatment units example, Ground water recharging techniques, Rain water harvesting.

Books Recommended:

1. Moore F: Environmental Control System McGraw Hill, Inc., 1994.
2. K S Jagadish, B V Venkataramana Reddy, K. S. NanjundaRao : Alternative Buildings Materials and Technologies, New Age International Publishers, New Delhi, 2007
3. "Construction Materials, Methods & techniques" (3e) by William P Spence, Yesdee Publication 2012, pvt.ltd, Chennai, India
4. "Concrete Structure Properties & Materials" by mehataP.K&MantreioP.J.M, Prentice hall.
5. "Building Materials" ny M. L. Gambhir, NeaJamwal, Tata McGraw Hill Publication.
6.Building Reuse ,Sustainability preservation and value of life by Kathrin Rogers Mrilino.
7. Sustainable Construction Engineering & Management by Dr. S.K.Deshmukh & Dr. Abhinandan R.Gupta, LAP academic Publishing Mauritius
8. Energy Efficient Construction Materials, Key Engineering Material, Elsevier by Dr. S.K. Deshmukh & Dr. Abhinandan R.Gupta
9.Handbook of GRIHA for Green Rating
10.Handbook of LEED , India for Green Rating.

5CE04 : (iv) Watershed Engineering And Management

Course Objective:

- To study the different hydrological parameters.
- To understand hydrological statistics and design.
- To characterize and mitigate natural and man-made hazards

Course Outcome: Student shall be able to

- Explain the hydrology and hydrological data.
- Analyze the hydrological methods for runoff.
- Evaluate the ground water hydrological problems.

SECTION - A

UNIT I: Introduction: Watershed, Definitions, Concept of watershed development, objectives of watershed development, and need for watershed development, Integrated and multidisciplinary approach for watershed management.

UNIT-II: Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-III: Hydrology in water resources development, statistical analysis of rainfall and runoff, different distributions methods, Estimation of Unit Hydrograph-flood flow formulae, Storm hydrograph, Storage and regulation of runoff-safe yield of streams

SECTION - B

UNIT-IV: Hydrology of ground water : Common aquifers-Exploration for ground water, hydraulics of ground water flow- Measurement of permeability of formations, flow nets and their constructions, Boundary conditions – Unconfined and Confined, steady and unsteady flow into wells, Method of images – Types, design, construction and maintenance of wells and infiltration galleries, Development of wells – well strainer – functions and selections, Ground water recharge

UNIT-V: Practice of watershed management: rehabilitation, protection and enhancement, non-point sources of pollution: the legal basis, the process of non point source pollution control, best management practices principles, Applications of Geographical Information System and Remote Sensing in Watershed Management

UNIT-VI: Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation. Drought assessment and classification, drought analysis techniques, drought mitigation planning. Water conservation by recycle and reuse

Books Recommended:

1. Watershed Hydrology by Peter E. Black.
2. Water Resources Systems, Planning and Management by R. N. Chaturvedi.

(Open Elective)

5CE05 : (i) Basics of Building Construction

Learning Objectives of Subject:

- To understand the basic concepts of structures and types of foundation of civil structure.
- To learn about the different type of masonry, types of bonds and construction methodology.
- To understand various levels in building – Types of floorings and floors,
- To understand the type and need of openings for access and circulation.
- To make aware of knowledge and importance of stairs, plastering and painting of structures.
- To understand the aspects of construction.

Course outcomes:

At the end of the subject the students will be able -

- To understand Load bearing and Frame structure with their foundations.
- To recognize various types of construction material and its suitability
- To recognize the various levels in building and its need.
- To know types of openings, doors, windows and other related fixtures.
- To recognize types of rock and minerals and its construction properties.
- To understand the basic concepts of DPC, fireproof, soundproof and expansion joints in structure.

SECTION –A

Unit I: Introduction: Definition of building as per national building code, components of buildings and their function , Types of structure-load bearing structure and frame structures, their relative advantages and disadvantages, load bearing walls and partition walls. Types of foundation- Definition and necessity and types of foundations, precautions to be taken against failure of foundations

Unit II: Stone Masonry- Technical term, general principles to be observed during construction, selection of stone masonry. Brick Masonry Construction- Technical term, general principles to be observed during construction, commonly used types of bonds such as Stretcher, Header, English bond Flemish bond and their suitability.

Unit III: Floors- Types of floors-Basement floor, ground floor and upper floor. Types of upper floors-R.C.C. slab floor, R.C.C. slab and beam floor, R.C.C. grid floor, R.C.C. flat slab floor. Floor Finishes Types of flooring material, Shahabad , Kota, Granite, Ceramic tiles, Plain tiles, mosaic tiles glazed tiles ,different types of floor finishes , their suitability. Method of

construction, criteria of selection. Roofs-Flat and pitched roof, steel roof trusses-types and suitability ,fixing details at supports ,types of roof covering, AC and GI sheets, acrylic sheets, fixing details of roof covering.

SECTION –B

Unit IV: Door –Purpose, criteria for location, size of door, door frames and its types, method of fixing Windows- Purpose, criteria for location, size and shapes of windows, types of windows and their suitability. Ventilators – Types and their suitability. Fixtures and Fastening for doors and windows. Glass- Types of glass and their suitability. Arches and Lintels - Types and their suitability. Details of R.C.C. lintels and chajja, precast lintels and arches

Unit V: Stairs- Function, technical terms, criteria for location, types of staircases and their suitability. Painting and Coloring – Necessity, types, processes of painting and coloring to the wall surface, wooden surfaces, iron and steel surfaces, types of paints and their uses Scaffolding-Purposes, types, suitability.

Unit VI: Special Aspects of Construction, Damp proofing-causes of dampness, its effects, various methods of damp proofing, material used for damp proofing. Fire proof construction-Points to be observed during planning and construction. Fire protection requirement for a multistoried building, Sound proof construction –Sound absorbents and their characteristic. Joints Expansion and construction joints necessity, details of expansion joint at foundation level and roof level of load bearing structure and framed structure, Provision of construction joints in slabs, beams and columns.

Books Recommended:

1. DeshpandeR.S... And Vartak C.V.: A Treatise on Building Construction.
2. Sharma S.K. Kaul and B.K.:A.T.B. Building Construction, S Chand and co.
3. Sane L.S.: Construction Engineering, ManakTalas, Mumbai
4. Chudley R.: Construction Technology, Volume I.II.III. And IV, Longmans Group Ltd.
5. Basics of Civil Engineering, Vol. I by Dr A.R.Gupta , Google book publishers ltd.
6. Gurucharan Sing: Building Construction Engineering, Standard Book House, Delhi-06
7. Sushilkumar :Building construction ,Standard publisher distributors.
8. B.C.Punmia ,A.K. Jain,: Building construction.

ISE National Building code of India, 1970

5CE05 : (ii) Disaster Management

Learning Objectives of Subject:

- Student should learn about the term Disaster and definitions associated with it.
- Student should know various types , reasons for happening and preventive measures for Natural Disasters .
- Student should know various types , reasons for happening and preventive measures for Artificial Disasters .
- Student should know about Impact and mitigation measures against disasters.
- Student should know about Disaster Risk Reduction and its utility practices.
- Learner should know about various Government and NG organization working for Disaster Management.
- Student should know role and responsibility of individual and group for managing Disaster.

Course outcomes:

At the end of the subject the students will be able -

- To understand concept and terms related to Disaster.
- To understand various types of Natural and Artificial Disaster .
- To decide and take actions to mitigate impact of disaster.
- To know roles and responsibility of organizations – public and private , individual and group to manage disaster.

SECTION A

Unit I: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, capacity, impact, prevention, mitigation. Study about natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.);

Unit II: Study about manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit III: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

SECTION B

Unit IV: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures, vulnerability and capacity assessment; early warning systems, Post disaster environmental response

Unit V: Institutional mechanism for Disaster Management**,** Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, Disaster Management Policy Environment and local Action, Funding for Disaster Management, Capacity Building, Disaster Management Act 2005.

Unit VI:. Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster, plan to counter, threats to water supply.

Books Recommended:

1. Cuny, Fred C; Disasters and management, oxford Uni. Press.
2. Alexander, David; Principles of emergency planning and management, Terra publishing, ISBN 1-903544-10-
3. National Disaster Management Authority, Govt. of India, Report.
4. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994

5CE05 : (iii) Soft Skills and Interpersonal Communication

Learning Objectives of Subject:

- Student should learn about the methods and measures to develop the interaction skills.
- Student should be able to have strong decision making and lateral thinking skills.
- Should know the do's and don'ts for being good leader.
- Should be able to understand about conflict and be able to manage it.
- Should understand need of Negotiation and strategy to handle it wisely.
- Should be able to recognize the type, ways and barriers in Communication so as to develop it.
- Should be able to conduct effective correspondence process and shall have knowledge of documentation and formal writing skills.

Course outcomes:

At the end of the subject the students will be able -

- Interact in developed way so as to handle the situations .
- To take analyzed decisions over the problem and will effectively carry out wok in time.
- To handle task with developed leadership skills.
- To determine the reasons and solutions over conflict and will be able to manage it.
- To understand need for negotiation and strategy negotiate things.
- To have strong communication.
- To carry out formal documentation process and will have proper guideline for writing formal basic documents.

Section A

Unit I : Individual's Basic Interaction Skills –Within family, Society Personal and interpersonal intrapersonal skills . Types of skills; conceptual, supervisory, technical, managerial and decision making skills. Problem Solving, Lateral Thinking. Self Awareness and Self Esteem Group Influence on Interaction Skills Human relations examples through role – play and cases.

Unit II : Leadership Skills Working individually and in a team Leadership skills Leadership Lessons through Literature Team work & Team building . Interpersonal skills – Conversation, Feedback, Feed forward Interpersonal skills – Delegation, Humor, Trust, Expectations, Values, Status, Compatibility and their role in building team – work. Conflict Management – Types of conflicts, how to cope with them Small cases including role – plays will be used as teaching methodology.

Unit III : Negotiation Skills (To be Taught through Role Plays and Cases) Types of Negotiation Negotiation Strategies Selling skills – Selling to customers Selling to Superiors Selling to peer groups, team mates & subordinates Conceptual selling, Strategic selling Selling skills – Body language

Section B

Unit IV : Introduction, Need for Communication, Process of Communication - Written and Verbal Communication, Visual communication, Signs, Signals and Symbols, Silence as a Mode of Communication - Inter-cultural, Intra-cultural, Cross-cultural and International communication - Communications skills, Communication through Questionnaires, Business Letter Writing, Electronic Communication.

Unit V : Barriers to Communication Improving Communication Skills -Preparation of Promotional Material -Non-verbal communication -Body language -Postures and gestures -Value of time -Organizational body language - Importance of Listening -Emotional Intelligence.

Unit VI : -Business Cases and Presentations, Letters within the Organizations, Letters from Top Management, Circulars and Memos - Business Presentations to Customers and other stakeholders, Presenting a Positive Image through Verbal and Non-verbal Cues, Preparing and Delivering the Presentations, Use of Audio-visual Aids .

Book Recommended

1. Personality Development & Soft Skills by Barun K. Mitra.
2. Soft Skills and Interpersonal Communication by S. Blasubhramanium.

5CE06 : Design Of Reinforced & Prestressed Concrete Structures - Lab

Practical's:

1. Candidates are required to prepare at least two designs based on theoretical course detailed working drawings are necessary.
2. A journal/report on design shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.
3. Field visit on any RCC framed structure & report of the same.

5CE07: Surveying & Geomatics – Lab

Following is the list of practical to be conducted. Minimum 8 practical out of the given should be carried out. Practical examination shall consist of field exercise and viva-voce examination based on theory&practical.

LIST OF PRACTICALS: (ANY EIGHT)

1. Ranging circular curve by offset from long chord.
2. Ranging circular curve by offset from tangent.
3. Ranging circular curve by offset from chord produced.
4. Ranging circular curve by Rankine's method.
5. Triangulation by satellite station.
6. Base line measurement in triangulation system.
7. To Find horizontal distance and difference in elevation between two points by using Total station.
8. To plot a layout using Total station.
9. Study on Stereoscope.
10. Application of GPS – Distance and Coordinate Measurement using GPS tool.

5CE08 : Numerical Methods And Computer Programming -Lab

PRACTICALS:

Preparation and execution of at least **six** computer programs using C language. Solution of at least **two** civil engineering problems using spreadsheet software. A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

5CE09: Highway Construction and Management -Lab

List of Practical's :-

Any **Five** of the following should be conducted and a report there
of should be submitted

1. Field CBR Test.
2. Pavement Evaluation by Benkelman Beam Method.
3. Road Unevenness Measurement by Bump-Integrator.
4. Valuation of Pavement Roughness by Roughometer / Profilometer.
5. Design of Flexible Pavements for Highway.
6. Design of Flexible Pavements for Runway.
7. Design of Rigid Pavements For Highway.
8 Design of Rigid Pavements For Runway
9. Design of Overlays.
10. Marshal Stability Test
11. Transportation management (**field studies)**
12. Parking management (**field studies)**
13. Road accident studies (**field studies)**
14. Rotary design

Field Visit:

1. Hot – mix plant visit,
2. Road construction site visit: Earth work construction procedure and bituminous mix laying, spreading and rolling procedure.

5CE09 : Repairs & Rehabilitation Of Structures - Lab

List of Experiments: (Any Three)

1. To perform a non-destructive and semi-destructive testing on the cast specimens of the beams using set up of Rebound hammer, UPSV, Core drilling etc. and there by prepare a report on the interpretation of the strength i.e quality of concrete based on NDT test results.
2. Take up Conditional Assessment of 5 different structures including Residential, Commercial, Industrial, and Government buildings, Private structures (old & new construction both). Prepare Rapid visual inspection data sheets of the same.
3. Prepare a report of the buildings surveyed, to highlight all the defects/deterioration seen through proper resolution photographs. The report must clearly indicate the distress – its source and symptoms.
4. Perform experiment to evaluate the Compatibility between the substrate material concrete and any repair material. (For instance comparing the Bond strength of Polymer modified mortar and Conventional Mortar with Concrete).

5. Experimental investigation to carry out the efficacy of repair material/ technique of enhancing the strength of concrete beam post cracking. (For instance, Cast a RCC beam, simulate cracking and then filling the crack with repair material and check the post-repair strength results).
Major Equipment: Compression Testing Machine, Concrete Mixture, NDT equipment like USPV, Rebound Hammer, Corrosion Meter, Rebar Locator, Engineer's inspection Kit.

5CE09 : Sustainable Construction Methods – Lab

1. Experimentation to check the corresponding strength of material by mixing waste material for Concrete work : Casting of 2 sets of specimen only with each set of 3 cubes , for percentage replacement of concrete elements with any suitable waste material like – Recycled aggregate, waste vehicle tire etc.
2. Experimentation to check the corresponding strength of material by mixing waste material for Brick work : Study of cavity wall and rattrap wall for thermo resistive property.
3. Student can work out and prepare report on installation plan , process ,budget, payback period and maintenance required for renewable energy source like solar / wind for small residential house of around 5 rooms.
4. Study and Preparation of Isolux mapping for room using Lux meter, for understanding illumination area and pattern.
5. Case Study : Students should visit to nearby sustainable construction like old existing monumental structure like Palace, religious place, well , fort **or** any Green rated structure by valid Rating agency like GRIHA , LEED India etc. **or** any undergoing sustainable project in vicinity for better understanding and needs to prepare the short report over learning's.

5CE09 : Watershed Engineering And Management – Lab

Minimum 8 practical's out of the given should be performed. The Site visit is compulsory. The Graphs and sheets are to be drawn whenever are necessary. The practical examination shall consist of viva-voce based on theory and Practical.

List of Experiment

1. Study of watershed management technologies.
2. Watershed planning and development.
3. Surveying and preparation of watershed map.
4. Analysis of hydrologic data for planning of watershed development.
5. Water budgeting of watersheds.
6. Grid survey of watershed area.
7. Study of Aquifer (Working, Types, Flow net)
8. Study of infiltration galleries. (Types, Design, Construction, Maintenance)
9. Study of unit hydrograph, Storm hydrograph
10. Design of storm water drainage system.
11. Visit to watershed development project

Sixth Semester

6CE01: Design of Steel Structure

Learning Objectives of Subject:

- To introduce steel structures and its basic components
- To understand methods of design of steel structure.
- To introduce structural steel fasteners like welding and bolting
- To introduce design method of tension & compression members.
- To introduce design method of beams, Column, Base Plate.
- To introduce design load on a typical steel roof trusses.

Course outcomes:

At the end of the subject the students will be able -

- To explain the methods of design of steel structure.
- To design bolted and welded connection.
- To identify the different failure modes of bolted and welded connections, and determine their design strengths.
- To design the Tension and compression member.
- To identify and compute the design loads on a typical steel roof trusses.
- To design basic elements of steel structure like beams, column and bases.

(By Limit State Method IS 800:2007)

SECTION – A

Unit I:

- Introduction to WSM, LSM & Plastic analysis of steel structure, plastic hinge, plastic moment capacity, shape factor, plastic section modulus.
- Design of bolted & welded connections subjected to axial and eccentric loading (In the plane of group of Bolts & Weld).

Unit II:

- Design of Compression & Tension member.
- Design of Industrial shed.

SECTION – B

Unit III:

- Design of simple & compound columns for axial loading.
- Design of column bases (Slab base & Gusseted base) subjected to axial load.

Unit IV:

- Design of simple Beams (laterally supported).
- Design of compound Beams (laterally supported).

Books Recommended:

1. Duggal, S. K., Design of Steel Structures, Tata McGraw Hill Pub. Company Ltd.
2. N. Subrramanyam, Design of Steel Structures, Oxford University Press, 2008.
3. V L Shah & Veena Gore: Limit State Design of steel structures IS 800-2007
4. M. R. Shiyekar, Limit state design in Structural Steel (Second Edition); PHI Learning Pvt. Ltd.
5. Bhavikatti, Design of Steel Structures: By Limit State Method as Per IS: 800 – 2007; I K International Publishing House Pvt. Ltd
6. M. L. Gambhir, Fundamentals of Structural Steel Design ; McGraw Hill Education

6CE02: Environmental Engineering – I

Course Objectives: -

- To make the students conversant with sources and its demand of water
- To understand the basic characteristics of water and its determination
- To expose the students to understand the design of water supply lines
- To provide adequate knowledge about the water treatment processes and its design
- To have adequate knowledge on operation and maintenance of water supply

Course Outcomes: -

- Define and explain the significance of terms and parameters frequently used in water supply engineering.
- Evaluate the influence of the different parameter in design and treatment of water treatment plant (water quality parameters).
- Basic methodology for water treatment (viz., sedimentation, coagulation, flocculation, filtration, disinfection and water softening.)
- An understanding of water quality criteria and standards, and their relation to public health.

SECTION – A

Unit-I : Quantity Estimation of water: Demand of water. Consumption for various purposes. Fire Demand, Per capita demand. Factors affecting consumption. Fluctuation in demand. Design period, forecasting population.
Sources: Surface sources, ground water sources, Infiltration Galleries, Relative merits of sources, assessment & suitability, selection.

Unit-II :Water quality: Impurities in water, their effects and significance water borne diseases, collection of water samples. Water analysis- physical, chemical and bacteriological. Water quality standards: I.S. & WHO, Flow diagrams and layouts of different water treatment works. Intakes- type, location, requirement & features.

Unit-III: Aeration: Purpose, types of gravity aerators & spray aerators.
Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, Flocculation, clarrifloculator. Design criteria for sedimentation tanks, surface loading, simple problems on design of sedimentation tanks.

SECTION – B

Unit-IV: Filtration: - Rapid sand and slow sand filters, filter media, Rate of filtration, under drainage system and washing process. Control system, Negative head, operating difficulties, pressure filter; Simple design problems on rapid sand filters.

Unit V:Disinfection: - Requirement of good disinfectant, methods of disinfection. Chlorination: Methods, prechlorination, post chlorination. Break point chlorination and super chlorination, forms of chlorine. Use of bleaching powder - Simple problems. Introduction to tertiary treatments-Softening and Defloridation.

Unit-VI: Distribution system: - Types of supply: Continuous, and intermittent. Types of system: Gravity, Pumping and combined gravity and pumping, Layouts of distributions system. Maintenance of distribution system. Equalizing storage, Type of storage reservoirs, capacity. Types of conduits, joints, appurtenances. Pipe laying and testing.

Books Recommended:

1. Steel E. W., “Water Supply and Sewerage”, Mc-Graw Hill.
2. Kshirsagar S. R., “Water Supply Engineering”, Roorkee Pub house, Roorkee.
3. Birde G. S. , “Water Supply and Sanitary Engineering”, Dhanpat Rai and Sons, Delhi.
4. Punmia B. C. “water Supply Engineering”. Laxmi publication.
5. Garg S.K. Water Supply Engineering, Khanna Publishers.

6CE03: Fluid Mechanics

Course Objective:

1. To study the basic behavior of fluids and fluid system and the laws governing this behavior
2. To understand and apply the basic concepts Mechanics to carry out professional engineering activities in the field of fluids.
3. To apply scientific strategies to analyze qualitatively and quantitatively the problems and give solutions.

Course Outcome : Student shall be able to

1. Describe basic properties of fluid flow.
2. Apply the knowledge to fluid flow problems.
3. Analyze the type of flow by using basic of mathematical principle.
4. Solve and modeling the pipe flow problems.

SECTION - A

Unit I: Properties of fluids: Introduction, properties of fluids, viscosity, surface tension, & capillarity, related problems.

Pressure and its measurement: Fluid pressure at a point, Pascal's Law, pressure variation in a fluid at rest, absolute gauge, atmospheric & vacuum pressures, measurement of pressure, simple manometers, differential manometers, related problems.

Unit II: Hydrostatic forces on surfaces: Introduction, total pressure & centre of pressure, vertical, horizontal plane surface submerged in liquid, related problems.

Buoyancy & floatation**:** Introduction, buoyancy, centre of buoyancy, metacentre, metacentric height, analytical method of metacentric height, conditions of equilibrium of a floating & submerged bodies, related problems.

Unit III: Kinematics of flow :Introduction, methods of describing fluid motion, types of fluid flows, continuity equation in three dimensions, velocity & acceleration, velocity potential function & stream function, related problems.

Dynamics of fluid flow: Introduction equation of motion, Euler's equation of motion, Bernoulli's equation from Euler's equation, its assumptions, related problems.

SECTION - B

Unit IV: Measurement of fluid flow, Horizontal venturimeter, V and Rectangular Notches, Darcy's equation (no proof), major and minor losses in pipes, pipes in series and parallel, pipe network. Momentum equation and its application to horizontal pipe bends.

Unit V: Dimensional Analysis; Buckingham's Pie theorem, it's application, similitude, Dimensionless numbers, Re, Fr, We, Predominant forces & their ratio, Model Analysis - Geometrically similar models, Reynolds law, Froudes law, Model study of spillways.

Unit VI: Uniform flow, Open channel flow, Types of flow, geometric elements of rectangular & trapezoidal sections, Chezy's &Mannings equations, most efficient rectangular & trapezoidal section, Energy & momentum principles, Normal & critical depth, specific energy diagram, discharge diagram.

Books Recommended:

1) Modi P.N. & Seth S.M.: Hydraulics & Fluid Mechanics, SI Edition, Standard book house.
2) Dr. Jain A.K.: Fluid Mechanics, Khanna publication.
3) Subramanya K.: Fluid Mechanics, Tata Mc-Graw Hill.
4) Streeter: Fluid Mechanics, Mc-Graw Hill.
5) Fluid mechanics by R.K.Bansal, Laxmi publication.
6) Garde&Mirajgaonkar: Fluid Mechanics, Scitech publication.

Professional Elective - II
6CE04: (i) Advanced Construction Materials

Learning Objectives of Subject:

- To understand the special type of concrete and supplementary cementitious materials.
- To learn about the different type of metals and new alloy steels.
- To learn different composite materials and Thermal and Sound insulating materials.
- To understand different types of construction chemicals and wastes.
- To learn different types of shoring and formwork materials.
- To understand the concept of smart materials.

Course outcomes:

At the end of the subject the students will be able -

- To understand special type of concrete and supplementary cementitious materials.
- To recognize various types of metals and new alloy steels.
- To understand Thermal and Sound insulating materials.
- To know types of construction chemicals and wastes.
- To recognize types of shoring and formwork materials.
- To understand the elementary concept of smart materials.

Section A

UNIT I: Cement, Mortar And Concrete Ceramic Materials

Study of Special Purpose Cement, Mortar, Concrete - High Strength And High Performance Concrete, Self Compacting Concrete, supplementary cementitious material - Fly Ash, Red Mud, Gypsum, Various Types of Finishes & Treatments, Engineering Grouts, Mortar plaster, Gypsum, Glass. GGBS, micro silica etc. Replacement of aggregates; stone dust, light weight aggregates, recycled aggregate.

UNIT II: Metals

Steels - HYSD, TMT, Tendons, Light Gauge Steel, Steel Fastenings, New Alloy Steels – Aluminum and Its Products, Protective Coatings to Reinforcement.

UNIT III: Composites

Polymer and its composites , Ceramic and its composite, FRC, Ferro cement etc.,Timber, bamboo, veneer, Laminates, Particle boards,Thermal and Sound insulating materials.

Section B

UNIT IV: Construction Chemicals And Waste

Chemical Admixtures and Adhesives, Water Proofing Compounds – Non Weathering Materials, GeoSynthetics, Geo-Membranes,, Asphalt, Tar & Bituminous Materials, Agro Waste Materials, Industrial Waste Materials, Disposable Materials.

UNIT V: Shoring & Formwork Materials

Materials, Accessories and Proprietary Products - Lumber - Types - Finish - Plywood -Types and grades, Reconstituted wood -Steel -Aluminum Form lining materials, Design Considerations, Building and Erecting the formwork, Causes of Failure of Formwork.

UNIT VI: Elementary Concept Of Smart Material

Smart and Intelligent Materials-Piezoelectric Materials, Shape Memory Alloys & Polymers, Magnetostrictive Materials, Temperature Responsive Polymer, Halo chromic Materials, Smart Hydrogels, Chromomeric Systems, Photomechanical Materials, Self Healing Materials, Dielectric Elastomers. Bio cement, Phase change material.

Text Book:

1. Building Materials, P.C. Varghese, Prentice-Hall India, 2555.

Reference Books:

1. Materials Science and Engineering: An introduction, W.D. Callister, John Wiley, 1994.
2. Materials Science and Engineering, V. Raghavan, Prentice Hall, 1990.
3. Properties of Engineering Materials, R.A. Higgins, Industrial Press, 1994.
4. Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press, 2551.
5. The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall, 1998.
6. Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann, 2553.
7. The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin, 1995.
8. Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill, 2556.
9. Properties of concrete, A.M. Neville, Pearson, 2554.
10.Materials for Civil and Construction engineers by Michael S. Mamlouk, John P. Zaniewski, Pearson Publication

6CE04 : (ii) Geographic Information System & Science

Course Objectives:

- To prepare the student to understand remote sensing, it's techniques and interpretations.
- To introduce the concepts of image processing and basic analytical methods to be used in image processing
- To familiarize students with image enhancement, restoration techniques, and to understand different image compression techniques.
- To gain a basic, practical understanding of GIS concepts, techniques and real-world applications

Course Outcomes:

Students will be able to

- Explain and communicate quantitative remote-sensing principles and integrate different tools for remote sensing data analysis
- Perform image corrections, enhancements and generate high-level remote sensing products.
- Apply basic graphic and data visualization concepts such as colour theory, symbolization, and use of white space.
- Demonstrate proficiency in the use of GIS tools to create maps that are fit-for-purpose and effectively convey the information they are intended to.
- Apply mathematical concepts, including statistical methods, to data to be used in geospatial analysis.
- Review the fundamental concepts of a digital image processing system.

SECTION – A

Unit I: Definition and scope of remote sensing: electromagnetic energy and its wavelengths. Remote sensing systems, sensors and scanners, resolution of sensors, multi-spectral, thermal and radar scanners, radiometers spectral response curve and spectral signatures.

Unit II: Elements of sensing system: Terrestrial, airborne and space borne platforms, Sun-synchronous and geo-stationary satellites, advantages and disadvantages. Various earth Resources satellites, Indian remote sensing program. Remote sensing data products and their types: analogues and digital data formats, Thermal and radar imageries.

Unit III: Interpretation techniques: Elements of interpretation and methods, interpretation key, interpretation instruments. Relief displacement, image parallax and vertical exaggeration, Determination and calculation of elevation from RS data

SECTION - B

Unit IV: Digital image processing: image rectification and restoration, image enhancement-contrast manipulations, spatial feature manipulation, multi-image manipulation, image classification supervised and unsupervised classification, accuracy assessments and data merging.

Unit V: Applications: Integrated approach of RS and GIS application: Application in Geological Investigations, water resources management, environmental studies, EIA based studies, Land use planning, soil studies and transportation planning. Application in civil engineering projects damns and bridges, site investigations, landslide studies.

Unit VI: Geographical Information System: Raster and vector data, concepts and basic characteristics of vectorization, topology generation, attribute data attachment, editing and analysis. Global Positioning System: Introduction to Global Positioning System (GPS) - Fundamental concepts, GPS system elements and signals, Classification of GPS receivers.

Books Recommended:

1. Remote sensing Geology: Ravi P Gupta, Springer publication
2. Remote sensing and GIS: Anji Reddy ISBN publication.
3. Remote Sensing: Sabins, Floyd F
4. Higher surveying volume III: Dr. B C Punmia

6CE04 : (iii) Masonry Structure

Course objectives:

This course will enable students to

- Understand properties of masonry units, strength and factor affecting strength
- Understand design criteria of various types of walls subjected to different loads system
- Impart the culture of following the codes, for strength, serviceability and durability as an ethics.
- Provide knowledge in analysis and design of masonry elements for the success in competitive examination

Course Outcomes:

After studying this course student will be able to

- Explain engineering properties and use of masonry units defect and cracks in masonry and its remedial measures
- Summaries various formulas for finding compressive strength of masonry units.
- Explain permissible stress and design criteria as per IS: 1905 and SP-20.
- Design different types of masonry walls for different load considerations.

Section A

Unit -1 :- Masonry unit materials, types and masonry construction : brick, stone and block masonry unit- strain, modulus of elasticity and water absorption of masonry materials, classification and properties of Mortar. Defect and errors in masonry construction- cracks in masonry, types, reason for cracking, methods of avoiding cracks.

Strength and stability: strength and stability of axially loaded masonry walls, effects of unit strength, mortar strength, joint thickness, rate of absorption, effect of curing, effect of aging, workmanship. Compressive strength formulae based on elastic theory and empirical formulae.

Unit -II:-**Permissible stresses:** Types of walls, permissible compressive stress, stress reduction and shape modification factors, increase in permissible stresses for eccentric vertical and Lateral load, permissible tensile stress and shear stresses.

Design consideration: Effective height of wall and columns, openings in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action in lintels. problems on design considerations for solid walls, cavity walls, walls with pillar.

Unit – III : Load consideration and design of Masonry walls subjected to axial loads: - Design criteria, Design of wall subjected to concentrated axial loads: - Solid walls, cavity walls, solid wall supported at the ends by cross wall, walls with piers,

Section B

Unit – IV: Design examples of walls under UDL ,Solid walls ,cavity walls ,solid walls supported at the end by cross walls, walls with piers .

Unit – V : Design of wall subjected to eccentric loads: - Design criteria - stress distribution under eccentric loads -problems on eccentrically loaded solid walls, cavity walls, walls with piers.

Design of laterally and transversely loaded walls: Design criteria, design of solid wall under wind loading, design of compound walls.

Unit –VI: Confined Masonry

Confined masonry construction, difference between confined masonry and RC frame construction. Earthquake resistance of confined masonry Structures. Earthquake-Resistant Confined Masonry Construction guidelines

Text Books:

1. Dayaratnam P, Brick and Reinforced Brick Structures, Scientific International Pvt. Ltd.
2. M. L. Gambhir, Building and Construction Materials, McGraw Hill education Pvt. Ltd.
3 Anand S. Arya, Masonry and Timber Structures Including Earthquake Resistant Design Published by Nem Chand and Bros
4 Svetlana Brzev , Earthquake-Resistant Confined Masonry construction , National Information center of earthquake engineering Indian Institute of technology Kanpur

Reference Book:

1.Materials for Civil and Construction engineers by Michael S. Mamlouk, John P. Zaniewski, Pearson Publication

2. Design of Masonry Structures By A.W. Hendry, B.P. Sinha, S.R. Davies

3. Design of Reinforced Masonry Structures, Second Edition, Narendra Taly, McGraw Hill education Pvt. Ltd

6CE04 : (iv) Solid And Hazardous Waste Management

Course Objectives: -

- To provide an overview of waste generation, waste characterization and waste management processes.
- To impart knowledge on solid waste management with particular emphasis on municipal solid waste management which includes different waste processing options such as pyrolysis, composting, and incineration; designing and operating sanitary landfill.
- To enrich knowledge about characteristics of hazardous wastes and their management.
- To impart knowledge on industry specific solid waste management practices.
- To provide an overview about the concept of land degradation and land reclamation

Course Outcomes: -

- An ability to identify and interpret the criteria for the classification of a substance as a solid/hazardous wastes.
- An ability to recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options.
- Define and elucidate the management, treatment and disposal of hazardous wastes.
- Skill to assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes.
- Skill to address and describe solid waste management including landfill operation.
- Ability to design and execute land reclamation projects.

SECTION A

Unit I: Municipal solid waste: Definition, Sources and types of solid waste, composition and its determinants of Solid waste-factors influencing generation, quantity assessment of solid wastes, methods of sampling and characterization.

Unit II: Collection and Transfer Collection: Collection of Solid waste, collection services , collection system, equipments, time and frequency of collection. Transfer and Transport: Need for transfer operation, transport means and methods, Optimization of Transport Cost.

Unit III: Disposal of Solid Wastes Refuse disposal : various methods, incinerations, principle features of an incinerator, site selection and plant layout of an incinerator, sanitary landfill-methods of operation, advantages and disadvantages of sanitary land fill, site selection, reactions accruing in completed landfills, gas and leachate movement and control, equipments necessary, Energy Recovery.

SECTION B

Unit IV: Introduction: Definition, Need for hazardous waste management, Sources of hazardous wastes, Effects on community, terminology and classification. Storage and collection of hazardous wastes, Problems in developing countries, Protection of public health and the environment.

Unit V: Management of hazardous wastes: Identifying a hazardous waste, methods, Quantities of hazardous waste generated, Components of a hazardous waste management plan, Hazardous waste minimization, Disposal practices in Indian Industries, Future challenges.

Unit VI: Nuclear wastes and E-waste: Characteristics, Types, Health and environmental effects, Audit of E-Waste. Biomedical and chemical wastes: Biomedical wastes, Types, Management and handling, control of biomedical wastes & Chemical wastes.

Books Recommended:

1) George Techobanoglous et al, "Integrated Solid Waste Management" McGraw - Hill, 1993.
2) Techobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.
3) R.E.Landreth and P.A.Rebers," Municipal Solid Wastes-Problems & Solutions". CRC press.
4) J. Glynn Henry and Gary. W. Heinke, "Environmental Science and Engineering", Pearson publication.
5) A. D.Bhide and B.B.Sundaresan, "Solid Waste Management – Collection, Processing and disposal" Mudrashilpa Offset Printers, Nagpur, 2001.
6) Biomedical waste (Management and Handling) Rules, 1998.

6CE04 : (v) Traffic Engineering & Management

Learning Objectives of Subject:

1. To understand traffic planning & characteristics for urban roads.
2. To understand different surveys and methods of traffic volume study.
3. To understand the design of different intersections and use visual aids
4. To understand the Traffic safety & control devices to prevent road accidents.
5. To understand the traffic system management.
6. To know advanced technology used in traffic engineering.

Course outcomes:

At the end of the subject the students will be able –

1. To explain the road characteristics & traffic planning.
2. To analyze traffic capacity of roads & intersection by different methods.
3. To design different types of road intersections & use of visual aids for roads.
4. To use knowledge of traffics safety & environmental hazards.
5. To recommend suitable traffic management system and traffic regularity measures
6. To apply the knowledge of Intelligent Transportation System to traffic management system.

Section A

Unit 1: Traffic Planning & Characteristics

Road Characteristics – Road User Characteristics – PIEV theory – vehicle – Performance Characteristics – Fundamental of traffic flow – Urban Traffic problems in India – Integrated planning of town, country, regional and all urban infrastructure – towards sustainable approach – Land use & transport and model integration

Unit 2 : Traffic surveys

Traffic surveys – Speed, Journey time and delay surveys – vehicles volume survey including non-motarized transport – methods and interpretation – origin destination survey – accident analyses methods , interpretation and presentation – statistical applications in traffic studies and traffic forecasting – level of service – concept, application and significance.

Unit 3 : Traffic design and visual aids

Intersection Design – channelization, Rotary intersection design – signal design – coordination of signals – grade separation – traffic signs including VMS and road markings – significant roles of traffic control personnel – networking pedestrian facilities & cycle tracks.

Section B

Unit 4: Traffic Safety and Environment

Road Accident – Causes, effects, prevention, and cost – street lighting – traffic and environment hazards – air and noise pollution, causes, abatement measures – promotion and integration of public transportation – Promotion of non-motorized transport.

Unit 5: Traffic Management

Area Traffic management system – traffic system management (TSM) with IRC standards _ Traffic Regulatory Measures – Travel Demand Management (TDM) – Direct and Indirect Methods - congestion and parking pricing – all segregation methods – coordination among different agencies

Unit 6 : ITS

Intelligent transport system for traffic management, enforcement and education, Application of ITS to Traffic Management System- Public Transportation Management System

(Open Elective II)

6CE05 : (I)Environmental Management

Course Objectives:

The objective of the course is to provide skills and an improved understanding of how firms and organisations work with sustainability issues such as environmental and natural resource management in order to protect our eco system.

Course Outcomes:

At the end of the course the student will:

- Be aware of different environmental problems, their causes and effects.
- Have knowledge regarding different environmental policies & management plans.
- Have thorough knowledge about Environmental Legislation and Acts.
- Acquire information about various agencies for Environmental Managements in India.
- Have knowledge regarding different systems working for Environmental Management.

SECTION – A

Unit I: Different environmental problems - Energy and the environment, Agriculture and the environment, the atmosphere and human activities, etc. Need for environmental management, the nature, scope and components of environmental management.

Unit II: Environmental policy analysis- micro level and macro level, methods of policy analysis, steps involved. : Operational methods, quantitative methods, statical analysis public policy analysis resource allocation, environmental economics etc.

Unit III: Environmental management plan (EMP): components of Environmental Management Plan, Preparation of Environmental Management Plan.

SECTION – B

Unit IV: Environmental Legislation and Acts: Water (prevention and control of pollution) Act1974,Air (prevention and control of pollution) Act 1981, environmental protection Act (EPA) 986, Hazardous waste rules1989, Factory Act 1984 amendments in 1987, Environmental Management System: ISO 14000(EMS) Environmental Audits: methods, components and preparation.

Unit V: Various agencies for Environmental Managements in India: Ministry of environment and forest, central pollution control boards, state pollution control boards, local bodies, - their scopes, organizational and functional issues, their working etc.

Unit VI: Basics of Data Base Management System (DBMS), Geographic Information System (GIS) and remote sensing in Environmental Management.

Books Recommended:

1. Environmental Impact Analysis- a decision Making Tool: By R KJain, McGraw – Hill.
2. Theory and Practice of Environmental Impact Assessment: By Abbasi and Ramesh, Discovery publishing house pvt.ltd.

6CE05 : (ii) Human Resource Development & Organizational Behavior

Learning Objectives of Subject:

- Student should learn about concept of Management and its utility.
- Student should learn about various types of Organization and its structure.
- Learner should be able to understand the concept of Human Resource Management .
- Learner should understand self development process and its fixity for Organizational need .
- Student should be able to understand and develop skills of Leadership , Team Work , Professional behavior , Job analysis and ethics .
- Student should be able to analyze job , opportunities and growth criteria's.

Course outcomes:

At the end of the subject the students will be able -

- To understand the concept of Management and Organization.
- To understand types of Organsiation and Its structure.
- To develop himself/ herself as per the need and requirement of work and self updation.
- To develop better skills related to leadership, team behavior, ethics at working place .
- To analyze job opportunity and future in it .
- To understand expectations for job evaluation , assessment of work and growth in the field.

Section A

UNIT I:- Understanding the Term Management and Organization. Learning about various types of Organizations and Organizational chart. Concept and need for Human Resource Management (HRM) and Human Resource Development (HRD) . Concept, Origin and Need, for HRD as a Total System; Approaches to HRD; Human Development and HRD; Introduction to Organizational Behavior (OB) .

Unit II :- Knowing and Managing Yourself Individual Behaviour: MARS model of individual behaviour Values: Values across cultures (Hofstede's framework); Personality: Big five model; MBTI; Use of personality tests; Personality attributes influencing OB Emotions: Understanding emotions; Emotional labour; Emotional Intelligence Attitudes: Attitudes v/s values; Job Satisfaction; Organizational Commitment Perception: Factors influencing perception; Perceptual errors; Self-fulfilling prophecy; Know yourself: Johari window

Unit III :- Motivation in the workplace , What is motivation; Types of Motives; Theories of Maslow; Herzberg, McGregor, Alderfers, Porter and Lawler's Model; Job Enlargement, Job Enrichment, Behaviour Modification.

Section B

Unit IV :- Communication What is communication; Organizational communication: Formal networks and Grapevine; Electronic communications; Barriers to effective communication; non-verbal communication; Improving Interpersonal communication: Empathy and Active listening

Unit V :- Leadership Difference between managers and leaders; Perspectives of leadership: Trait, Behavioural, Contingency; Inspirational leadership: Transactional, Transformational, Charismatic; NGO leadership

Unit VI :- Job Analysis, Job description; Job Specification; Job Evaluation, Recruitment, Selection, Orientation Sources of recruitment: Internal and external; Steps in selection process; Performance Management , What is performance appraisal; Purposes, Process and Uses.
Compensation Management – Need, Objectives and factors determining compensation; Developing pay structures, Executive remuneration; components of compensation; Incentives

Prescribed Books :

1. Nadler, Leonard : Corporat Human Resource Development, Van Nostrand Reinhold, ASTD, New York .
2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems, Oxford IBH Pub. Pvt.Ltd., New Delhi , 2005.
3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.
4. Viramani, B.R and Seth, Parmila: Evaluating Management Development, Vision Books, New Delhi .
5. Rao, T.V.(et.al): HRD in the New Economic Environment, Tata McGraw-Hill Pub.Pvt, Ltd., New Delhi , 2003.
6. Management & Organisation , Dr A. R Gupta , Google book Publishers.
7. ILO, Teaching and Training Methods for Management Development Hand Book, McGraw-Hill , New York .
8. Rao, T.V: Human Resource Development, Sage Publications, New Delhi .
9. Kapur, Sashi: Human Resource Development and Training in Practice, Beacon Books, New Delhi .
10. Lynton, Rolf. P and Pareek, Udai: Training for Develfopment, Vastaar Publishers, New Delhi .
11. Viramani, B.R and Rao, Kala: Economic Restructuring, Technology Transfer and Human Resource Development, Response Books, New Delhi .
12. Jaya Gopakl, R: Human Resource Development : Coneputal analysis and Strategies, Sterling Publishing Pvt. Ltd., New Delhi .
13. Truelove, Steve.A: hand book of Training and Development, Beacon Books, New Delhi . 14. Goldstein, Irwin : Training in Organisations, Cole Publishing Co., California .

6CE05 : (iii) Introduction To Earthquake Engineering

Course Learning Objective:

This course will cover the basics of seismology and Earthquake engineering. Students will learn

1. Basic seismology, earthquake phenomenon and its characteristic.
2. Earthquake resistant concept
3. Use of earthquake bands in masonry structure
4. Behavior of buildings during earthquakes

Course outcomes:

At the end of the subject the students will be able to -

1. Identify type of earthquake, its properties
2. Earthquake resistance planning
3. Apply knowledge of seismic bands in masonry structure construction
4. Solve engineering problems in the context of Earthquake Engineering.

SECTION A

Unit I: Interior of earth, engineering geology of earthquakes, plate tectonics, Seismicity of the world, tectonics features of India, Faults, and Propagation of earthquake waves.

Unit II: Quantification of earthquake (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph, accelerogram recording), Determination of magnitude, Epicenter distance, Ground motion and their characteristics, Factors affecting ground motions.

Unit III: Guidelines for achieving efficient seismic resistant planning, selection of sites, importance of architectural features in earthquake resistant buildings.

SECTION B

Unit IV: Projections & suspended parts, special construction features like separation of adjoining structure, crumble section, stair case etc., twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking.

Unit V: Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures.

Unit VI: Behavior of R.C. building in past earthquakes. Concept of earthquake Resistant design, Introduction to IS: 1893

Books Recommended:

1. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007
2. Amita Sinvhal; Understanding Earthquake Disasters, Tata McGraw Hill
3. P. N. Agraval; Engineering Seismology Oxford & IBH Publishing
4. C.V.R. Murty; Earthquake Tips National Information Centre of Earthquake Engineering IIT Kanpur
5. Pankaj Agrawal & Manish Shrikhande ; Earthquake Resistant Designof Structures Prentice- Hall of India

6CE06 : Design Of Steel Structure– Lab

List of Experiments:

1. Candidates are required to prepare at least **two** designs of steel structures based on theoretical course detailed working drawings are necessary.
2. A compulsory **site visit** for studying the various aspect and prepare a report. A Journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

6CE07: Environmental Engineering Lab – I

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva voce based on theory & practical. Graphs are to be drawn wherever necessary

List of Experiments

1. Determination of Turbidity of water sample
2. Determination of Electrical Conductivity water sample
3. Determination of pH of water sample
4. Analysis of Dissolved, Suspended and Total solids
5. Analysis of Volatile and Fixed solids
7. Optimum coagulant dose
8. Determination of Temporary and Permanent Hardness of water sample
9. Determination of Acidity & Alkalinity of water sample
10. Determination of Iron and Manganese
11. Determination of residual chlorine in the given water sample
12. Total Count of Bacteria Test

6CE08 :Fluid Mechanics – Lab

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoulli's theorem.
2. Determination of coefficient of discharge for Venturimeter
3. Determination of metacentric height.
4. Determination of friction factor for GI pipe
5. Determination of coefficient of discharge for triangular notch.
6. Determination of Chezy's coefficient.
7. Determination of coefficient of discharge of Venturiflume.
8. Verification of momentum equation.
9. Study of hydraulic jump, calculations of height of jump, length & energy loss.
10. Trial on Pelton wheel.
11. Trial on Francis turbine.
12. Trial on Centrifugal pump.

6CE09 : Mini Project

Any one Group Project in details.

1) Irrigation Project
2) Rehabilitation of Village / Town
3) Water Supply Project
4) Sewerage System
5) Bridge on River
6) Flood Relief Structures

Students should conduct a detailed survey in a seven day camp.
Data Analysis, Design & Submit Report & Drawing sheets.

Four Year Degree Course in Bachelor of Engineering Branch: **CIVIL ENGINEERING**
Semester Pattern (Choice Based Credit Grade System)

SEMESTER : THIRD																	
Sr. No.	**Subject Code**	**Subject**	**TEACHING SCHEME**					**EXAMINATION SCHEME**									
			HOURS / WEEK			**Total HOURS/WEEK**	**CREDITS**	**THEORY**					**PRACTICAL**				
			Lecture	**Tutorial**	**P/D**			**Duration Of Paper (Hr.)**	**Max. Marks Theory Paper**	**Internal Marks**	**Total**	**Min. Passing Marks**	**Max. Marks**		**Total**	**Min. Passing Marks**
													Int.	**Ext.**		
THEORY																	
01	3CE01	Engineering Mathematics-III	3	1	--	4	4	3	80	20	100	40	--	--	--	--
02	3CE02	Strength of Materials	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	3CE03	Building Construction & Engineering. Geology	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	3CE04	Transportation Engineering	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	3CE05	Concrete Technology & RCC	3	--	--	3	3	3	80	20	100	40	--	--	--	--
06	4ES06	**Environmental Science	2	--	--	2	--	--	--	--	--	--	-	-	-	-
PRACTICALS / DRAWING / DESIGN																	
07	3CE07	Strength of Materials- lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	3CE08	Building Construction & Engineering. Geology-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	3CE09	Transportation Engineering-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
10	3CE10	Concrete Technology & RCC-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**17**	**1**	**8**	**26**	**20**	--	--	--	**500**	--	--	--	**200**	**--**
														Grand Total	**700**		

Note: **The Examination of Mandatory Subject Environmental Science shall be conducted in IV Semester.

SEMESTER : FOURTH																
Sr. No.	**Subject Code**	**Subject**	**TEACHING SCHEME**					**EXAMINATION SCHEME**								
			HOURS / WEEK			**Total HOURS/WEEK**	**CREDITS**	**THEORY**					**PRACTICAL**			
			Lecture	**Tutorial**	**P/D**			**Duration Of Paper (Hr.)**	**Max. Marks Theory Paper**	**Internal Marks**	**Total**	**Min. Passing Marks**	**Max. Marks**		**Total**	**Min. Passing Marks**
													Int.	**Ext.**		
THEORY																
01	4CE01	Building Planning Designing & CAD	3	--	--	3	3	4	80	20	100	40	--	--	--	--
02	4CE02	Hydrology & Water Resource Engg.	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	4CE03	Surveying	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	4CE04	Geotechnical Engineering- I	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	4CE05	Structural Analysis - I	3	1	--	4	4	3	80	20	100	40	--	--	--	--
06	4ES06	**Environmental Science	2	--	--	2	2	3	**80**	**20**	**100**	**40**	-	-	-	-
PRACTICALS / DRAWING / DESIGN																
07	4CE07	Building Planning Designing & CAD -lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	4CE08	Hydrology & Water Resource Engg. – lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	4CE09	Surveying – lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
10	4CE10	Geotechnical Engineering- I- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**17**	**1**	**8**	**26**	**22**	--	--	--	**500**	--	--	--	**200**	--
														Grand Total	**700**	

Note: **The Examination of Subject Environmental Science shall be conducted in IV Semester.

SEMESTER : FIFTH																
Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	5CE01	Design of Reinforced & Prestressed Concrete Structures	3	1	--	4	4	3	80	20	100	40	--	--	--	--
02	5CE02	Surveying & Geomatics	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	5CE03	Numerical Methods &Computer Programming	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	5CE04	Professional Elective –I	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	5CE05	Open Elective – I	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	5CE06	Design of Reinforced & Prestressed Concrete Structures- lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	5CE07	Surveying & Geomatics -lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	5CE08	Numerical Methods &Computer Programming -lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	5CE09	Professional Elective –I -lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**15**	**1**	**8**	**24**	**20**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**200**	**--**
														Grand Total	**700**	

Note : Open Elective – I to be opted from the Courses offered by the other Engineering & Technology courses from the College / Deptts. of the University.

5CE04 & 5CE09 Prof. Elective I : (i) Highway Construction & Management (ii) Repairs & Rehabilitation of Structures (iii) Sustainable Construction Methods iv) Watershed Engg. & Management

5CE05: Open Elective I : (i) Basic to Building Construction (ii) Disaster Management (iii) Soft Skills and Interpersonal Communication

SEMESTER : SIXTH				
			TEACHING SCHEME	EXAMINATION SCHEME

Sr. No.	Subject Code	Subject	HOURS / WEEK					THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	6CE01	Design of Steel Structures	3	1	--	4	4	3	80	20	100	40	--	--	--	--
02	6CE02	Environmental Engineering - I	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	6CE03	Fluid Mechanics	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	6CE04	Prof. Elective - II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	6CE05	Open Elective - II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	6CE06	Design of Steel Structures-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	6CE07	Environmental Engineering – I-lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	6CE08	Fluid Mechanics-lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	6CE09	Mini Project	--	--	2	2	1	--	--	--	--	--	25	25	50	25
		Total	**15**	**1**	**8**	**24**	**20**	--	--	--	**500**	--	--	--	**200**	**--**
															Grand Total	**700**

Note : i) Open Elective – II to be opted from the Courses offered by the other Engineering & Technology courses from the College / Deptts. of the University.

ii) Students need to do compulsory Two (2) weeks Internship after 6th Semester and that shall be monitored by allotted Final year Project Guides.

6CE04 : PE (II) : (i) Advanced Construction Materials (ii) Geographic Information Systems & Science (iii) Masonry Structures (iv) Solid & Hazardous Waste Management **(v)** Traffic Engineering & Management

6CE05 : OE (II) : (i) Environmental Management (ii) Human Resource Development & Organizational Behavior (iii) Introduction to Earthquake Engineering

SEMESTER : SEVENTH

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	7CE01	Structural Analysis - II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
02	7CE02	Geotechnical Engineering - II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
03	7CE03	Hydraulic Engineering	3	--	--	3	3	3	80	20	100	40	--	--	--	--
04	7CE04	Environmental Engineering -II	3	--	--	3	3	3	80	20	100	40	--	--	--	--
05	7CE05	Professional Elective- III	3	--	--	3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
06	7CE06	Computational Structure Analysis –lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	7CE07	Geotechnical Engineering – II- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
08	7CE08	Environmental Engineering –II- lab.	--	--	2	2	1	--	--	--	--	--	25	25	50	25
09	7CE09	Project & Seminar	--	--	8	8	4	--	--	--	--	--	50	--	50	25
		Total	**15**	**0**	**14**	**29**	**22**	**--**	**--**	**--**	**500**	**--**	**--**	**--**	**200**	**--**
														Grand Total		**700**

7CE05 Prof Elect. III : (i) Analysis & Design of Structures for Earthquake & Wind (ii) Environmental Impact Assessment & Life Cycle (iii) Pavement Design (iv) Water Power Engineering

SEMESTER : EIGHT

Sr. No.	Subject Code	Subject	TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS	THEORY					PRACTICAL			
			Lecture	Tutorial	P/D			Duration Of Paper (Hr.)	Max. Marks Theory Paper	Internal Marks	Total	Min. Passing Marks	Max. Marks		Total	Min. Passing Marks
													Int.	Ext.		
THEORY																
01	8CE01	Construction Project Management	3	--		3	3	3	80	20	100	40	--	--	--	--
02	8CE02	Construction Economics & Estimating - Costing	3	--		3	3	3	80	20	100	40	--	--	--	--
03	8CE03	Professional Elective- IV	3	--		3	3	3	80	20	100	40	--	--	--	--
04	8CE04	Professional Elective-V	3	--		3	3	3	80	20	100	40	--	--	--	--
PRACTICALS / DRAWING / DESIGN																
05	8CE05	Construction Economics & Estimating – Costing – lab.	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
06	8CE06	Professional Elective- IV – lab.	--	--	2	2	1	--	--	-- --	--	--	25	25	50	25
07	8CE07	Project & Seminar	--	--	12	12	6	--	--	--	--	--	75	75	150	75
		Total	**12**	**0**	**16**	**28**	**20**	**--**	**--**	**--**	**400**	**--**	**--**	**--**	**250**	--
														Grand Total		**650**

8CE03 : Prof. Elect IV: (i) Advanced Design of Steel Structures (ii) Advanced Pre-stressed Concrete Structures (iii) Advanced Water Treatment (iv) Industrial Waste Water Treatment **(v)** Structural Analysis by Matrix Methods

8CE04 : Prof Elect V : (i) Advanced Geotechnical Engineering (ii) Advanced Structural Analysis (iii) Advanced Design of RCC Structures (iv)Advanced Waste Water Engineering **(v)** Construction Equipment & Machinery (vi) Finite Element Methods

SYLLABUS PRESCRIBED FOR
THREE YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING (FULL TIME)
CIVILENGINEERING
(ENVIRONMENTAL ENGINEERING)

SEMESTER: FIRST

CORE 1 (1SFEE1): ENVIRONMENTAL MICROBIOLOGY

Course Objectives:

1. The main objective is to know and understand the role of microbes in biogeochemical processes in different ecosystems.
2. The students will learn the basic microbiological principles, the methods in microbial ecology and theoretical and practical use.
3. To create base for understanding processes and changes in environment.

Course Outcomes:

At the end of the course the student will be able to:

1. Acquire basic knowledge regarding preparation and perform sampling and microbial analysis to determine the growth rate, micro community composition with the basic environmental parameters.
2. Use the knowledge to prevent infections to human and environmental health.
3. Acquire basic knowledge to determine the role of microbes in different habitat, in nutrient recycling, water quality determination and in degradation of natural organic compounds and pollutants in the environment.

SECTION – A

Unit I : Introduction to microbiology : Classification of microorganisms, prokaryotic cells, eukaryotic cells. Characterization of microorganism, microorganism of importance. Distribution of biological forms, interrelationship application in the field of Environmental Engineering.

Unit II : Bacteria : Distribution, cytology, forms size, morphology and file structure of bacteria, nutritional requirements, metabolism, growth of bacteria, growth patterns, food microorganism relationship, Aerobic, Anaerobic growth. Factor affecting growth, generation time.

Bacteriology of water : Pathogens and indicator of pollution, method of isolation, enumeration and differentiation. Presumptive, confirmative and completed test for E-coli, most probable number, Membrane filter technique, indicators of pollution, sampling method, frequency, precautions.

Microbiology of food : Microorganisms associated with milk and food, diseases transmitted, food poisoning.

Unit III : Enzymes : Nature of enzymes, mode of actions, effect of temperature, pH, salts and heavy metal, extra cellular and intracellular enzymes classification, source of enzymes, enzymes formation.

Fresh water biology : Flora and fauna in rivers, distribution, limnology, biological cycles, oxygen concentration, nutrient concentration, oxygen depletion, oxygen sag reaeration, Lake eutrophication and its prevention.

SECTION - B

Unit IV: Algae, Fungi Protozoa and viruses: General, introduction to these groups, their role in environmental Engineering and their classification, identification, observation nutrition, reproductions, their control.

Viruses: Occurrence, special features, diseases caused by them, culturing, control of viruses.

Unit V: Bacterial culture: Isolation of microorganisms, staining procedures, pure and mix cultures, culture characteristics, different medias, selective methods, interference, gram positive and negative bacteria laboratory culturing techniques, equipments used, microscope, autoclave, incubator, test chamber. Microbiology of waste water treatment: Microorganisms, fundamental theory, theory of operations, oxygen requirements and environmental factors associated with following waste treatment methods.

- Activated sludge process
- Trickling filter
- Oxidation pond
- Sludge digestion
- Cesspools, septic tank and Imhoff tank.

Unit VI: Air microbiology: Types of microorganisms, Air borne diseases, sampling of air, microbial content of air, control of airborne diseases.

Control of microorganisms: Death of bacteria, Pattern of death, effect of temp pH, toxic substances on growth of bacteria, Antagonism and synergism. Control of microorganisms by physical age Control of microorganisms by chemical agents.

Recommended Books:

1. Microbiology for Environmental Scientist and Engineers, Anthony Gaudy, Elizabeth Gaudy, McGraw Hill Int. Book Co., 1980.
2. Microbiology for Sanitary Engineers, R. E. Mckinney, McGraw Hill Int. Book Co., 1967
3. Microbiology of Water and Sewage, P. L. Gainey., Prentice Hall Inc., 1952
4. Microbiology, M. J Pelczar., E. C. S. Chan, Tata McGraw Hill, 1986
5. Environmental Biology, Mukherjee, Tata McGraw Hill Publishing. Co. Ltd,1996.

CORE 2 (1SFEE2): ENVIRONMENTAL SCIENCES AND CHEMISTRY

Course Objectives:

1. Understanding the concept and importance Environmental problems, Climatology & meteorology, Ecology and global atmospheric change.
2. To provides an in depth knowledge of basics of chemistry, variety of reactions and introduces equilibrium chemistry.
3. To lays foundation of electrochemistry, colloidal and surface chemistry to know instrumental methods of analysis.

Course Outcomes

At the end of the course the student will be able to:

1. Explain the environmental problems and climates
2. Explain ecology & global atmospheric change
3. Explain chemical reactions and their importance. Physical chemistry. potential.
4. Classify organic and biochemistry. Formulate enzymatic relationships using kinetics
5. Perform different techniques for measuring waste water quality parameters. colloids, discuss their properties and their environmental significance.
6. Apply the knowledge of chemistry for water treatment process like coagulation, softening etc.

SECTION – A

Unit I : The Nature and scope of Environmental Problems :- Interaction of systems, Environmental disturbances, public awareness and action, Quantification of Environmental problems.

Climatology and Meteorology: - Introduction, Basic atmospheric properties, Energy outputs and inputs, wind stability and turbulence, water in the atmosphere, climate.

Unit II : Ecology :- Introduction, Energy flow in Ecosystems, food chain and trophic level, elements of limnology, Eutrophication.

Global Atmospheric change :- The greenhouse effect and stratosphere ozone depletion, Global temperature, the greenhouse effect, carbon dioxide, chlorofluorocarbons, the greenhouse gases, changes in stratospheric ozone.

Unit III : General Chemistry: - Law of mass action, Stoichiometry, Gas Laws.

Physical Chemistry: - Types of solution, electrical conductivity and aqueous solution, ionic theory, electrical dissociation, Buffer solutions, Indicators, Solubility products, Common ion effect, Amphoteric hydroxides, chemical equilibrium and ways of shifting it.

SECTION - B

Unit IV : Organic Chemistry and Biochemistry : Organic compounds of interest to environmental engineers (Details of preparation and chemical reactions involved are not required) General preparation of the functional groups of organic compounds. Enzymes, classification, Enzyme carbolized reactions.

Unit V : Break down and synthesis of carbohydrates, fats, protein under aerobic and anaerobic reactions. CNP cycle under aerobic and anaerobic reactions. Concept of B.O.D., C.O.D., T.O.C. Colloids, Dispersion of Colloids, General and electro kinetic properties of colloids, colloidal solutions and mixtures.

Unit VI : Environmental Chemistry :- Water structure and anomalous behavior of water, Chemistry involved in water treatment processes like coagulation, disinfection, softening, fluoridation, defluorination, Iron and its control.
Composition and characterization of sewage, sewage sludge and gas analysis.
Chromatography: - Principles and uses in Environmental Engg.

Recommended Books:

1) Introduction to Environmental Engg. and Science By Gilbert M Masters.
2) Environmental Science By Alam Singh, Vol-I, II, III.
3) Environmental Science & Engg. By Henry.
4) Fair G M, Geyr J C, Okun D A, Water and Wastewater Engineering, Vol, I & II, John Wiley & Sons, New York.
5) Chemistry for Environmental Engg. By Sawyer & McCarty.

PROGRAM ELECTIVE – I (1SFEE3):

(A) WATERSHED MANAGEMENT

Course Objectives:

1. To understand the concept of hydrology and hydrological cycle.
2. To study the hydrology of groundwater.
3. To provide knowledge regarding watershed development and management.

Course Outcomes:

At the end of the course the student will be able to:

1. Explain the concept of hydrological cycle in detail.
2. Understand the hydrology of ground water.
3. To apply knowledge of watershed development and management.

SECTION – A

Unit I: Introduction : The hydrological cycle, storage, concept of storage, the watershed.

Water and Energy: Energy movement, quality of energy, the geometry of energy, the energy budget, Instruments and limitations, the role of water in energy sphere.

Unit II: Water in Vegetation: Processes, interception, Transpiration, Evapotranspiration, calculations by using water budget, Evapotranspiration, models, storage.

Unit III: Hydrology in water resources development, statistical analysis of rainfall and runoff, different distributions methods, Estimation of Unit Hydrograph-flood flow formulae, Storm hydrograph, Storage and regulation of runoff-safe yield of streams, Estimate of storage requirements.

SECTION – B

Unit IV : Hydrology of Ground Water : Common aquifers-Exploration for ground water, hydraulics of ground water flow- Measurement of permeability of formations, flow nets and their constructions.

Boundary conditions – Unconfined and Confined, steady and unsteady flow into wells and infiltration galleries – Evaluation of formulation constant interference, Method of images – Types, design, construction and maintenance of wells and infiltration galleries, Development of wells – well strainer – functions and selections, field tests – Hydraulics of salt water intrusions and their prevention, Ground water recharge.

Unit V : Watershed Development and Management : Definition, Need and scope, characterization of watershed criteria survey, Basic data collection and interpretation, Establishment of watershed research stations. Watershed resource evaluation and management. Irrigation technology. Integrated farming system. Project formulation and economic analysis.

Perspective of Watershed Management: Methodologies for modifying the water resource environment, watershed management and large-scale changes.

Unit VI : Practice of Watershed Management: Rehabilitation, Protection and Enhancement.

Non-Point Sources of Pollution: The legal basis, the process of non-point source pollution control, Best management practices principles, Best management practices on wet lands.

Rain Water Harvesting: Necessity, Methods of rain water harvesting, Requirements for design of project, community participation, Role of NGO's, Government and Municipal Corporation, Limitations, quality assurance of stored water.

Recommended Books:

1. Watershed Hydrology by Peter E. Black.
2. Water Resources Systems, Planning and Management by R. N.Chaturvedi.

PROGRAM ELECTIVE – I (1SFEE3):

(B) ENVIRONMENTAL GEOTECHNOLOGY

Course Objectives:

1. To study the concept of contamination and contamination of solid waste in landfills.
2. To study the different containment systems using Geo-membrane.
3. To provide the knowledge regarding contaminants of slurry wastes.

Course Outcomes:

At the end of the course the student will be able to:

1. Understand the concept of contamination in detail.
2. Apply knowledge regarding different containment systems.
3. Make geotechnical reuse of Waste material.

SECTION A

Unit I : Contamination: Surface & subsurface contamination, Sources and effects of subsurface contamination, Physical, Chemical and biological characteristics of solid waste, Identification, Characterization and regulatory requirements for disposal of hazardous, non-hazardous and domestic waste Soil-waste interaction, Effect of pollutants on soil properties

Unit II : Contaminants of solid waste in landfills: Characteristics of solid wastes, Disposal of solid waste, Stabilization and solidification of solid waste, Waste containment, Solid waste Landfills and its components, Shape and size of landfills, Types of landfills, Site selection Impervious barriers for liners and Covers, Liner systems and cover systems, , Landfill construction and operation, Leachate generation, Leachate collection and detection system , Closure and post-closure care, Sustainable waste management, Ground water contamination associated with leachate transfer

Unit III : Containment systems using Geo-membrane: Advantages of using composite barrier for Liners and Covers, Single composite liner system for MSW landfill, Double composite liner system for HW landfill, Stability of landfills.

SECTION B

Unit IV : Contaminants of slurry wastes: Slurry transported waste, Slurry Ponds and their operation, Embankment construction methods for ponds, Design aspects, Environmental impact and control,

Unit V : Vertical barriers for containment: Contaminated sites, Types of vertical barriers, - Soil-bentonite slurry trench walls, and Cement-Bentonite slurry trench walls -construction and design aspects.

Unit VI : Geotechnical reuse of Waste material: Waste reduction, Use of waste in Geotechnical construction, Waste characteristics for soil replacement, Transportation consideration, Engineering properties of waste, Waste material in embankment and fills.
Reclamation of contaminated site, various methods.

Recommended Books:

1. Mitchell, J.K and Soga, K., Fundamentals of Soil Behaviour, John Wiley and Sons Inc., 2005.
2. Fang, H-Y., Introduction to Environmental Geotechnology, CRC Press,1997.
3. Daniel, D.E, Geotechnical Practice for Waste Disposal, Chapman and Hall, 1993.
4. Rowe, R.K., Quigley, R.M. and Booker, J.R., Clay Barrier Systems for Waste Disposal Facilities, E & FN Spon, 1995.
5. Rowe, R.K, Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, 2001.
6. Reddi, L.N. and Inyang, H.F, Geoenvironmental Engineering - Principles and Applications, Marcel Dekker Inc, 2000.
7. Sharma, H.D. and Lewis, S.P, Waste Containment Systems, Waste Stabilization and
8. Landfills: Design and Evaluation, John Wiley & Sons Inc., 1994.

PROGRAM ELECTIVE – I (1SFEE3):

(C) HAZARDOUS WASTE MANAGEMENT

Course Objectives:

1. To provide knowledge regarding hazardous wastes.
2. To characterize Hazardous Wastes and be able apply different site treatments.
3. To provide information regarding Basic Disaster Management Aspects and long term measures.

Course Outcomes:

At the end of the course the student will be able to:

1. Understand the concept of hazardous wastes.
2. Do the assessment of hazardous sites for waste minimization and resource recovery.
3. Implement long-term measures for prevention of hazardous wastes.

SECTION A

Unit I : Introduction to Hazardous Waste: Definition, Problems, general awareness, Industry and Government's perspective. Risk Assessments, Environmental legislation.

Unit II : Hazardous Waste Characterization and site Treatment. Introduction, study of characterization, Assessment of Hazardous sites, waste minimization and Resource Recovery, chemical, physical and biological treatment to Hazardous waste. Thermal process.

Unit III : Transportation of Hazardous wastes, container for Hazardous waste, bulk transport, Non bulk transport. Hazardous Wastes (Handling, Storage & Management) Rules, 1989 of MoEF. Introduction.

SECTION B

Unit IV : Groundwater Contamination: Effect on human health, Historical uses and abuses, hydrology, Detection, Control and Mitigation of groundwater contamination. Process Techniques and Disposal: Selecting the process, siting the facility, integrated landfill system as Disposal sites, developing a new facility, and operating a landfill.

Unit V : Basic Disaster Management Aspects: The significance of Disaster, the Disaster threat, National Disaster Management policy, major Requirement for coping with Disaster Management cycle, Disaster and National Development, Disaster legislation, counter disaster resources. International Disaster Organisation, utilisation of Resources.

Unit VI : Long-Term Measures: Prevention, Mitigation. Major factors for occurrence of Disaster impact: - Response to Disaster impact: - Major post impact factors, Disaster management support requirements.

Recommended Books:

1. Hazardous Waste Management: Charles A. Wentz., McGraw-Hill, New York,1989.
2. Hazardous Waste Minimization, Harry M. Preeman, McGraw-Hill, 1989
3. Hazardous Waste Chemistry, Toxicology and Treatment, Stanly E. Manahan, 1st edition, CRC-Press, 1990)
4. Disaster Management: A Disaster Manager's Hand Book, W. Nick Carter, ADB Publ., Manila,1991

5. Hazardous Waste Management, Wentz, Charles A., McGraw-Hill, 1989
6. Hazardous Waste Management, LaGrega, Michael D. Buckingham, Philip L. Evans and Jeffrey C., McGraw-Hill, 1989

PROGRAM ELECTIVE – II (1SFEE4):

(A) AIR POLLUTION

Course Objectives:

1. Understanding of basic concepts of air pollution.
2. Study of air pollution episodes.
3. Study of sampling types and methods for ambient air and stack.
4. Study of macro and micro meteorology for understanding the dispersion of pollutants.
5. Simple and complex modeling for point source, line source and area source.
6. Study of pollution control methods, mechanism and devices.

Course Outcomes:

At the end of the subject the students will be able to:

1. Identify air pollution problems and interpret criteria air quality data.
2. Recognize various environmental transformation processes of pollutants under extreme weather condition.
3. Interpret meteorological data and develop capability to assessment of project proposal, air quality pollution index for any region.
4. Justify the use of pollution control equipment and their design.

SECTION A

Unit I : Elements of air pollution: Definition and classification, History of air pollution, Natural versus polluted atmosphere, Air quality, Sources of air pollution. Air pollution episodes.

Unit II : Effects of air pollution: Effect on human health, on vegetation and animals, on material.

Unit III : Measurement and monitoring of air pollution: Atmospheric Chemistry, Ambient air sampling, Ambient air pollutants, air pollution-monitoring & surveillance.

SECTION B

Unit IV : Meteorology of Pollution : Physics of atmosphere, Meteorological bases of Atmospheric pollution, Transport & dispersion of air pollutants, air pollution modelling & prediction, Wind rose.

Unit V : Regulatory Control of air pollution: Air quality criteria & standards Elements of Regulatory Control.

Unit VI : Engg. Control of air pollution: Engg. Control concept, control device & systems, Control of stationery sources, Control of mobile sources, source sampling & monitoring.

Recommended Books:

1) Air Pollution, Vol. I To IV – A. C. Stern.
2) Fundamentals Of Air Pollution – Stern, Wohlers, Bouble, Lower.
3) Air Pollution & Control – P. P. Mowli & N. Venkata Subbayya.
4) Air Pollution – Rao & Rao.
5) Air Pollution Sienfeld J. H.
6) Air Pollution – Perkins.
7) Air Quality Monitoring – A Course Manual By NEERI, 19981.
8) Mechanical handbook
9) Mechanical Handling - Jolley, F. Raby, & H. Walder.
10) Fundamentals of Air pollution – R. W. Boubel, D. L. Fox, A. C. Stern

PROGRAM ELECTIVE – II (1SFEE4):

(B) RURAL WATER SUPPLY AND SANITATION

Course Objectives:

1. To provide knowledge regarding rural water supply.
2. To understand the concept of rural sanitation.
3. To provide knowledge of solid waste management.

Course Outcomes:

At the end of the course the student will be able to:

1. Recognize different issues of rural water supply.
2. Explain compact and simple wastewater treatment units and systems in rural areas.
3. Determine non-conventional energy resources.

SECTION A

Unit I : Rural Water Supply: Issues of rural water supply, various techniques for rural water supply- merits, National rural drinking water program- rural water quality monitoring and surveillance, operation and maintenance of rural water supplies.

Unit II : Low Cost Water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment, Specific contaminant removal systems

Unit III : Rural Sanitation: Introduction to rural sanitation, Community and sanitary latrines, Planning of wastewater collection system in rural areas, Treatment and Disposal of wastewater, Compact and simple wastewater treatment units and systems in rural areas, stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems- Effluent disposal.

SECTION B

Unit IV : Industrial Hygiene And Sanitation: Occupational Hazards- Schools- Public Buildings Hospitals- Eating establishments- Swimming pools, Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit V : Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants, Rural health - Other specific issues and problems encountered in rural sanitation.

Unit VI : Non-conventional energy sources.

Anaerobic digester: terms, principle and theory associated with Anaerobic digestion, Design of Gobar gas plant, construction aspect associated with gobar gas plant, operation and maintenance of gobar gas plant.

Solar power plant: terms, principle and theory associated with solar power generation, suitability and adaptability of solar power plant for rural area, Design of solar power plant for given capacity, construction aspect associated with solar power plant, operation and maintenance of solar power plant.

Recommended Books:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6th Ed., McGraw Hill Book Company, 1965
2. Park, J.E., and Park, K., Text Book of Preventive and Social Medicine, Banarsidas Bhanot, 1972
3. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York, 1977
4. Juuti, P., Tapio S. K., and Vuorinen H., Environmental History of Water: Global Views on Community Water Supply and Sanitation, IWA Publishing (Intl Water Assoc), 2007

PROGRAM ELECTIVE – II (1SFEE4):

(C) ENVIRONMENTAL STATISTICS AND OPTIMIZATION TECHNIQUES

Course Objectives:

1. To study the sampling and estimation theory.
2. To provide knowledge of various tests of hypothesis and significance.
3. Differentiate different O.R. techniques.

Course Outcomes:

At the end of the course the student will be able to:

1. Explain the sampling theory and estimation theory.
2. Carry out various tests of hypothesis and significance.
3. Evaluate linear programming, transportation and non-linear programming problems.

SECTION A

Unit I : Sampling Theory: Population Parameter, Sample Statistics, Sampling distributions, Sample mean, Sampling distribution of means, the sample variance, the sampling distribution of variance.

Unit II : Estimation Theory: Point estimate and interval estimates reliability, confidence interval estimates of population parameters, confidence intervals for means, proportions and variance.

Unit III : Tests of Hypothesis and Significance: Statistical decisions, tests of hypotheses and significance, Type I and Type II errors, level of significance, one tailed and two tailed tests. Tests involving small samples and large samples, fitting theoretical distributions to sample frequency distribution, The chi-square test for goodness of fit.

SECTION B

Unit IV : Linear Programming: Formulation of linear programming problem, Graphical solution- simplex method (including Big M method and two phase method), dual problem- duality theory, dual simplex method, revised simplex method.

Unit V : Transportation problem: existence of solution-degeneracy- MODI method; Assignment problem- traveling salesman problem

Unit VI : Nonlinear programming problem (NLPP): Constrained NLPP, Lagrange's multipliers method – convex NLPP, Kuhn-Tucker conditions

Recommended Books:

1. Environmental Statistics and Data Analysis, Wayne R. Ott, CRC Press, 1994
2. Environmental statistics: Methods and Applications, V Barnett, John Wiley & Sons Ltd, 2004
3. Environmental Statistics with S-Plus, Steven P. Millard, Nagaraj K. and Neerchal, CRC Press 2001
4. Probability and Statistics, M.R. Speigel, McGraw Hill,
5. Operation Research, H.A. Taha, Prentice Hall of India Pvt. Ltd.
6. Introduction to Optimisation: Operations Research, J.C. Pant,Jain Brothers, New Delhi. Probability and Statistics for Engineers. Miller and Freund.

MLC (1SFEE5): RESEARCH METHODOLOGY AND IPR

Course Objectives:

1. To study the meaning, sources of, criteria and characteristics of a good research problem.
2. To provide knowledge regarding effective literature studies, approaches, analysis, Plagiarism and Research ethics.
3. To provide information regarding Patent Rights and new development in IPR.

Course Outcomes:

At the end of the course the student will be able to:

1. Evaluate the problems related to research work.
2. Apply effective technical writing skills for research work.
3. Gain knowledge regarding patient rights.

SYLLABUS

1. Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem, Research problem, data collection.

2. Effective literature studies approaches, analysis, Plagiarism, Research ethics,

3. Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

4. Nature of Intellectual Property: Patents, Designs, Trade and Copyright, Process of Patenting and Development: technological research, innovation, patenting, development. Procedure for grants of patents

5. Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

6. New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc.
   Traditional knowledge Case Studies, IPR and IITs.

Recommended Books:

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students'
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"
4. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
5. Mayall, "Industrial Design", McGraw Hill, 1992.
6. Niebel, "Product Design", McGraw Hill, 1974.
7. Asimov, "Introduction to Design", Prentice Hall, 1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, "Intellectual Property in New Technological Age", 2016.
9. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008.

AUDIT COURSE – I (1SFEE6):

(A) ENGLISH FOR RESEARCH PAPER WRITING

Course Objectives:

1. To provide knowledge to improve the writing skills and level of readability.
2. To make one understand what to write in each section.
3. To be able to work on the skills needed while writing a Title.

Course Outcomes:

At the end of the course the student will be to:

1. Improve their writing skills and level of readability.
2. Improve key skills while writing a Title.
3. Ensure the good quality of paper at very first-time submission.

SYLLABUS

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Key skills key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Recommended Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press.
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM.
4. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

AUDIT COURSE – I (1SFEE6):

(B) VALUE EDUCATION

Course Objectives:

1. Inculcate the value of education and self- development.
2. To imbibe good values in students.
3. Let the student know about the importance of character.

Course Outcomes:

At the end of the course the student will be to:

1. Gain knowledge regarding social values and individual attitude.
2. Have the attitude of Sense of duty, devotion, self reliance, etc.
3. Improve their personality and behaviour towards others.

SYLLABUS

- Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.
- Moral and non- moral valuation. Standards and principles.
- Value judgements
- Importance of cultivation of values.
- Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness.
- Honesty, Humanity. Power of faith, National Unity.

- Patriotism. Love for nature, Discipline
- Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline.
- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labour.
- Universal brotherhood and religious tolerance.
- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.
- Doing best for saving nature
- Character and Competence –Holy books vs. Blind faith.
- Self-management and Good health.
- Science of reincarnation.
- Equality, Nonviolence, Humility, Role of Women.
- All religions and same message.
- Mind your Mind, Self-control.
- Honesty, Studying effectively.

Recommended Books:

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

AUDIT COURSE – I (1SFEE6):

(C) PEDAGOGY STUDIES

Course Objectives:

1. To Understand the Theories of learning, Curriculum and Teacher education.
2. To Understand the Conceptual framework and Research questions.
3. To provide Overview of methodology and Searching.

Course Outcomes:

At the end of the course the student will be able to:

1. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
2. Identify critical evidence gaps to guide the development.

SYLLABUS

- Introduction and Methodology:
- Aims and rationale, Policy background, Conceptual framework and terminology

- Theories of learning, Curriculum, Teacher education.
- Conceptual framework, Research questions.
- Overview of methodology and Searching.
- Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
- Curriculum, Teacher education.
- Evidence on the effectiveness of pedagogical practices
- Methodology for the in depth stage: quality assessment of included studies.
- How can teacher education (curriculum and practicum) and the school?
- curriculum and guidance materials best support effective pedagogy
- Theory of change.
- Strength and nature of the body of evidence for effective pedagogical practices.
- Pedagogic theory and pedagogical approaches.
- Teachers' attitudes and beliefs and Pedagogic strategies.
- Professional development: alignment with classroom practices and follow-up support
- Peer support
- Support from the head teacher and the community.
- Curriculum and assessment
- Barriers to learning: limited resources and large class sizes
- Research gaps and future directions
- Research design
- Contexts
- Pedagogy
- Teacher education
- Curriculum and assessment
- Dissemination and research impact.

Recommended Books:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of
3. Curriculum Studies, 36 (3): 361-379.
4. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education
5. Research project (MUSTER) country report 1. London: DFID.
6. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of
7. Basic maths and reading in Africa: Does teacher preparation count? International Journal

8. Educational Development, 33 (3): 272–282. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education.
9. Oxford and Boston: Blackwell.
10. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.

CORE LAB I (1SFEE7):
ENVIRONMENTAL ENGINEERING LAB - 1

Determination of :-
1) Conductivity
2) pH (indicators and pH meter)
3) Turbidity
4) Hardness (Calcium and total by EDTA method)
5) Sulphate
6) Chlorides
7) Chlorine demand and Chlorine residual (Available, Break point dose)
8) Nitrogen all types
9) DO, BOD
10) COD, TOC
11) Iron and Manganese
12) Acidity and Alkalinity
13) Fluorides
14) Solids (Fixed, suspended and Volatile)

CORE LAB – II (1SFEE8):
ENVIRONMENTAL ENGINEERING LAB - 2

1) Study of instruments.
2) Heterotrophic plate count.
3) Preparation of differential media
4) Isolation of bacteria by various methods,
5) Staining of bacteria,
6) Enumeration of bacteria by various methods,
7) M.F. technique, Control of microorganisms.

SEMESTER: SECOND

CORE 3 (2SFEE1): ADVANCED WATER TREATMENT TECHNOLOGY

Course Objectives:

1. To provide an overview of both the theoretical and practical aspects of conventional and advanced water technology for surface water treatment.
2. Select an appropriate treatment process for a specific application, and be able to identify appropriate pre-treatment and post treatment schemes, and cleaning protocols for these processes.

Course Outcomes:

At the end of the course the student will be able to:

1. Explain the water quality parameters, layout of treatment plant. Able to design intake structures.
2. Learn sedimentation and floatation. Able to explain settling equations. mathematical model of unit processes.
3. learn coagulation and flocculation processes
4. Design filter units alongwith filter backwash system.
5. Analyze chemistry of disinfection and to know the kinetics of disinfection. Learn aeration. Understand adsorption process and apply the knowledge of isotherms. Learn and design various miscellaneous treatment processes such as fluoridation/defluoridation, Colour.
6. Explain need for industrial water quality requirements. Learn and design various miscellaneous treatment processes such as softening, Iron & manganese. Able to know the importance of corrosion control.

SECTION A

Unit I : Standards for treated waters. Surface waters. Effects of storage on water quality. Limnology. Water ecology, Thermal stratification. Seasonal Change, lake overturns. Algae, Control measures, quality of underground Waters. Nature and source of impurities. Examination of waters.

Requirements of water treatment facilities. Unit operations, Gravity systems, pumping systems. Period of design, Fluctuations in demand. Intake structures.

Unit II : Principles of sedimentation and floatation. General equations for settling or discrete particulates. Hindred settling, efficiency of an ideal basin, short-circuiting. Sludge moisture content – specific gravity relationship. Up flow and sludge blanket tanks – mathematical model of the unit processes.

Unit III : Theories of chemical coagulation. Nature of colloids. Zeta potential. Coagulant and their specificity. Design of mechanical flocculators. Mean velocity gradient "G", "Gt" effect of temperature and other variables. Power consumption. Mathematical Modeling.

SECTION B

Unit IV : Theory of filtration. System Parameter and mathematical modeling, size and shape characteristics of granular filtering materials. Preparations of filter sand, Hydraulics of filtration through homogeneous and stratified beds. Performance of slow, rapid, high-rate multiplayer and composite filters. Up flow, two way filter, dual media filter.
Pressure filters. Diatomaceous earth filters. Mico-strainers. Filterability Index.

Unit V : Principles of disinfection. Factors affecting disinfection. Halogens: Chlorine, Iodine and Bromine.
Principles of aeration, System parameters and mathematical model. Methods of aeration. Theories of adsorption. Freudlich equation. Removal of taste and odour by adsorption. Removal of colour. Effects of fluorides. Fluoridation. Removal of fluorides.

Unit VI : Industrial water treatment: Boiler feed water. Softening of water. Reuse of water and conservation of water in industry.
Methods of Iron and Manganese removal. Use of aeration, oxidation, ion exchange and other methods and their control.
Theory of corrosion, and corrosion control.

Recommended Books:

1. Water and Waste water Engineering by Fair Geyer and Okun, John Willy and Sons
2. Water and Waste water Technology by Mark J. Hammer, John Willyand Sons
3. Water Supply and Sewerage by E. W. Steel and McGhee, McGraw Hill Company.
4. Manual on Water Supply & Treatment, CPHEEO, New Delhi.
5. Physico-Chemical Processes for Water Quality Control by Weber, John Wiley & Sons, 1972.

CORE 4 (2SFEE2): ADVANCED WASTE WATER TREATMENT TECHNOLOGY

Course Objectives:

1. Students should learn the principles of waste water treatment and management.
2. Students should learn the fundamental concepts in waste water treatment technologies, hazardous waste disposal and management issues related to sludge treatment and disposal.
3. Students should acquire process design skills related to waste water treatment.

Course Outcomes:

At the end of the course the student will be able to:

1. Students should be able to describe the unit processes associated with the the waste water treatment systems.
2. Explain the principles of waste water treatment and apply the knowledge in process design.
3. Carry out innovative and creative laboratory exercise related to waste water treatment.
4. Identify the specific pollution problems.

SECTION A

Unit I : Introduction : Objectives of waste water treatment, Purpose of advanced wastewater treatment, Wastewater quantity and transport and waste water characteristics. Alternative flowcharts, function and basic principles involved in different units of conventional wastewater treatment plant.

Unit II : Process Analysis : Reaction and reaction kinetics, Mass balance, Reactors and their hydraulic characteristics, Practical aspects of reactor design.

Unit III : Physical and Chemical Treatment: Screening, Grit removal, flow equalizations and mixing. Flocculation, sedimentation, flotation. Detailed principles and design aspects of Screening, Grit chamber and Sedimentation tank.

SECTION-B

Unit IV : Principles of Biological Treatment : Kinetics of biological growth, introduction to suspended and fixed film reactors. Concepts of gas transfer and solids separation, Nitrogen and Phosphorus removal from waste water. Concepts of aerobic and anaerobic treatment of waste water. Design of Activated Sludge system using biological process dynamics. Complete design details of Activated Sludge Process. Modifications of ASP. Process concepts and design aspects of Trickling Filters, Rotating Biological Contactors (RBC), Fluidized bed reactor/treatment.

Unit V : Sludge Treatment and Disposal : Aerobic and Anaerobic digestion of sludge, sludge stabilization, dewatering, conditioning and disposal.

Unit VI : Tertiary Treatment : Principles of tertiary treatment, theory of adsorption and factors affecting adsorption. Concepts and different methods of dissolved solids removal. Basic principles of Reverse Osmosis, Ultra-filtration, Electro dialysis, Desalination.

Recommended Books:

1. Wastewater Engineering: Treatment, Disposal & Reuse, By Metcalf & Eddy Inc. Sixth Ed. 2002, McGraw Hill.
2. Introduction to Environmental Engg., By. P.A. Veslind, PWS, Publishing Company, Boston, 1997.
3. Wastewater Treatment and disposal, By S.J. Arceivalla, Marcel Dekker,1981.

4. Wastewater Treatment Plant Planning, Design and Operation, By S.R. Quasim, Holt, Rinehart & Winston N.Y.
5. Activated Sludge Process: Theory and Practices, By N.F Grey, Oxford University Press, 1990.

PROGRAM ELECTIVE – III (2SFEE3):
(A) SOLID AND BIOMEDICAL WASTE MANAGEMENT

Course Objectives:

1. To provide an overview of waste generation, waste characterization and waste management processes.
2. To impart knowledge on solid waste management with emphasis on municipal solid waste management which includes different waste processing options such as pyrolysis, composting, and incineration; designing and operating sanitary landfill.
3. To enrich knowledge about characteristics of hazardous wastes and their management.
4. To make learners focus on energy recovery from biomass, agricultural and industrial wastes for production of biogas, ethanol, methanol and hydrogen.
5. To impart knowledge on industry specific solid waste management practices.
6. To enrich knowledge about characteristics of biomedical wastes and their management.

Course Outcomes:

At the end of the subject the students will be able to:

1. Identify and interpret the criteria for the classification of a substance as a solid waste.
2. Recognize waste minimization and source reduction, assess and describe the procedure for solid and hazardous waste identification and characterization and various waste processing options.
3. Define and elucidate the management, treatment and disposal of hazardous wastes.
4. To assess and develop physical/chemical/biological treatment techniques for the control of hazardous wastes.
5. To address and describe solid waste management including landfill operation.
6. To manage industry specific solid waste issues.
7. To design and execute land reclamation projects.
8. To explain and interpret the regulations concerning the handling, transportation and disposal of municipal, hazardous, radioactive and biomedical wastes.

SECTION A

Unit I : Problems and impacts of solid waste in developing countries; Sources, types and composition of Municipal solid waste, quantity estimation and forecast, Management systems and planning.

Unit II : Characteristics of solid waste: Sampling – physical, chemical and biological analysis, Sources, types and composition of industrial hazardous and toxic wastes, Treatment and disposal methods

Unit III : Collection of solid waste: On site handling and processing; Collection systems and service; Analysis of collection systems, collection routes; Management issues and concerns.
Transfer and transport, design requirements.

SECTION B

Unit IV : Composting: Process microbiology, Aerobic and anaerobic composting, parameters affecting, Design considerations, compost control, engineering design and operations
Sanitary Landfill: Process mechanism, Classification, types, siting considerations, engineering design and operations.

Unit V : Incineration: Process details, classification, types, siting considerations, Energy recovery, Pyrolysis, engineering design and operations.

Unit VI : Biogas from solid wastes: Conversion of solid wastes to protein, Legislation and byelaws in solid waste management, Solid Waste (Management & Handling) Rules, 2001.
Biomedical waste Treatment and Disposal: Generation, collection, transport, treatment and disposal.

Recommended Books:

1. Municipal and Rural Sanitation, Ehlens and Steel; Tata McGraw-Hill, 1976.
2. Solid Waste Engineering – Principles and Managements Issues, G. Techbanoglous, H. Theisen and Elliasen, Mc-Graw Hill Inc., 1972.
3. Water Supply for Rural Areas and Small Communities, Wagner E. G. and Lanoik J.N; Geneva, WHO Publication, 1989
4. Solid waste Engineering, Principles and management issues, G. Techbanoglous, Elliasen; Mc-Graw Hill Book Co.1985
5. Solid waste Management in developing Countries, Bhide A.D and Sudaresan B.B; INSDOC, New Delhi, 1983.
6. Solid Waste Management, D. Joseph Hagerty, Joseph L. Pavoni & John E. Heer Jr.;Van Norstrand ,Van Nostrand Reinhold, New York 1973.

7. Handbook of solid waste Management, Frank Kreith; 2nd edition, Mc-Graw Hill Inc. 2002
8. Management of Solid Waste in Developing Countries, Frank Flintoff; 2nd Edn, WHO publication, 1984.

PROGRAM ELECTIVE – III (2SFEE3):
(B) BIOREMEDIATION: PRINCIPLES AND APPLICATION

Course Objectives:

1. To provide knowledge regarding bioremediation and bio remedial practices those are being carried out.
2. To provide knowledge regarding natural and programmed bioremediation.
3. To study different types of bioremediation in detail.

Course Outcomes:

At the end of the course the student will be able to:

1. Acquire detail knowledge regarding bio remedial practices.
2. Understand solid and slurry phase bioremediation (composting, land farming, slurry bioreactors and lagoons).
3. Explain Genetic Engineering and Bioremediation.

SECTION A

Unit I : Introduction to biotransformation, biodegradation and bioremediation, history of bioremediation, xenobiotics and their structures and persistence in the environment, in situ and ex situ bioremediation technologies and their merits and demerits.

II : Bio remedial practices. An overview of the current bio remedial practices and its application, factors affecting bioremediation (physical, chemical and biological), bio stimulation and bio augmentation, bio concentration and bio magnifications.

Unit III : Natural and programmed bioremediation. Inducible and degrading enzymes and their roles, Roles of electron donors and acceptors in bioremediation, anaerobic and aerobic bioremediation processes, application of bioinformatics in bioremediation.

SECTION B

Unit IV : Types of bioremediation Solid and slurry phase bioremediation (composting, land farming, slurry bioreactors and lagoons), liquid phase bioremediation, bioventing, soil-vapour extraction(SVE) and treatment.

Unit V : Genetic Engineering and bioremediation

Phytoremediation Concept of phytoremediation, roles of phytochelatins and chemicals secreted by the plant roots, phytoremediation with trangemic plants, fungal and algal bioremediation, merits and demerits of phytoremediation, Types of phytoremediation systems.

Unit VI : Regulations of GM organisms in India, Biosensors and their applications in bioremediation.

Recommended Books:

1. Baker H. and Herson D.S. Bioremediation, McGraw Hill, 1994
2. Eweis J.B., Ergas S.J., Chang D.P.Y. and Schroeder E.D., Bioremediation Principles, McGraw Hill, 1998.

PROGRAM ELECTIVE – III (2SFEE3):

(C) SOFT COMPUTING SKILLS

Course Objectives:

1. To study the need for soft computing techniques.
2. To Learn Artificial Neural Networks (ANN) and its applications.
3. To study different types of computing techniques and their applications in civil engineering.

Course Outcomes:

At the end of the course the student will be to:

1. Explain the different components of soft computing.
2. Gain Knowledge regarding fuzzy set operations and fuzzy relations.
3. To apply Evolutionary computing, Genetic algorithm and Hybrid soft computing techniques.

SECTION A

Unit I : Need for soft computing techniques, components of soft computing.

Unit II : Artificial Neural Networks (ANN), Types of ANN, Learning algorithms.

Unit III : Applications of ANN, Information and uncertainty, Chance versus ambiguity.

SECTION B

Unit IV : Classical sets and fuzzy sets, Logic and reasoning, Fuzzy set operations and fuzzy relations.

Unit V : Membership Functions, Fuzzy Systems, Decision Making with Fuzzy Information, Fuzzy Classification and Pattern Recognition, Neuro-Fuzzy Systems.

Unit VI : Evolutionary computing, Genetic algorithm, Hybrid soft computing techniques, Applications in Civil Engineering.

Recommended Books:

1. Haykin, Neural Networks: A Comprehensive Foundation, Prentice Hall India, New Delhi, 2008
2. Jang, J.R, Sun Chuen-tsai, and Mizutani Eiji, Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, PHI Learning, 2009 Rajasekaran, S., and Vijayalakshmi Pai, G.A., Neural Networks, Fuzzy Logic and Genetic Algorithms – Synthesis and Applications, Prentice-Hall India, New Delhi, 2003
3. Sivanandam, S N and S N Deepa, Principles of Soft Computing, Wiley India, 2013
4. Karray, Fakhreddin O. and Clarence De Silva, Soft Computing and Intelligent Systems Design – Theory, Tools and Applications, Pearson Education Ltd., 2013

PROGRAM ELECTIVE – IV (2SFEE4):

(A)INDUSTRIAL WASTE WATER TREATMENT

Course Objectives:

1. To impart knowledge on composition treatment and effective disposal of industrial effluents.

Course Outcomes:

At the end of the course the student will be able to:

1. Understand and explain the theories and systems of industrial effluent treatment and disposal.
2. Have an outlook on industrial effluent management with reference to specific industry.

SECTION A

Unit I : Problem of Industrial Waste Water:

Variation in quality and quantity of industrial waste water. Effects of discharge of industrial waste water on streams; land and municipal sewers. Benefits of water pollution control by doing treatment of industrial waste.

Unit II : Indian standards for discharge of treated waste water on land, into municipal sewer and natural water courses.

Sampling procedure. Experimental evaluation of physico-chemical or biological treatment methods for treatment of the wastewater.

Unit III : Approaches to minimization of problem of industrial waste water, Good house-keeping, equalization, neutralization, precipitation, mixing of different effluent streams, recycle of effluent streams, process modifications in terms of raw materials or chemicals used general approach to planning of industrial waste water treatment and disposal.Cleaner Technologies of production for waste minimization.

SECTION B

Unit IV : Different aspects and choices of various alternatives such as:
1) Treating different effluent streams separately.
2) Treating different streams jointly after mixing them partly or fully.
3) Including/excluding domestic waste along with the industrial waste.
General approach for handling and treatment of industrial waste water with following special characteristics.

Unit V : Shock loads, presence of colours, toxic metal/ions, refractory substances, e.g. A B S and other detergents, growth inhibiting substances such as insecticides, waste rich in nutrients (N.P.K. etc.), waste rich in oil & grease, high suspended solids, high BOD, high temperature, acidity, alkalinity etc.

Unit VI : Experimental evaluation of physico-chemical or biological treatment processes for treatment of the waste water.
Process line diagrams, characteristics and treatment of industrial waste of: Pulp and paper, textile, tannery, food, Canings, sugar mill, distillery, dairy, pharmaceutical, electroplating etc. industries.

Recommended Books:

1) Waste Water Treatment, Disposal and Reuse-Mctcalf and Eddy.
2) Pollution Control in Process Industries – S. P. Mahajan.
3) Liquid Waste of Industry – Theory, Practices and Treatment Nemcrow.
4) Industrial Water Pollution Control- W. W. Eekenfelder.
5) Natural Systems for Waste Management and Treatment – S.C. Reed,
E.J. Middlebrooks, R. W. Crites.
6) The Treatment of Industrial Waste – Purse Lievre E.B.
7) Water Quality Management by W.W. Eckenfelder
8) Biological Treatment of Waste Waters: W.W. Enkenfelder

PROGRAM ELECTIVE – IV (2SFEE4):

(B) ENVIRONMENTAL MANAGEMENT AND AUDITING

Course Objectives:

1. To study the principles of Environmental Management.
2.To study the policy and legal aspects of Environmental Management.

3.To provide knowledge regarding Environmental Management System Standards.

Course Outcomes:

At the end of the course the student will be able to:

1. Acquire knowledge regarding goals, need for sustainable development, tools, etc. of Environmental Management.
2. Understand the Policy and Legal Aspects of EM.
3. Gain knowledge regarding Life Cycle Assessment (LCA) and Environmental Management System Standards.

SECTION A

Unit I : Principles of Environment Management: Introducing Environmental Management (EM), Definition and scope, Goals of EM, Need for EM, Need for sustainable development, EM tools, Participants in EM, Existing users, Groups seeking change, Groups with little control, The public, Facilitators, Controllers,

Unit II : Ethics and the Environment, The philosophy of Aldo Leopold, Factors that necessitate environmental ethics, International Environmental Movement, Environmental Concerns in India

Unit III : Policy and Legal Aspects of EM: Introduction to Environmental Policies, Economics and environmental policies, Industries and environmental policies, Agriculture and environmental policies, Ecosystem and environmental policies, Environmental policy instruments (EPI), Environmental Policies and Programmes in India, Forest conservation activities, NGO movements for environmental protection in India, Environmental Laws and Legislations, Private and Public law, Principles of international law, Indian Environmental Laws, International institutions, Key international treaties, Objectives and principles of legislation, Environmental Legislations in India, Evolution of Indian Legislations, Constitution of India, Union Government initiatives

SECTION B

Unit IV : Environmental Auditing: Introduction to Environmental Auditing (EA), Principles of auditing, Objectives and scope, Responsibilities, resources and procedures within the audit records from the audit program, monitoring and reviewing the audit program, Types of environmental audits, General Audit Methodology, Basic structure of EA, General steps in EA procedure, Elements of Audit Process, What to audit, Who should audit, Why an audit, How to audit, Waste Audits and Pollution Prevention Assessments, EA in Industrial Projects, Liability Audits and Site Assessment, Auditing of EMS, Audit objectives, roles and responsibilities, Scoping and review, Preparing the audit(start, setting objectives, scope and audit criteria, determining the feasibility audit, selection of the audit team to establish initial contact with the audited organization, document review, preparation of the audit on the spot),

Implementation of on-site audit, Preparation, approval and distribution of messages, Resolution of disagreements, corrective and preventive actions, competence and evaluation of auditors, Conducting the audit, Content of audit report

Unit V : Life Cycle Assessment (LCA): Life cycle assessment and its purpose, Evolution of Life Cycle Assessment, Stages in LCA of a Product, A Code of Good Conduct for LCA, Procedures for LCA, Defining the goal and scope, Analyzing the inventory, Assessing environmental impact, Evaluating environmental profiles, Different Applications of LCA, Private sector applications, Governmental application.

Unit VI : Environmental Management System Standards: Environmental Management Systems (EMS), Core elements of EMS, Benefits of EMS, Certification body assessments of EMS, Documentation for EMS, EMS Standards: ISO 14000-Evolution, Principles and structure, ISO 14000 supporting systems, EMS specification standards: ISO 14001, Implementation of EMS Conforming to ISO 14001, Benefits of Implementing ISO 14001: An Indian Scenario, OHSAS 18001 and its comparison with ISO 14001 and ISO 9001, BS 18004:2008

Recommended Books:

1. Environmental Science and Management, Abhijit Mallick,
2. The ISO 14000 EMS Audit Handbook, Greg Johnson
3. Corporate Environmental Management Systems and Strategies, Richard Welford, Universities Press (I) Ltd., Hyderabad, 1996.

PROGRAM ELECTIVE – IV (2SFEE4):

(C) ENVIRONMENTAL SYSTEMS MODELLING AND STATISTICS

Course Objectives:

1. To provide knowledge regarding the Models for environmental systems.
2. To study Global radiation balance and climatic changes, Transport and fate of pollutant in aquatic systems.
3. To study the Stochastic Processes in the Environment.
4. To study Sampling and determine the sample size.

Course Outcomes:

At the end of the course the student will be able to:

1. Acquire knowledge regarding air quality models.
2. Explain the Applications of public domain models and software.
3. Make the use of Computational methods in environmental modelling.
4. Calculate the Sampling frequency and duration.

SECTION A

Unit I : Models for environmental systems Definition; Classification; Examples of models for environmental systems.
Introduction to air quality models; Meteorology; Atmospheric stability and turbulence; Gaussian plume model and modifications.

Unit II : Numerical models, Urban diffusion models, Calibration and sensitivity analysis; Applications of public domain models, and software.

Unit III : Global radiation balance and climatic changes, Transport and fate of pollutant in aquatic systems; Introduction to river, estuarine and lake hydrodynamics; Stratification and eutrophication of lakes; Dissolved oxygen model for streams; Temperature models, Transport and fate of pollutants in soils and ground water.

SECTION B

Unit IV : Utility of environmental models for forecasting, Computational methods in environmental modelling.

Unit V : Stochastic Processes in the Environment: Probability concepts; Conditional probability and Bayes theorem. Environmental Data Analysis and QA/QC: Descriptive statistics; Averaging times.

Unit VI : Sampling and analysis Sample size determination; Sampling frequency and duration; Measurement uncertainty; Accuracy testing and precision; Sample and dynamic blanks; Error propagation; Linear least-squares regression; Trend analysis; Non-parametric statistics. Experiment Design and Hypothesis: Testing: Factorial design of experiments; Confidence intervals; Equality of means; T-test; Analysis of variance (ANOVA); F-test; Significance of factor effects and their interactions.

Recommended Books:

1. Environmental Statistics and Data Analysis, Wayne R. Ott, CRC Press, 1994.
2. Environmental statistics: Methods and Applications, V Barnett, John Wiley & Sons Ltd, 2004.
3. Environmental Statistics with S-Plus, Steven P. Millard, Nagaraj K. and Neerchal, CRC Press 2001.
4. Principles of Surface Water Quality Modelling and Control, R. V. Thomann and J. A. Muller, Harper International edition, 1987
5. Water Quality, G. Tchibangolous, E. D. Schroedere, Addision Wesley Publishing Co. Massachusettes, 1987
6. Atmospheric Chemistry and Physics, J.H. Seinfeld, and S.N, Pandis, John Wiley and Sons Inc, New York, 1998
7. Experimental Modelling, J.L. Schnoor, Inter Sc. Publications, 1996

8. Fundamentals of Air Pollution, R.W. Boubel, and A.C Stern,Academic Press, 1994

AUDIT COURSES – II (2SFEE5):

(A) DISASTER MANAGEMENT

Course Objectives:

1. To demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. To be able to evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. To develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

Course Outcomes:

At the end of the course the students will be able to:

1. Critically understand the strengths and weaknesses of disaster management approaches,
2. Planning and programming in different countries, particularly their home country or the countries they work in

SYLLABUS

UNIT I : Introduction Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II : Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem.
Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Manmade disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT III : Disaster Prone Areas in India: Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.

UNIT IV: Disaster Preparedness and Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological and Other Agencies, Media Reports: Governmental And Community Preparedness.

UNIT V : Risk Assessment; Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival.

UNIT VI : Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

Recommended Books:

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi.
3. Goel S. L. , Disaster Administration And Management Text And Case Studies" ,Deep & Deep Publication Pvt. Ltd., New Delhi.

AUDIT COURSES – II (2SFEE5):

(B) PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Objectives:

1. To learn to achieve the highest goal happily.
2. To become a person with stable mind, pleasing personality and determination.
3. To awaken wisdom in students.

Course Outcomes:

At the end of the course the students will be able to:

1. Acquire knowledge regarding the Study of Shrimad-Bhagwad- Geeta that will help them in developing his personality and achieve the highest goal in life.
2. Lead the nation and mankind to peace and prosperity.
3. Study Neetishatakam that will help in developing their versatile personality.

SYLLABUS

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)
- Approach to day to day work and duties.
- Shrimad BhagwadGeeta : Chapter 2-Verses 41, 47,48,
- Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
- Chapter 18-Verses 45, 46, 48.
- Statements of basic knowledge.
- Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

Recommended Books:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram Publication
2. Department), Kolkata
3. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P. Gopinath,
4. Rashtriya Sanskrit Sansthanam, New Delhi.

AUDIT COURSES – II (2SFEE5):

(C) STRESS MANAGEMENT BY YOGA

Course Objectives:

1. To achieve overall health of body and mind
2. To overcome stress

Course Outcomes:

At the end of the course the students will be able to:

1. Develop healthy mind in a healthy body thus improving their social health also.
2. Improve their efficiency.

SYLLABUS

- Definitions of Eight parts of yog (Ashtanga)
- Yam and Niyam

Do`s and Don'ts's in life.

i) Ahinsa, satya, astheya, bramhacharya and aparigraha

ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

- Asan and Pranayam

i) Various yog poses and their benefits for mind & body

ii) Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata

CORE LAB III (2SFEE6):

ENVIRONMENTAL ENGINEERING LAB - 3

Design any one of the following:

1) Design of Water Treatment Processes.
2) Design of Sewage Treatment Processes.
3) Design of plumbing for multistory building.
4) Design of sewerage systems for small town/village.

CORE LAB IV (2SFEE7):

ENVIRONMENTAL ENGINEERING LAB - 4

Software based practical on treatment process design and modeling for pollution assessment and control.

MINI PROJECT (2SFEE8)

Mini project is based on the syllabus of Environmental Engineering

SEMESTER THIRD

PROGRAM ELECTIVE – V (3SFEE1):
(A) ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

Course Objective:

1. To provides a detailed insight into the Indian environmental legislation aspects including National Environmental Policy, legal framework, Gand various Acts related to environmental pollution, Prevention and control.
2. Explains the process of impact assessment; and deals with various methodologies. It reviews few case studies on EIA.

Course Outcomes:

At the end of the course student will be able to:

1. Explain the National Environmental policy and Legal framework related to environmental aspects.
2. List and Identify various Indian Environmental Acts in vogue, Amendments, modifications and notifications. Describe the Role of Tribunal.
3. Discuss the concept of Carrying Capacity; Environmental Impact Assessment studies for various developmental activities. Defines objectives, types and limitations of EIA. Lists and describes various EIA methodologies.
4. Describe the scope of EIA along with the framework. Propose the need for public participation in EIA. Explain importance of attributes, Standards and Value functions for various parameters. Apply predictive models.

SECTION A

Unit I : Development and Environment, need for EIA, concept of EIA, elements of EIA, nature of impacts – primary, secondary, tertiary, short-term, long-term, local and regional, reversible & irreversible impacts.

Unit II : Overview of impacts – directly & indirectly measurable impacts w.r.to air, noise & water.
Screening and scoping in EIA, terms of reference for conducting EIA, methodologies of EIA-checklists, matrices, overlays, cost benefit analysis, & networks.

Unit III : Framework of EIA – scope of EIA, baseline data collection, prediction of impacts, evaluation of impacts, battelle environmental evaluation system, environmental quality monitoring.

SECTION B

Unit IV : Environmental legislation – basic concepts, critical issues, civil liability, various enactment and their provisions – Water Act (1974,1988), Air Act (1981, 1988), Environmental Protection Act 1986, Role

of State & Central boards of pollution control, local Govt., social action groups.

Unit V : Environmental Audit – definition, concept of EA, types of environmental audit, benefits of environmental audit, scope & objectives, environmental statement, procedural aspects of conducting environmental audit, pre-audit phase, on-site audit phase & post-audit phase.
Sustainable development & environmental management, carrying capacity based developmental planning process, concept of carrying capacity, assimilative and supportive capacity, Environmental Management in India.

Unit VI : Resource Management Types of resources - terrestrial (soil) resources, minerals, plants & animals (biotic) resources, marine, fresh water, air & bioenergy resources, resource utilization-renewable and non-renewable resources, optimal use of resources, depletion of resources – causes & effects.

Recommended Books:

1) Environmental Impact Assessment: Rau & Woofes.
2) Environmental Impact Assessment: W.F. Canter, McGraw Hill.
3) Proceedings of Indo-British Workshop on EIA of Petrochemical. Industries and Environmental Audit, Jan. 1994, IAEM, Nagpur.
4) andbook on Pollution Control Acts, Central Pollution Control Board, New Delhi.
5) The New Environmental Age by R. K. Sapra, S. Bhardwaj, Ashish Pub. House, New Delhi.

PROGRAM ELECTIVE – V (3SFEE1):

(B)WATER SUPPLY AND WASTE WATER COLLECTION SYSTEMS

Course Objectives:

1. To study the Water transmission systems and water distribution systems.
2. To provide knowledge regarding the Design of rising mains.
3. To study the different types of sewer system.
4. To study Optimization Techniques Analytical solutions using different methods.

Course Outcomes:

At the end of the course the student will be able to:

1. Analyse the flow in closed and open pipe networks using various methods.
2. Acquire knowledge regarding the requisites for sewerage system design.
3. Find out the solutions by Calculus, Lagrange Multiplier method, Linear programming Optimization of water distribution systems including branching, water hammer, causes and prevention.
4. Carry out the Cost analysis and optimization of sewer system.

SECTION A

Unit I : Hydraulics of water mains: Water transmission systems and water distribution systems, analysis, different methods Relaxations methods, method of section, Equivalent pipe method, Maintenance of distribution systems.

Unit II : Design of rising mains, Analysis of flow Analysis of flow in closed and open pipe networks using various methods, Hardy Cross Method, Newton Raphson Method, Linear Method, CPM method, Distribution network, Pumps and Pumping station. Design of pump and pumping station.

Unit III : Types of sewer system , requisites for sewerage system design, Flow through sewers Hydraulics of sewers, Self-cleansing velocity, Sewer shape-their usefulness, sewer invert drop, Design of sewerage networks.

SECTION B

Unit IV : Pumps and pumping station: Requirement analysis of pumps, Design of pumping mains.

Unit V : Optimization Techniques Analytical solutions by Calculus, Lagrange Multiplier method, Linear programming Optimization of water distribution systems including branching, water hammer, causes and prevention.

Unit VI : Cost analysis and optimization of sewer system, Principles of Reliability analysis.

Recommended Books:

1. Watershed Hydrology, Peter E. Black, Prentice Hall, 1991.
2. Water Resources Systems, Planning and Management, R.N. Chaturvedi, New Delhi : Tata McGraw-Hill, 1987
3. Bhave P. R. And Gupta R, Analysis of Water Distribution Networks, Narosa Publishing Co., New Delhi (2006).
4. Bhave P.R, Optimal design of water distribution networks, Narosa Publishing Co., New Delhi (2003).
5. Engineering Optimization: Theory and Practice Book by S. S. Rao

PROGRAM ELECTIVE – V (3SFEE1):

(B) REMOTE SENSING AND GIS IN ENVIRONMENTAL ENGINEERING

Course Objectives:

1. To provide information about Surface-Water Hydrologic Data, Spatial techniques for Surface-Water Hydrology Modelling.
2. To study the Geospatial techniques for planning and design of Water-Supply.

3. To provide knowledge regarding Applications of Geo informatics for spatial management of resources.
4. To study the integrated applications using various technologies within Geo informatics.

Course Outcomes:

At the end of the course the student will be able to:

1. Design GIS-Based Wastewater Collection System Design.
2. Design GIS-Based Decision-Support Systems for Wastewater and Storm water Systems.
3. Gain knowledge regarding Geospatial technologies for Water Resources Monitoring and Forecasting.
4. Explain the Applications of Remote Sensing and Geographic Information Systems in Wildlife Mapping and Modelling.

SECTION A

Unit I : Surface-Water Hydrologic Data, Spatial techniques for Surface-Water Hydrology Modeling, Surface-Water Hydrology Models, ArcSWAT model and its applications; Groundwater Data, Ground water Models and spatial techniques for Groundwater Modeling and Visualization, The ArcHydro Data Model.

Unit II : Geospatial techniques for planning and design of Water-Supply, Geospatial techniques for planning and design of solid waste collection and Irrigation Systems, Spatial Database Development for Wastewater and Storm water Systems, GIS-Based Wastewater Collection System Design and Management Applications, GIS-Based Decision-Support Systems for Wastewater and Storm water Systems.

Unit III : Geospatial technologies for Water Resources Monitoring and Forecasting; Spatial Decision-Support Systems in River Basin Management; Spatial systems for floodplain mapping and management. Spatial techniques for Water Quality Monitoring and Modeling, GIS for Water Quality Database Development.

SECTION B

Unit IV : Applications of Geoinformatics for spatial management of resources: Run-off estimations, infiltration characteristics, groundwater potential and recharge characteristics, Watershed management, watershed prioritization, Sediment yield estimation, reservoir capacity studies, transportation design and planning, Spatial analyses for Environment Impact assessment, Monitoring and feedback, Natural indices, Concept of E-Governance using Geoinformatics, web GIS.

Unit V : Integrated applications using various technologies within Geoinformatics; methods and approach. Real time and temporal analysis using Geoinformatics. Multidisciplinary applications of Geoinformatics; integration of various segments. Geoinformatics for resources management and utilities management.

Unit VI : Taxonomy of Environmental Models in the Spatial Sciences. Geographic Data for Environmental Modeling and Assessment. Applications of Remote Sensing and Geographic Information Systems in Wildlife Mapping and Modeling. Land Use Planning and Environmental Impact Assessment Using Geographic Information Systems.

Recommended Books:

1. Lynn E. Johnson, Geographic Information Systems in Water Resources Engineering, CRC Press, 2008.
2. Praveen Kumar, Mike Folk, Momcilo Markus and Jay C. Alameda, Hydroinformatics: Data Integrative Approaches in Computation, Analysis, and Modeling, CRC Press, 2005. Allan Brimicombe, GIS, Environmental Modeling and Engineering, Second Edition, CRC Press, 2009. 4. Andrew Skidmore (Editor, Environmental Modelling with GIS and Remote Sensing, CRC Press), 2002

OPEN ELECTIVE – 1 (3SFEE2):
(A) BUSINESS ANALYTICS

Course Objectives:

1. To understand the role of business analytics within an organization.
2. To analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
3. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
4. To become familiar with processes needed to develop, report, and analyze business data.
5. Use decision-making tools/Operations research techniques.
6. Mange business process using analytical and management tools.
7. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.

Course Outcomes:

At the end of the course the student will be able to:

1. Demonstrate knowledge of data analytics.
2. Demonstrate the ability to think critically in making decisions based on data and deep analytics.

3. Demonstrate the ability to use technical skills in predicative and prescriptive modelling to support business decision-making.
4. Demonstrate the ability to translate data into clear, actionable insights.

SECTION A

1. Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics.

2.Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.

3. Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression, Important Resources, Business Analytics Personnel, Data and models for
Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

4. Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.
Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

5.Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models.

Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.
6. Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Recent Trends in : Embedded and collaborative business intelligence,
Visual data recovery, Data Storytelling and Data journalism.

Recommended Books:

1.Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.

2.Business Analytics by James Evans, persons Education.

OPEN ELECTIVE – 1 (3SFEE2):
(B) INDUSTRIAL SAFETY

Course Objectives:

1. To provide knowledge regarding industrial safety.
2. To study the fundamentals of maintenance engineering.
3. To study the fundamentals of maintenance engineering and the concept of fault tracing.

Course Outcomes

At the end of the course the student will be able to:

1. Acquire detailed knowledge regarding accidents, causes, types, results and control, mechanical and electrical hazards in industries.
2. Understand the aim of maintenance engineering and the primary and secondary functions and responsibility of maintenance department.
3. To perform periodic and preventive maintenance of the industries.

SYLLABUS

1. Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, Safety color codes. Fire prevention and firefighting, equipment and methods.

2. Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

3. Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

4. Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

5. Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Recommended Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

OPEN ELECTIVE – 1 (3SFEE2):
(C) OPERATION RESEARCH

Course Objectives:

1. To study Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis and Inventory Control Models.
2. To study Formulation of a LPP and Nonlinear programming problem.
3. To make one understand the scheduling and sequencing of different models.

Course Outcomes

At the end of the course the student will be able to:

1. Find Graphical solution by revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.
2. Evaluate Kuhn-Tucker conditions min using cost flow problem and max flow problem using CPM/PERT.
3. Schedule and sequence single server and multiple server models and also deterministic inventory models.

SYLLABUS

1.Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models

2.Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming

3. Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

4.Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

5.Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation

Recommended Books:

1 H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

OPEN ELECTIVE – 1 (3SFEE2):

(D) COST MANAGEMENT OF ENGINEERING PROJECTS

Course Objectives:

1. To introduce and overview the Strategic Cost Management Process Cost concepts in decision-making.
2. To study the concept of project in detail.
3. To study Cost Behaviour and Profit Planning Cost Behaviour and Profit Planning Marginal Costing.
4. To understand the Quantitative techniques for cost management.

Course Outcomes:

At the end of the course the student will be able to:

1. Understand Objectives of a Costing System.
2. Explain project execution as conglomeration of technical and nontechnical activities and detailed engineering activities.

3. Learn Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

SYLLABUS

1.Introduction and Overview of the Strategic Cost Management Process Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.

2. Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

3. Cost Behavior and Profit Planning Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of divisional profitability pricing decisions including transfer pricing.

4. Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory

Recommended Books:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

OPEN ELECTIVE – 1 (3SFEE2):
(E) COMPOSITE MATERIALS

Course Objectives:

1. To introduce the concept of composite materials.
2. To study reinforcements in detail.
3. To study the Manufacturing of Metal Matrix Composites and Polymer Matrix Composites**.**

Course Outcomes

At the end of the course the student will be able to:

1. Understand the advantages and application of composite, functional requirements of reinforcement and matrix and effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.
2. Acquire knowledge regarding the properties and applications of whiskers, particle reinforcements and the mechanical behaviour of composites.
3. Know the Laminar Failure Criteria that includes strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hydrothermal failure.

SYLLABUS

1. Introduction: Definition, Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

2. Reinforcements: Preparation-layup, curing, properties and applications of glass fibres, carbon fibres, Kevlar fibres and Boron fibres. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

3. Manufacturing of Metal Matrix Composites: Casting, Solid State diffusion technique, Cladding, Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration, Liquid phase sintering. Manufacturing of Carbon, Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

4. Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs, hand layup method, Autoclave method, Filament winding method, Compression moulding, Reaction injection moulding. Properties and applications.

5. Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hydrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Reference Book:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
1. Hand Book of Composite Materials-ed-Lubin.
2. Composite Materials – K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L. Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W. Tasi.

OPEN ELECTIVE – 1 (3SFEE2):

(F)WASTE TO ENERGY

Course Objectives:

1. To introduce the concept of Energy from Waste.
2. To study the concept of Biomass Pyrolysis, Biomass Gasification, and Biomass Combustion.
3. To understand Technology and status of bio-energy system.

Course Outcomes:

At the end of the course the student will be able to:

1. Classify the different types of wastes.
2. Acquire knowledge regarding the different types of systems used for the conversion of energy from wastes.
3. Design different systems for energy conversion.

SYLLABUS

1. Introduction to Energy from Waste: Classification of waste as fuel, Agro based, Forest residue, Industrial waste, MSW, Conversion devices, Incinerators, gasifier, digesters

2. Biomass Pyrolysis: Pyrolysis, Types, slow fast, Manufacture of charcoal, Methods, Yields and application, Manufacture of pyrolytic oils and gases, yields and applications.

3. Biomass Gasification: Gasifier, Fixed bed system, Downdraft and updraft gasifiers, Fluidized bed gasifiers, Design, construction and operation, Gasifier burner arrangement for thermal heating, Gasifier engine arrangement and electrical power, Equilibrium and kinetic consideration in gasifier operation.

4. Biomass Combustion: Biomass stoves, Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation, Operation of all the above biomass combustors.

5. Technology and status - Bio energy system, Design and constructional features, Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, Types of biogas Plants, Applications, Alcohol production from biomass, Bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

Recommended Books:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

SEMINAR & DISSERTATION (3SFEE3) PHASE – I

Student has to select a topic for dissertation, carry out literature review, find the literature gap, carry out 40% or more work on dissertation topic and submit the report and deliver the seminar based on it.

SEMESTER FOURTH

SEMINAR & DISSERTATION (4SFEE1) PHASE – II

Student has to carryout remaining dissertation work on the selected dissertation topic and submit the report. Seminar shall be delivered on the dissertation submitted. Marks shall be based on your work, Seminar and Viva-Voce on dissertation.

M.E. (Full Time) **Prospectus No. 131736**

संत गाडगे बाबा अमरावती विद्यापीठ

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6) M.E. (Electrical & Electronics Engineering)
7) M.E. (Computer Science & Information Technology)

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6 of 2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

SANT GADGE BABA AMRAVATI UNIVERSITY
DIRECTION

No. 32 /2012 Date : 18 /09/2012

Subject :- Corrigendum to Direrction No.31 of 2010, 57 of 2010 & 30 of 2012 regarding Examinations leading to the Degree of अभियांत्रिज्ञी पारंजत (Master of Engineering) (Full Time) तंत्रशास्त्र पारंजत (Master of Technology) (Semester Pattern... Credit Grade System)

Whereas, the Direction No.31/2010 in respect of the examinations leading to the degree of अभियांत्रिज्ञी पारंजत(Master of Engineering) (Full Time)/ तंत्रशास्त्र पारंजत (Master of Technology) (Full Time) (Semester Pattern.. Credit Grade System) is in existence**,**

AND

Whereas, the Schemes of teaching & examinations for various branches of Two Year Post Graduate Degree Course in Master of Engineering (Full Time) in the faculty of Engineering & Technology have been provided vide appendices A, B,C,D,E,F,G,H and I appended with Direction No. 31 of 2010,

AND

Whereas, the provisions for the admissions and other detailed provisions to the Degree of Master of Engineering (Full Time) are prescribed by the Direction No. 31 of 2010,

AND

Whereas, the Direction No. 30/2012 which was issued as Corrigendum to Direction No. 31 of 2010 for revised Schemes of teaching and Examinations of M.E. Civil (Structural Engg.) (Full Time) is in existence,

AND

Whereas, the proposals were received from the Principal, I.B.S.S. College of Engg., Ghatkheda, Amravati, Principal, P.R. Pote (Patil) College of Engg., Amravati, Principal, S.S.G.M. College of Engg., Shegaon, Principal, P.R.M.College of Engg. & Mngt., Badnera and H.O.D., P.G. Deptt. of Computer Science, Sant Gadge Baba Amravati University, Amravati regarding starting of new course i.e. M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), M.E. (Electrical & Electronics Engg.) (Full Time), M.E. (Computer Science & Information Technology)(Full Time) respectively from the current Academic Session 2012-2013,

AND

Whereas, the Board of Studies in Computer Science & Engineering in its meeting held on 29.08.2012 resolved to recommend the scheme of teaching & examination, Eligibility Criteria and draft syllabus of Master of Engineering in Computer Science & Information Technology course for its implementation from the current sessiion 2012-2013 and onwards,

AND

Whereas, Hon'ble Vice Chancellor has accepted the Scheme of teaching & examination, Eligibility Criteria with correction and draft syllabus of Master of Engineering in Computer Science & Information Technology course under section 14(7) of the Maharashtra Universities Act, 1994 on behalf of the Faculty of Engineering & Technology and Academic Council,

AND

Whereas, the Management Council in its meeting held on 16.5.2012, vide item No. 175 has considered and approved the recommendations of Academic Council to start M.E. in Computer Science & I.T. in the P.G. T. Deptt. of Computer Science of Sant Gadge Baba Amravati University,

AND

Whereas,the Management Council in its meeting held on 14.08.2012, vide item No. 251 has resolved to refer the proposal for starting M.E.(Computer Science & Information Technology) Course to the Board of Studies in Computer Engineering in the faculty of Engineering & Technology, for consideration and recommendation in this respect,

AND

Whereas, the Academic Council in its meeting held on 28-8-2012 vide Item No.96 has considered and approved the Schemes of Examinations and Syllabi alongwith Eligibility Criteria for admission to M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), and M.E. (Electrical & Electronics Engg.) (Full Time) alongwith the corrections received from the Chairman, Board of Studies in Civil Engineering (including Construction Technology) in the revised scheme of teaching & examinations of first & second Semester of M.E.Civil (Structural) Engineering which was already approved by theAcademic Council inits meeting held on 05.05.2012,

AND

Whereas, the Schemes of Examinations and Syllabi alongwith Eligibility Criteria for admission to the courses as mentioned in above paragraph are to be implemented from the current academic session 2012-2013 in phase wise manner,

AND

Whereas, admissions to the First Year of Master of Engineering (Full Time) course are to be made in the Academic Session 2012-2013,

AND

Whereas, the matter for admission of the students at the examination is required to be regulated by an Ordinance,

AND

Whereas, the Schemes of Examinations for the said courses in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas, the process of making an Ordinance and the Regulation is likely to take some time,

AND

Whereas, the Syllabi along with the Schemes of Examinations of the above mentioned courses for Semester I & II of M.E. (Full Time) Courses are to be made available for the students admitted during the session 2012-2013,

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of Section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under :-

1. This Direction shall be called " Corrigendum to Direrction No.31 of 2010, 57 of 2010 & 31 of 2012 regarding Examinations leading to the Degree of अभियांत्रिकी पारंजत (Master of Engineering) (Full Time) तंत्रशास्त्र पारंजत (Master of Technology) (Semester Pattern... Credit Grade System) Direction, 2012."

2. This Direction shall come into force with effect from the session:

   i) 2012-2013 for Semester -I & II and,

   ii) 2013-2014 for Semester - III & IV

3. The Eligibility Criteria for admission to the degree of Master of Engineering (Full Time)/Master of Technology (Full Time) course shall have passed the Degree examination in Bachelor of Engineering/Bachelor of Technology in the branches mentioned under Column No.2 of the following table against the respective courses :-

TABLE

	M.E./M.Tech.	B.E./B.Tech.of this University or any other statutory University/ Diploma
1.		2.
a)	M.E.Civil (Transportation Engg.)	Civil/Construction Engg. Similarly Diplma holders in Civil Engg. who have completed A.M.I.E. through the Institution of Engineerins (I),Kolkata
b)	M.E.Mechanical (Thermal Engg.)	Mechanical/Automobile Engg. Similarly Diploma holders in Mechanical Engg.who have completed A.M.I.E. through the Institution the Engineers(I),Kolkata.
c)	M.E.Mechanical (Adv.Manufac.& Mech. Systems Design)	Mechanical/Automobile/Production/ Industrial Engg. Similarly Diploma holders in Mechanical/Production Engg.who have completed A.M.I.E. through the Institution of Engineers, (I),Kolkata.
d)	M.E. (Electrical & Electronics Engg.)	Electrical Engg.,Electrical(Electronics & Power) Electrical & Electronics Engg.,Electronics Engg.,Industrial Electronics Engg., Electronics & Telecommunication Engg., Instrumentation, Electrical Power System, Biomedical Engg., Telecommunication Engg.,
e)	*M.E.(Computer Science & Information Technology)	Computer Technology, Computer Engineering, Computer Science & Engg.,Electronics & Tele. Engg., Information Tech.,Electronics Engg., Electrical & Electronics Engg.,

* The process of admission shall be as per G.R. issued from time to time by the Higher & Technical Education Department, Government of Mahrashtra, Mumbai.

4. The Schemes of Examinations for M.E. Civil (Transportation Engg.) (Full-Time), M.E. Mechanical (Thermal Engg.) (Full-Time), M.E. Mechanical Engg. (Advanced Manufacturing & Mechanical Systems Designs) (Full Time), M.E. (Electrical & Electronics Engg.) (Full Time), M.E. (Computer Science & Information Technology)(Full Time) shall be as per the appendices-A, B, C, D and E respectively, appended with this Direction.

5. Following corrections shall be carried out in Direction No. 30 of 2012:-

a) In Appendix, Under the Schemes of Examination of First Semester of Master of Engineering Civil (Structural Engg.) (Full-Time) -

(i) Under the column of "Minimum Pass Marks" the words "College assessment" shall be substituted by the word "Subject" and the figure "10" against subject Sr.No. 1 to 5 of the same column shall be substituted by the figures "50",

(ii) Under the column "Name of the subject", against Sr. No. 6 and 7, the word "Studio" be substitued by the word "Lab" respectively.

b) In Appendix, Under the Schemes of Examination of Second Semester of Master of Engineering Civil (Structural Engg.) (Full-Time) -

(i) Under the column of "Minimum Pass Marks" the words "College assessment" shall be substituted by the word "Subject" and the figures "10" against subject Sr.No. 1 to 5 of the same column shall be substituted by the figures "50",

(ii) Under the column "Name of the subject", against Sr. No. 6 and 7, the word "Studio" be substitued by the word "Lab" respectively.

6. Other related provisions of the Direction No. 31 of 2010 shall be applicable for the above mentioned courses.

Date : /09/2012

(Mohan K. Khedkar)
Vice-Chancellor

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)

CIVIL ENGINEERING (TRANSPORTATION ENGINEERING AND MANAGEMENT)

CREDIT GRADE SYSTEM

Appendix - A

First Semester																				
			TEACHING SCHEME					EXAMINATION SCHEME												
			HOURS / WEEK					THEORY							PRACTICAL					
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS		MAX. MARKS		TOTAL	MIN. PASSING MARKS
												THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL		
01	1SFTR1	Trafic Engineering and Field Studies	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	1SFTR2	Transport Planning and Management	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	1SFTR3	Design and Construction of Pavement	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	1SFTR4	Docks Harbour and Airport Engineering	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	1SFTR5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	1SFTR6	Trafuc Engineering and Field Studies (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	1SFTR7	Design & Construction of Pavement (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
															TOTAL		600

Elective – I 1) Applied soil mechanies 2) DESIGN OF BRIDGES

Second Semester																				
01	2SFTR1	Advanced Rail Road Engineering	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	2SFTR2	Road Safety and Management System	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	2SFTR3	Environmental Impact Assessment	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	2SFTR4	Elective – II	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	2SFTR5	Elective – III	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	2SFTR6	Road Safety and Management System (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	2SFTR7	Environmental Impact Assessment (Lab)	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective –II – 1) Geometric Design of Transportation Facilities 2)Theory and Application of GIS
Elective –III – 1) Transprtation Economics & Evaluation 2) Transportaion Systems.

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**3 SFTR 1**	**SEMINAR AND DISSERTATION**	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
											TOTAL **100**

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**4 SFTR 1**	**SEMINAR AND DISSERTATION**	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL **300**
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertatio guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

MECHANICAL ENGINEERING (THERMAL ENGINEERING)

CREDIT GRADE SYSTEM

Appendix - B

First Semester

			TEACHING SCHEME						EXAMINATION SCHEME									
			HOURS / WEEK						THEORY						PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS		DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS THEORY PAPER	MIN. PASSING MARKS SUBJECT	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
01	1MTE1	Advanced Mathematics	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
02	1MTE2	Advanced Thermodynamics	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
03	1MTE3	Fluid Dynamics	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
04	1MTE4	Advanced Heat Transfer	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
05	1MTE5	Elective – I	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
06	1MTE6	Fluid dynamics Labs	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
07	1MTE7	Advanced Heat Transfer Lab	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
		TOTAL	20	0	4	24	22					500					100	
																TOTAL		600

Elective – I 1) Waste Management & Energy Generation Systems. 2) Energy Conservation & Power Plant Economics
3) Modern Energy Sources 4) Environmental Pollution Control

Second Semester

01	2MTE1	Advanced Internal Combustion Engines.	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
02	2MTE2	Advance Refrigeration Engineerings	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
03	2MTE3	Research Methodology	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
04	2MTE4	Elective – II	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
05	2MTE5	Elective – III	4	0	0	4	4		3	80	20	100	40	50	–	–	–	–
06	2MTE6	Advance Internal Combustion Engine Lab	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
07	2MTE7	Advanced Refrigeration Engineering Lab	0	0	2	2	1		–	–	–	–	–	–	25	25	50	25
		TOTAL	20	1	2	23	22					500					100	
																TOTAL		600

Elective –II – 1) Heat Exchanger Design 2) Advanced Air Conditioning Systems 3) Finite Element Methods 4) Gas Turbine and Jet Propulsion
Elective –III – 1) Fuels and Combustion 2) Solar Energy 3) Mechatronics 4) Computational Fluid Dynamics.

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**3 MTES**	**SEMINAR AND DISSERTATION**	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
											TOTAL 100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**4 MTEP**	**SEMINAR AND DISSERTATION**	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL 300
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

MECHANICAL ENGINEERING (Advanced Manufacturing & Mechanical System Design)

CREDIT GRADE SYSTEM

Appendix - C

First Semester

			TEACHING SCHEME					EXAMINATION SCHEME										
			HOURS / WEEK					THEORY						PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS		MAX. MARKS		TOTAL	MIN. PASSING MARKS
												THEORY PAPER	SUBJECT	EXTERNAL	INTERNAL		
01	1MMD1	Advanced Manufacturing Processes	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	1MMD2	Advanced Machine Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	1MMD3	Computer Aided Design and Engineering	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	1MMD4	Design of Material Handling Equipments	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	1MMD5	Elective – I	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	1MMD6	Advanced Manufacturing Processes- Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	1MMD7	Computer Aided Design and Engineering Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	0	4	24	22				500					100	
															TOTAL		600

Elective – I 1) Reliability, Maintenance Management & Safety, 2) New Product design 3) Lean Manufacturing
4) Design for Manufacturing and Assembly 5) Ergonomics of Manufacturing

Second Semester

01	2MMD1	Advanced Material Technology	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	2MMD2	Required Prototyping and Tooling	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	2MMD3	Mechatronics in System Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	2MMD4	Experimental Stress Analysis	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	2MMD5	Elective – II	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	2MMD6	Mechatronics in System Design Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
07	2MMD7	Experimental Stress Analysis Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective –II – 1) Optimization Methods in Engineering Design, 2) Advanced Machine Tool Design 3) Total Quality Management
4) Computer Assisted Production Management, 5) Concurrent Engineering & Product Lifecycle Management

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**3 MMDS**	**SEMINAR AND DISSERTATION**	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
										TOTAL	**100**

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	**4 MMDP**	**SEMINAR AND DISSERTATION**	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL 300
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Dissertation : Title of the dissertation work to be submitted to the University on or before 15th Sept. (for regular examination) and 15th of February (for supplementary exam.).

Semester IV

Seminar : to be delivered on the complete work of dissertation. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Note : Thesis of dissertation work must be submitted to the University on or before 30th April (for regular exam.) and 30th November (for supplementary exam.). Thesis of Dissertation work be submitted with late fee to the University upto 31 May (for regular exam.) and 31st December (for supplementary exam.). The late fee shall be charged as in case of Examination form.

Notes : 1. Student should fill the examination form in the begining of III semester jointly for III & IV semester.

2. Single marksheet for III & IV semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)

ELECTRICAL & ELECTRONICS ENGINEERING

CREDIT GRADE SYSTEM

Appendix - D

First Semester

			TEACHING SCHEME					EXAMINATION SCHEME										
			HOURS / WEEK					THEORY						PRACTICAL				
Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total HOURS	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS THEORY PAPER	MIN. PASSING MARKS SUBJECT	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
01	1EEEME1	Advanced Control Systems	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	1EEEME2	Advanced Power Electronics	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	1EEEME3	Advanced Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	1EEEME4	VLSI Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	1EEEME5	Modelling & Analysis of Electrical Machines	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	1EEEME6	Seminar	0	1	0	1	1	_	_	_	_	_	_	_	50	50	25
07	1EEEME7	VLSI Design-Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Second Semester

01	2EEEME1	Digital Instrumentation	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
02	2EEEME2	Embedded Systems Design	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
03	2EEEME3	Neuro Fuzzy Control	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
04	2EEEME4	Elective- I	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
05	2EEEME5	Elective- II	4	0	0	4	4	3	80	20	100	40	50	_	_	_	_
06	2EEEME6	Seminar	0	1	0	1	1	_	_	_	_	_	_	_	50	50	25
07	2EEEME7	Embedded Systems Design-Lab	0	0	2	2	1	_	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	2	23	22				500					100	
															TOTAL		600

Elective- I : 1) Power Electronic Controlled Drives 2) Digital Communication
Elective- II : 1) Flexible AC Transmission Systems 2) Digital Image Processing

Third Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	3EEEME1	SEMINAR AND DISSERTATION	_	_	6	6	15		100	100	50
		TOTAL	_	_	**6**	**6**	**15**			**100**	
											TOTAL 100

Fourth Semester

Sr. No.	Subject Code	Subject	Lecture	Tutorial	Practical	Total	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MIM. PASSING MARKS
01	4EEEME1	SEMINAR AND DISSERTATION	_	_	12	12	30		200	100	300	150
		TOTAL	_	_	**12**	**12**	**30**				**300**	
												TOTAL 300
												GRAND TOTAL 1600

Semester III

Seminar : Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

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Semester IV

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TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULLTIME)

COMPUTER SCIENCE & INFORMATION TECHNOLOGY

CREDIT GRADE SYSTEM

Appendix - E

First Semester

S.No.	Subject Code	Subject	TEACHING SCHEME HOURS/WEEK Lecture	Tutorial	Practical	TOTAL HOURS	CREDITS	EXAMINATION SCHEME THEORY DURATION OF PAPERS (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS THEORY PAPER	MIN. PASSING MARKS SUBJECT	PRACTICAL MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
01	1RNME1	Advance Computer Architecture	3	0	0	3	3	3	80	20	100	40	50	--	--	--	--
02	1RNME2	Distributed Operating System Design	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
03	1RNME3	Distributed Database System	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
04	1RNME4	Wireless Communication & Network Computing	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
05	1RNME5	Elective-I	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
06	1RNME6	CSIT Lab-I	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
07	1RNME7	CSIT Lab-II	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
08	1RNME8	Seminar & Technical Paper Writing	0	1	0	1	1	--	--	--	--	--	--	--	50	50	25
		TOTAL	**19**	**1**	**4**	**24**	**22**				**500**					**150**	
															TOTAL		**650**

Elective-I: 1) Expert System Design & Intelligent System 2) Algorithmics 3) Information Technology & Management

Second Semester

01	2RNME1	Real Time Embedded Systems	3	0	0	3	3	3	80	20	100	40	50	--	--	--	--
02	2RNME2	Performance Analysis For Imaging Systems	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
03	2RNME3	Information Technology & Security	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
04	2RNME4	Software Engineering, Testing & Reliability	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
05	2RNME5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	--	--	--	--
06	2RNME6	CSIT Lab-III	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
07	2RNME7	CSIT Lab-IV	0	0	2	2	1	--	--	--	--	--	--	25	25	50	25
08	2RNME8	Seminar	0	1	0	1	1	--	--	--	--	--	--	--	50	50	25
		TOTAL	**19**	**1**	**4**	**24**	**22**				**500**					**150**	
															TOTAL		**650**

Elective-II : 1) Advanced Computing Techniques 2) Mobile Computing 3) Digital Media Development

Two Year Post Graduate Degree Course in Master of Engineering (Full-Time) (CGS)
Computer Science & Information Technology

Third Semester

S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL	CREDITS		INTERNAL MARKS	TOTAL	MM. PASSING MARKS
01	3RNME1	SEMINAR AND DISSERTATION	--	--	6	6	15		100	100	50
		TOTAL	**--**	**--**	**6**	**6**	**15**			**100**	
											TOTAL 100

Fourth Semester

S.No.	Subject Code	Subject	Lecture	Tutorial	Practical	TOTAL	CREDITS		EXTERNAL MARKS	INTERNAL MARKS	TOTAL	MM. PASSING MARKS
01	4RNME1	SEMINAR AND DISSERTATION	--	--	12	12	30			100	300	150
		TOTAL	--	--	**12**	**12**	**30**			**100**	**300**	
												TOTAL 300
												GRAND TOTAL 1700

Semester III

Seminar: Seminar to be delivered on work completed during third semester. 50 internal marks out of 100 will be assessed by a Committee consisting of Head of Department, dissertation guide and subject expert appointed by Principal of the College / Head of University Department. Remaining 50 internal marks will be given by guide based on performance.

Semester IV

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SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
ELECTRONICS & TELECOMMUNICATION (C.G.S.)

SEMESTER I

1ENTC1 ADVANCED OPTICAL COMMUNICATION

SECTION - A

Unit I : Optical Fibre basics and Transmission Characteristics:-
Prorogation of light in planer and circular optical waveguides, Numerical Aperture, Modes in optical fibres, Attenuation in single and multimode fibres, Inter-modal and chromatic dispersion of single mode and multi-mode fibres, Waveguide dispersion, Bandwidth of single mode and multimode fibres, Polarization mode dispersion, Dispersion Compensation fibres, Techniques for reducing fiber losses.

Unit II : Optical Sources, Detectors and Optical fibre measurements

Optical Sources: Absorption & emission of radiation, Einstein Relations, Population inversion, Optical feedback and LASER oscillations, Threshold Conditions, Principles of LASER diode, characteristic and efficiency, Semiconductor injection LASER, Injection LASER characteristics.

Optical Detectors: Optical Detection principles, PIN photodiode, Avalanche photodiodes, Metal semiconductor photo detectors, Noise in P-N photo diode.

Measurements: Fibre attenuation measurement, Fibre dispersion measurement, Fibre reflective index profile measurement, Fibre cut-off wavelength measurement, Fibre NA and diameter measurement, Reflectance and optical return losses , field measurement.

SECTION- B

Unit III : Optical fibre links and components of fibre optic network:-
Link power budget, rise time budget, transmission distance for single mode links, Power penalties in design, Semiconductor optical amplifiers, Erbium Doped Fibre amplifier (EDFA), Stimulated Raman's Scattering, Raman Amplifiers, Optical parametric amplifiers.

Passive Components, switches and functional modules:-
Directional couplers, fixed and tuneable optical filters, isolators, circulators and attenuators, Concept of optical switching,

optical switches, wavelength converters, Optical add/drop multiplexers, optical cross connectors.

Unit IV : WDM Devices and it's Application
Hybrid & planer wave guide devices, Active WDM devices, Wavelength non selective devices, System application. Long Haul Broad Bandwidth Transmission System : Designing systems for long haul broad bandwidth consideration-Outage, Bit error rate, Cross connect, Low & high speed inter-phases, Multiplex / De-multiplex consideration, Regenerator spacing, Degeneration & Allowances

REFERENCE BOOKS:

1) Fiber Optic Communication Technology by Djafar Mynbaev, Lowell Scheiner, Pearson Education 2011.
2) Optical Fiber communication Principles and Practice by John M Senior, 3rd Ed, Pearson Education.
3) Optical Fiber Communication by Gerd Keiser, 4th Ed, McGraw Hill
4) Optical Network by Raju Ramswami (2nd Edition)

1ENTC2 RANDOM PROCESSES

SECTION-A

Unit - I : Scalar Random Variables: -
Concept of random variable, Discrete random variable, Continuous random variable, Expectations & Moments, Characteristics functions, Functions of random variables, Moment generation function, Central Limit theorem (CLT), Generation of random numbers.

Unit - II: Multi-dimensional Random Variables: -
Joint distribution function, Joint density function, Marginal distribution function, Conditional distribution, Covariance & Covariance matrix, Expectations & Moments, Mean and Variance of weighted sum of Random Variables, Joint Gaussian Random Variables

SECTION -B

Unit - III: Random Processes and Statistical Models for Random Signals:-
Concept of random process, Characterization and Classification, Correlation function, Properties of Auto Correlation function, Relationship between two Random Processes, Properties of

Cross Correlation function, Gaussian Random Processes. Introduction to White noise, Random Walks, Brownian motion

UNIT- IV: Power Spectral Density (PSD): -

Concept of Power Spectral Density, Properties of PSD, Power Spectral Estimation, Cross Spectral Density, Power Spectrum in Laplace Domain

REFERENCE BOOKS:

1) Probabilistic Random Signals and Statistics by X Rong Li, CRC Press
2) Random Signals and Systems by Bernard Picnicbono, PHI.
3) A First Course in Probability by Shelabo Ross, Pearson Education

1ENTC3 DIGITAL COMMUNICATION TECHNIQUES

SECTION -A

Unit -I : Characterization of Communication Signal and Optimum Receiver for AWGN Channel:-

Signal Space representation, Memory less Modulation methods, Linear Modulation with memory, Non- linear Modulation methods with memory, CPFSK & CPM, Power Spectra of Linear Modulated signal, Power Spectra of CPFSK & CPM Signals, Correlation Demodulator, Match Filter Demodulator, Optimum Detector, Probability of Error for Binary & M-array signals

Unit - II : Source and Channel Coding:-

Average mutual information & Entropy, Coding of discrete memory-less sources, Discrete Stationary Sources, Lempel-Ziv algorithm; Coding of analog sources, Rate distortion function, Scalar Quantization & Vector Quantization, Temporal and Spectral Waveform Coding, BCH codes, Reed Soloman codes, Reed Muller Codes, Convolution Codes, Transfer function of convolution codes, Viterbi decoding algorithm, stack algorithm(No problems expected)., trellis coded modulation.

SECTION: B

Unit -III : Signal Design for Band Limited Channel & Equalization:-

Design of band limited signal for zero ISI, Nyquist Criterion, Design of band limited signal for controlled ISI, partial response signaling, Data detection for controlled ISI

Linear Equalization: Peak Distortion Criterion, Mean Square Error (MSE) criterion, Decision Feedback Equalization, Coefficient Optimization, Adaptive Linear Equalizer, Zero Forcing Algorithm, LMS Algorithm.

Unit -IV : Spread Spectrum Techniques:-

Generation of PN sequence, direct sequence spread spectrum system, processing gain, jamming margin, application of direct sequence spread spectrum signal, frequency hopped spread spectrum signal, time hopping spread spectrum signal, synchronization of spread spectrum signal – acquisition & tracking.

REFERENCE BOOKS :

1) Digital Communication by J.G. Proakis, Fourth Ed, Mc Graw Hill
2) Digital Communication Techniques by Simon Haykin, John Wiley & Sons
3) Digital Communication Fundamentals and applications by Bernard Sklar, 2nd Ed, Pearson Education Asia
4) Advanced Digital Communication System and Signal Processing techniques by Dr. Kemilo Feher Prentice Hall International

1ENTC 4 DIGITAL SIGNAL PROCESSING AND APPLICATIONS

SECTION –A

Unit -I: Design of Digital FIR filters:-

Filter specifications, Magnitude & Phase response of digital filter.

Linear Phase filters: Type I, Type II, Type III, & Type IV.

FIR filter design using Impulse Response Truncation: Low pass, High pass filter & Band pass filter, FIR design using Hamming, Hanning, Blackman & Kaiser window, Differentiators, Hilbert transforms, Equi-ripple FIR filter design.

Unit -II: Design of Digital IIR filter:-

Analog filter basics: Butterworth, Chebyshev, Inverse Chebyshev filters, Elliptic filters, IIR filter design using impulse invariance, Bilinear Transform, Matched Transformation, Differentiation method (Backward difference method), Frequency transformations in Analog and Digital domain, frequency normalization, Finite word length problem, Quantization Effects on poles & zeros and frequency response

SECTION - B

Unit III: Multi-rate Digital Signal Processing:-
Decimation & Interpolation, Linear filtering with decimation and interpolation, Poly-phase filters, Filter banks, sub-band processing, Decimated filter banks, Uniform DFT filter banks, Quadrature mirror filters

Unit IV: DSP Processors and its Application:-
Architecture of TMS 320C67XX, Assembly language instructions, pipeline operations, Speech signal processing, Radar signal processing

REFERENCE BOOKS:

1) A Course in Digital Signal Processing by Boaz Porat John Wiley & Sons
2) Digital Signal Processing by J. P. Proakis, PHI
3) Real Time Digital Signal Processing- Implementation and Applications by Sen M. Kuo, Bob H.
   Lee and Wenshun Tian, 2nd Ed, John Wiley & Sons, 2006
4) Digital Signal Processing- A Computer based Approach by Sanjit K. Mitra, 4th Ed, Mc- Graw Hill
5) Digital Signal Processing: A Modern Introduction, Ashok Ambardar, Thomson, 2007
6) Digital Signal Processing, Thomas J. Cavicchi, John Wiley

ELECTIVE-I

1ENTC5 (A) REAL TIME EMBEDDED SYSTEM

SECTION – A

Unit I : Embedded System Hardware: -
Embedded systems overview, Hardware components like microcontroller, GPP,ASSP,AISP, SOC, Details of 32 bit ARM SOC architecture, Organization, Analog, Digital & High speed I/O for embedded systems, Interfacing SRAM, DRAM and flash memories with microcontroller, memory management, allocation of memory to program segments and blocks, memory maps.

Unit II : Embedded System Software: -
Techniques of writing efficient C code for microcontroller, C data types for ARM, Signed & unsigned data types, limitation of char & data types, storage class – static & extern, volatile keyword, operation on bits, functions, ARM Thumb procedural

call standard, pointers & arrays, conditional statements – if-else, switch, structure, conditional loops – for & while, preprocessing, compiling, cross compiling, compiler driver, startup code and board support packages, program segments calling assembly routines in C, interrupt handling in C, interrupt latency.

SECTION - B

Unit III: Uniprocessor Real Time Scheduling: -
Real time systems, tasks and its states, task assignment & scheduling, scheduling algorithms – rate monotonic and earliest deadline first, inter-task communication, semaphore, priority inheritance protocol, priority ceiling protocol, real time operating system features, features of micro COS – II, RTOS.

Unit IV: Embedded System Architecture & Design: -
Embedded system implementation aspects & estimation modeling, embedded system architecture, validation and debugging of embedded systems, hardware – software co-design in an embedded system, ARM Philips NXP LPC 2148 programming of on – chip components like ADC and interfacing external peripherals like keyboard, LCD, Stepper Motor.

REFERENCE BOOKS:

01) Embedded Systems by Rajkamal, 2nd Ed, Tata McGraw Hill
02) Embedded Real-time Systems Programming by Iyer & Gupta, Tata McGraw Hill
03) ARM System on Chip Architecture by Furber, 2nd Ed, Pearson India
04) Intro. To Embedded Systems by K.V. Shibu, McGraw Hill
05) Philips NXP LPC 2148 user manual
06) Scheduling in Real Time systems by Cottet, Delacroix & Mammeri, John Wiley & Sons
07) Embedded system design A Unified Hardware/software approach by Frank Valid & Tony Givangis, Publishing 1999
08) Embedded systems: World Class Designs- Jack Ganssle, Newness Publication, Australia.
09) Embedded Microprocessor Systems: Real world design – Stuart R & Ball P.E., 3rd Ed., Newness, Imprint Elsevier Science.

1ENTC5 (B) DATA COMPRESSION
SECTION- A

UNIT- I : Introduction and Mathematical background: -
Lossless compression, Lossy compression, Measure of performance, Modeling and Coding, Physical model, Probability model, Markov model, Composite Source model, Uniquely decodable codes, Prefix codes, Kraft-McMillan inequality
Huffman coding: Minimum variance, optimal, length, Extended Huffman codes, Non-binary Huffman codes, Adaptive Huffman coding, Application of Huffman codes.
Arithmetic coding: Coding a sequence, generating binary codes, Adaptive arithmetic coding, Application of arithmetic coding

Unit - II : Dictionary based compression, Context based compression and Lossless image compression: -
Static and adaptive dictionary coding techniques, Application related to file compression and Image Compression, V.42 bis Standard.
Context based Compression: Prediction with Partial Match (PPM), Burrows Wheeler Transform, Associative coder,
Lossless Image Compression: JPEG, Run-length coding, facsimile coding standards, progressive Image transmission

SECTION- B

Unit –III: Quantization Transform Coding and Sub-band Coding: -
Scalar Quantization, Quantization problem, Uniform quantization, Adaptive quantization, Non-uniform Quantization, Entropy Coded Quantization.
Vector Quantization (VQ): Advantages over Scalar Quantization, The Linde-Buzo-Gray algorithm, Tree Structured, Vector Quantization, Structured VQ.
Transform Coding: K L Transform, DCT, DST, Discrete Walsh-Hadamard transform, Applications of Transform coding to Image and audio compression
Sub band Coding: Filters, Basic Sub-band coding, algorithm, design of Filter Banks, Application to speech coding audio coding and Image compression

Unit - IV: Audio, Image and Video Compression: -
Spectral masking, Temporal masking, Psychoacoustic model, MPEG Audio coding, MPEG Advanced Audio coding, Dolby digital.

Image Compression : Predictive techniques like PCM, DPCM and DM, JPEG,JPEG-2000.
Video compression: Video signal representation, H.261 Standard by ITU-T, model based coding MPEG-1 and MPEG-2 Video Standards, ITU-T H.263 and H.264 Standards, Packet Video

REFERENCE BOOKS:

1) Introduction to Data Compression by Khalid Sayood, 2nd Ed, Academic Press.
2) Data Compression Complete Reference by David Salomon, 3rd Edition, Springer 2004.
3) Digital Image Processing by S Jayaraman, S Esakkirajan, T Veerakumar, Tata Mc-Graw Hill.
4) Digital Image Processing by R.C.Gonzalez and Woods 3rd Edition, Pearson Education.

1ENTC5 (C) ARTIFICIAL INTELLIGENCE
SECTION-A

Unit I : Fuzzy Set theory: -
Introduction to Fuzzy sets, Fuzzy relation, Membership functions, Fuzzification, De-fuzzification, Fuzzy logic, Fuzzy rule based system, Fuzzy inference system

Unit II : Fuzzy Decision Making: -
Fuzzy modeling, Adaptive Neuro-Fuzzy Inference system, Cognitive Neuro-Fuzzy modeling, Neuro-fuzzy control, Application of Neuro Fuzzy control

SECTION-B

Unit III: Artificial Neuron model: -
Single and multilayer perceptron neural network (MLP)
Learning process: Training by back-propagation, Swarm particle optimization, Genetic algorithm, simulated annealing, basic concept of bidirectional associative memory (BAM), Self organization feature map, Optical neural network.

Unit IV : Neural Networks and Applications: -
Recurrent Networks, Hamming Network, Support Vector Machine**,** Counter Propagation Networks, Cluster Discovery Network (ART), Applications of Neural Network in Character Recognition, Forecasting, Robot Kinematics and Biomedical signals .

REFERENCE BOOKS:

1) Fuzzy sets and Fuzzy Logic -Theory and Applications by George J. Klir, Bo Yuan, PHI
2) Neural Networks by Simon Haykin, Pearson Education

3) Neural networks, Fuzzy logic and genetic algorithms synthesis and applications by S. Rajasekaran, G.A. Vijayalakshmi Pai, Prentice Hall Inc (PHI)
4) Artificial Neural Networks by Zurada
5) Neuro Fuzzy and Soft Computing by Jang-Sun, Mezutani, Pearson Education
6) Introduction to Neural Networks using MATLAB 6.0 by S.N.Sivanandan, S. Sumathi, S.N. Deepa, McGraw Hill
7) Intelligent Systems & Controls by Laxmidhar Behera, Indrani Kar, Oxford University Press

1ENTC5 (D) CRYPTOGRAPHY AND NETWORK SECURITY

SECTION-A

Unit I : Overview: Services, Mechanisms and Attacks:-
The OSI Security Architecture, A model for network security.
Classical Encryption Techniques: Symmetric Cipher model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography .
Block Ciphers and Data Encryption Standards: Simplified DES, Block cipher principles, Data encryption, The Strength of DES, Differential linear cryptanalysis, Block cipher design principles, Block cipher modes of operations, Contemporary symmetric ciphers- Triple DES, Blowfish, RC5, Characteristics of Advanced symmetric block ciphers
Confidentiality using symmetric encryption: Placement of Encryption function, Traffic Confidentiality, Key distribution

Unit II: Public Key Cryptography and RSA:-
Principles of Public key crypto-systems, The RSA Algorithm, Key management, other public key crypto-systems, Key management, Diffle-Hellaman key exchange
Message Authentication and flash function: Authentication requirements, Authentication function, Message Authentication codes, Hash function, Security of Hash function & MACs

SECTION- B

Unit - III: Hash Algorithms:- MD5 Message Digest Algorithm, Secure Hash Algorithm Authentification Applications: Kerberos X-509, Authentication Service.

Unit - IV: Electronic Mail, IP & Web Security:-
Electronic Mail Security: Pretty good privacy, S/MIME IP

Security: Overview, IP Security Architecture, Authentifications, Header, Encapsulating Security Payload, Combining security Associations, key Management
Web Security: Web security considerations, System Security: Intruders, Malicious software, Viruses, Viruses and related threats Firewalls: Firewall design principles.

REFERENCE BOOKS:

1) Cryptography and Network Security by William Stallings, Third Edition, Pearson Education.
2) Network Security, Private Communication in Public World by Charlie Kaufman, Rudia Perlman, Mike Spenciner, Second Ed., Pearson Education Asia 2002.
3) Contemporary Cryptography by Rolf Oppliger, Artech Home Publication, 2005
4) Cryptography and Network Security by Atul Kahate, Tata McGraw Hill,2003

LABORATORIES

1ENTC6 Lab-I: The laboratory work shall consist of at least 8 experiments. The experiments shall be equally distributed and based on 1ENTC1 and 1ENTC3.

1ENTC7 Lab-II: The laboratory work shall consist of at least 8 experiments. The experiments shall be equally distributed and based on 1ENTC2 and 1ENTC4.

SEMESTER-II
2ENTC1 ADAPTIVE SIGNAL PROCESSING

SECTION -A

Unit I: Introduction to Random Signals: -
Random variables, Sequences and Stochastic Process, Random Signals and Distributions, Averages, Stationary Processes, Special Random signals & its Probability Density Functions (PDF), Weiner-Khintchin relations, Filtering Random processes, Non-parametric spectral estimation, Parametric methods of power spectral estimations

Unit II: Wiener Filter and Adaptive Filtering Algorithms: -
Mean Square Error (MSE), FIR Wiener filter, Wiener solution with Wiener filtering examples.
Algorithms: Eigen values of the correlation matrix, one dimensional gradient search method, Steepest Descent algorithm, LMS algorithm, Modified LMS algorithm, Examples of LMS algorithm.

Performance analysis: stability Constraints, Conversion Speed, excess MSE

SECTION - B

UNIT III: Kalman Filters and Square Root Adaptive Filters:
Introduction to Recursive Least-Squares Adaptive filters, Recursive minimum MSE for Scalar random variables, Kalman filtering problem, Innovation process and estimation of state, Kalman filtering, Square root Kalman filters, QR-RLS algorithm

UNIT IV : Applications of Adaptive filtering:
Adaptive Equalization, Adaptive noise cancellation, Adaptive Linear prediction, Adaptive Echo Cancellation, Adaptive Lattice Filters

REFERENCE BOOKS:

1) Adaptive filter Theory by Simon Haykin, 3rd Ed, Prentice Hall Inc, 2002
2) Real Time Digital Signal Processing- Implementation and Applications by Sen M. Kuo, Bob H. Lee and Wenshun Tian, 2nd Ed, John Wiley & Sons, 2006
3) Adaptive Filtering Primer with MATLAS by Alexander D. Poulanikas & Zayed M Ramadan, Taylor & Francis Series, CRS press.
4) Adaptive Digital Filters by Maurice G Bellanger, 2nd Edition, MARCEL DEKKAR INC Adaptive Nonlinear System Identification by T Ogunfummi, Springer

2ENTC2 WIRELESS COMMUNICATION

SECTION-A

Unit -I : Fundamentals of Wireless Communication : Evolution of wireless networks and challenges
Long term fading models: two ray model, diffraction model, scattering model, Shadow fading
Short term fading: Impulse response of time varying channels, Narrow band fading model, wide band fading models, discrete time model. Capacity of wireless channel, Capacity of AWGN channel, Capacity of flat fading channel, Capacity of frequency selective fading channel, Basic diversity combining techniques.

Unit II : Analog and Digital Cellular Mobile System:- Analog Cellular System: AMPS, NMT Digital Cellular System: GSM, GSM Architecture, TDMA frame structure, Traffic and Control channels, Voice Processing in GSM. IS -95 (CDMA one): Forward Modulation channel, Reverse Modulation channel.

SECTION-B

Unit III : Low power wireless communication systems, Data Networks and protocols:-
Cordless Telephony 2 (CT2), Digital Enhanced Cordless Telephony (DECT), PHS, PDC, WAP, PCS (Functional Architecture, Radio Specifications, Frame Structure).
Protocols: IEEE 802.11, IEEE 802.15.

Unit IV: Private Mobile Radio network and Introduction to 3G Systems:-
Private Mobile Radio (PMR): Introduction, user community, requirement of PMR services, PMR configurations, PMR standards, TETRA Network Architecture. IMT 2000: Radio aspects, Network Aspects and Regional initiatives
Universal Personal Communication: UPT, Concepts and Service aspects, Functional architecture, Routing, Scenarios for partitioning and location of service information, Access security, Basic concepts of UMTS.

REFERENCE BOOKS:

1) Wireless Networks by G. S. Papadimitriou, A. S Pomportisis, P Nicopolitidis, John Wiley & Sons.
2) Wireless Communication by Andrea Goldsmith, Cambridge University Press.
3) Mobile and personal Communication: Systems & Service by Raj Pandya, Prentice Hall India.
4) Digital Mobile Communication and TETRA Systems by John Dunlop, Demessie Girma, James Irvine, John Wiley & Sons.
5) Wireless communications: Principles and Practice by Theodore S. Rappaport, P.E.
6) Principles of Mobile Communication by Gordon L Stuber, 2nd Ed, Kluwer Academic Publishers
7) Mobile Cellular Telecommunication, William C Y Lee , Mc Graw Hill

2ENTC3 ADVANCED COMPUTER NETWORKS AND PROGRAMMING

SECTION- A

Unit - I: Basics of Communication Networks:-
Communication networks and services, Approach to network design, Key factors in Communication network, Evolution, Concept of Layering, OSI Reference model, TCP/IP

architecture, Barkley API, TCP/IP utilities, Concept of Space-Division Switching and Time- Division Switching, Time Space Time (TST) Switching

Unit - II: Queuing models: -

Delay analysis, Arrival rate, Traffic load, Erlang 'B' and Erlang 'C' concepts, Arrival process, Service time classification of queuing systems, M/M/1 queue and Basic multiplexer model, M/M/1 steady state probabilities, Effect of scale on performance, Average packet delay, M/M/C/C Systems, M/G/1 model, Service time, Variability and Delay in M/M/1 systems.

SECTION- B

Unit III: TCP/IP and Routing: -

Architecture IPV6 IP addressing ICMP, IGMP, ARP, RARP, DHCP, Transmission Control (TCP), TCP Segment, TCP flow control, TCP Congestion control, UDP, Mobile IP, Unicast Routing protocols, Multicast Routing Protocols

Unit IV: ATM Network and Advanced Network Architectures:-

Need for ATM, B-ISDN Reference model, ATM layers, ATM Adaptation layers, ATM signaling, PNNI Routing, QoS in ATM, Overlay model, MPLS, Integrated services, RSVP, Differentiated Services.

REFERENCE BOOKS :

1) Communication Networks by Leon Garcia, Wadeja, Tata Mc Graw Hill
2) Data and Computer Communication by William Stallings, 8th Edition, Pearson Education.
3) Data Communication and networking by Behrouz Furozan, Fourth edition, McGraw Hill.
4) TCP /IP Protocol Suite by Behrouz Furozan, McGraw Hill.
5) Internetworking with TCP/IP- Vol I, II, & III by D.E. Comer, PHI

2ENTC4 RF AND MICROWAVE CIRCUIT DESIGN

Unit I : Two Port RF Networks-Circuit Refrigeration

Low frequency parameters-impedance, admittance, hybrid and ABCD. High frequency parameters-Formulation of S parameters, properties of S parameters-Reciprocal and lossless networks, transmission matrix, Signal Flow Graph:

Unit II : RF Transistor Amplifier Design And Matching Networks

Amplifier power relation, stability considerations, gain considerations noise figure, impedance matching networks,

frequency response, T and Ð matching networks, microstripline matching networks (unilateral/bilateral)

Unit III : Microstrips Lines, Design, Analysis

Introduction, types of MICs and their technology, Propagating models, Analysis of MIC by conformal transformation, Numerical analysis, Hybrid mode analysis. losses in Microstrip, Introduction to coupled Microstrip, Even and odd mode analysis, Directional couplers, branch line couplers, Design and Fabrication of Lumped elements for MICs,

Unit IV : Microstrip Circuit Design And MMIC Technology

Introduction, Impedance transformers, Filters, High power circuits, Low power circuits, MICs in satelite and Radar. Fabrication process of MMIC, Hybrid MICs, Configuration, Dielectric substances, thick and thin film technology, Testing methods, Encapsulation and mounting of Devices.

TEXT BOOKS :

1) Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006.
2) Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc., 2006
4) M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007.
5) Hoffman R.K."HandBook of Microwave intergrated circuits",Artech House,Boston,1987.
6) Gupta .K.C and Amarjit Singh,"Microwave Intergrated circuits"John Wiley,New York,1975.

2 ENTC5 Elective-II
(A) MOBILE COMPUTING

Unit – I: Wireless network technology: Introduction to 3G and 4G mobile systems. Global System for Mobile Communication (GSM) , Wireless media access control protocols; Wireless LAN, TDMA, PRMA, CDMA, WCDMA.

Unit – II: Location management: Location management in internet, Location management in cellular phone network and PCN, performance issues, future research directions. Transport protocols in mobile environments: I-TCP, snooping protocols, Multicast transport services.

Unit – III: Services in wireless networks: Quality of service, Delays, error and packet loss, Error control schemes, Mobile distributed application support: Operating system support, Mobile

middleware and object architecture, Mobile transaction, Remote execution and mobile RPC, Cache strategies for wireless networks.

Unit – IV: Security issues in mobile and wireless: Traditional Security Issues, Mobile and Wireless Security Issues, Additional Issues(Liability, Fear, uncertainty and doubt, Fraud, Big bucks at stake), Additional Types of Attacks(man in the middle attacks, traffic analysis, Replay attacks, Buffer overflow attacks)

Approaches to security: Limit the signal, Encryption, Integrity codes, Ip security, Other Security related Mechanism (Authentication protocols, AAA, Special Hardware)

REFERENCE BOOKS:

1. Mobile Computing, edited by T. Imielinski and H.F. Korth, KluwerAcademic
2. Mobile computing by Asok Talukdar, Roopa Yawagal, TMH
3. Fundamentals of Mobile and Pervasive Computing by Frank Adelstein, Sandeep K.S. Gupta—TMT

2ENTC5 ELECTIVE-II
(B) COMMUNICATION SYSTEM DESIGN

Unit – I: Designers perspective of communication system: Wireless channel description, path loss, multi path fading Communication concepts, Receiver Architectures: Introduction, Overview of Modulation Schemes, Classical Channel, Wireless Channel Description, Path Losses: Detailed Discussion.

Unit – II: Multipath Fading: Channel model and Envelope Fading, Multipath Fading: Frequency Selective and Fast Fading, Summary of Standard Translation, Introduction Receiver Architectures, Receiver front End: general discussion, Filter Design, rest of Receiver Front Eng: Nonideatlites and Design Parameters, Derivation of NF, IIP3 of Receiver Front End, Partitioning of required NFrec_front and IIP3,rec_front into individual.

Unit – III: Low Noise Amplifier: Introduction, Wideband LNA, Design, Narrow band LNA:Impedance Matching, Narrowband LNA: Core Amplifier, Active Mixer: Introduction, Balancing, Qualitative Description of The Gilbert Mixer, Conversion Gain, Distortion, Low-Frequency Case: Analysis of Gilbert Mixer, Distortion, High- Frequency Case, Noise, A Complete Active Mixer, References, Problems.

Unit – IV: Analog to Digital Converters: Demodulators, A to D Converters used in receivers, Low cost Sigma delta modulators and it's implementation, Design Technology for Wireless Systems: Design entry / simulation, Validation and analysis tools

REFERENCE BOOKS:

1. VLSI for Wireless Communication- Bosco Leuing, (PE).
2. The design of CMOS Radio frequency integrated circuits – T Lee (Cambridge University press)
3. Analysis and design of analog integrated circuits – P Gray and R Meyer (John Wiley & Sons)
4. Microelectronics Transistor Amplifier, Analysis and design G Gonzalez (Prentice Hall)

2ENTC5 ELECTIVE-II
(C) OPTICAL NETWORKS

Unit I : SDH/SONET/WDM & DWDM

SONET/SDH architecture and protocols,Multiplexing structures, Functional components, virtual tributaries and containers, SONET/ SDH network elements, SONET/ SDH migration, Single wavelength limitations, WDM concepts and components, Introduction of DWDM,WDM network designs.

Unit II: Optical Networks ATM, IP

Basic of ATM, ATM virtual channels and path, ATM signalling Principal LANE, MOPA ATM in optical world. IP suit, Router and Switches. MPL's switching in IP, MPLS as an optical control channel, getting IP packets onto DWDM. Optical routers

Unit III: Photonic Packet switching and network survivability

Optical TDM, Synchronization, Header processing, Buffering, Burst switching Testbeds, Basic concept, Protection in SONET / SDM, Protection in client lager, Service class base on protection, Optical layer protection scheme, Network between layers.

Unit IV : Control Management

N/W management functions of SDH/SONET Frames, optical layers services and interfacing, layers within optical layers, Multivendor Interoperability performance and fault Management, Optical safety.

REFERENCE BOOKS:

1. Optical Network by Raju Ramswami (2nd Edition) Morban Kaufmann Elfpvier
2. Optical Networks– Third generation transport system -Uyless Black (Prentice Hall)
3. Opto Electronic computing system – Jordan
4. Optical networking and WDM- W. Goralski

2ENTC5 (D) SPEECH & AUDIO PROCESSING

SECTION - A

Unit I: Introduction – Speech production and acoustic phonetics, speech perception. Speech analysis: time and frequency domain techniques for pitch and formant estimation, cepstral and LPC analysis.

Unit II : Speech Enhancement: Microform Codes, Source coders, and Hybrid coders. Microphone Array processing, Noice Suppression, and Echo Canceller.

SECTION - B

Unit III : Speech Recognition: Basic pattern recognition, preprocessing, Parametic representation, evaluating the similarity of speech pattern (Accommodating both spectral and temporal variability), Network for speech recognition, Language model, artificial neural networks. Summary of current speech recognition design.

Unit IV: Speech synthesis & Applications: Articulatory, formant, and LPC synthesis, voice response and text-to-speech systems. Applications: data compression, vocoders, speech enhancement, speech recognition speaker recognition, aids for the speech and hearing impairments.

Reference Books :

1. D O'shaughnessy, Speech Communication: Human and Machine, Addison Wesley.
2. L R Rabiner and R W Schafer, Digital Processing of Speech Signals, Prentice Hall
3. J Flanagan, Speech Analysis, Synthesis, and Perception, Springer Verlag.
4. L.R. Rabiner and B. Juang " Fundamentals of Speech Recognition" Pearson Education (Asia)Pte. Ltd., 2004.

2ENTC6 Lab- I (Based on 2ENTC2 & 2ENTC3)

2ENTC7 lAB-I (Based on 2ENTC1 & 2ENTC4)

THIRD SEMESTER

3ENTC1 SEMINAR & DISSERTATION

(As per Given Scheme)

FOURTH SEMESTER

4ENTC1 SEMINAR & DISSERTATION

(As per Given Scheme)

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SYLLABUS PRESCRIBED FOR TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.) CIVIL ENGINEERING (TRANSPORTATION ENGINEERING & MANAGEMENT) (C.G.S.)

SEMESTER-I

1SFTR1 TRAFFIC ENGINEERING AND FIELD STUDIES

Introduction: Components of road traffic - the vehicle, driver and road. Objectives and scope of traffic engineering.

Traffic Engineering: Road user characteristics; human and vehicle characteristics, factors affecting road traffic; methods of measurement. Concepts of passenger car units for mixed traffic flow.

Traffic Engineering Studies and Analysis: Sampling in traffic studies; adequacy of sample size; application of sampling methods for traffic studies, objectives, methods of traffic study, equipment, data collection, analysis and interpretation (including case studies) of (i) Spot speed (ii) Speed and delay (iii) Volume (iv) Origin - destination (v) Parking . Traffic manoeuvres and Stream Characteristics; application in intersection design.

Probability and statistics for traffic engineering .

Traffic Regulations and Control: General regulations; Regulations on Vehicles, drivers and flow; Other regulations and control. Traffic management; noise and air pollution due to road traffic and method of control.

Traffic Control Devices: Traffic signs, markings, islands and signals. Different methods of signal design; redesign of existing signal including case studies. Signal system and co-ordination. Evaluation and design of road lighting.

ITS: Introduction to Intelligent Transport System- Application of ITS to Traffic Management System- Public Transportation Management System
Traffic Forecast: General travel forecasting principles, different methods of traffic forecast - Mechanical and analytical methods, Demand relationships, methods for future projection.

Design Hourly Volume for Varying Demand Conditions: Concept of Design vehicle units and determination of PCU under mixed traffic conditions, Price-volume relationships, demand functions. Determination of design hourly volume; critical hour concept.

Highway Capacity: Factors affecting capacity, level of service; Capacity studies Capacity of different highway facilities including unsignalised and signalised intersections.

REFERENCE BOOKS:

1. Kadiyali, L.R. 'Traffic Engineering and Transport Planning', Khanna Publishers.
2. Drew, D.R. 'Traffic Flow Theory and Control', McGraw Hill Book Co.
3. IRC and IS Publications.
4. Institute of Transportation Engineers, 'Manual of Transportation Engineering Studies', Prentice Hall
5. Khanna and Justo,Text book of Highway Engineering , Nemchand Brothers, Roorkee,2000.
6. Papacostas, C.A.,, Fundamentals of Transportation Engineering', Prentice-Hall of India Private Limited, New Delhi.2000.
7. William R. McShane and Roger P. Roess,, Traffic Engineering', Prentice hall, New Jersey,2000.
8. Drew, D.R., **'Traffic Flow Theory and Contro**l', McGraw Hill Book Co.
9. Pignataro, Louis; **'Traffic Engineering** - Theory and Practice', John Wiley.
10. IRC Third **Highway Safety Workshop**, Lecture Notes 1978 and other IRC publications.
11. Highway Capacity Manual. Transportation Research board .
12. Fundamentals of Transportation and traffic Operations. Pergamon, Elsevier science Inc

1SFTR2 TRANSPORT PLANNING AND MANAGEMENT

Urban Transportation Planning - Goals and objectives - Hierarchical levels of transportation planning - Forecast - Implementation - Constraints. UTP survey – Inventory of land use Trip generation - Trip classification - productions and attractions - Multiple regression models - Category analysis - Trip production models - Trip distribution models – Linear programming approach.

Modal split models - Behavioural models - Probabilistic models - Utility functions – logit models - Two stage model. Traffic assignment - Assignment methods - Route-choice behavior - Network analysis. Landuse and its interaction - Lowry derivative models - Quick response techniques - Non-Transport solutions for transport problems. Characteristics of urban structure. Town planning concepts.

Preparation of alternative plans - Evaluation techniques - Plan implementation - Monitoring- Financing of Project – Case studies.

Motor Vehicles Act - statutory provision for road transport and connected organizations.

Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.

Depots and Terminals - Principles and types of layout, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays.

REFERENCE BOOKS:

1. Hutchinson, B.G., '**Principles of Urban Transport System Planning'** - McGraw Hill Book Co.
2. Kadiyali, L.R., '**Traffic Engineering and Transportation Planning'** - Khanna Publication.
3. Institute of Traffic Engineers - **An Introduction to Highway Transportation Engineering**'.
4. Khisty C.J., *Transportation Engineering - An Introduction*, Prentice Hall, India, 2002.

1SFTR3 DESIGN AND CONSTRUCTION OF PAVEMENT

Components of pavement structure, importance of Sub-Grade soil properties on pavement performance. Functions of Sub-Grade, sub-base, base course and wearing course.

Stresses in flexible pavements: Stresses in homogeneous masses and layered system, deflections, shear failures, equivalent wheel and axle loads.

Elements in design of flexible pavement: Loading characteristics-Static, impact and repeated loads, affects of dual wheels and tandem axles, area of contact and tyre pressure, modulus, CBR value of different layers, equivalent single wheel load, equivalent stress equivalent deflection criterion, equivalent wheel load factors, climatic and environmental factors.

Types of distress: Structural and functional, serviceability, fatigue cracking, pavement deformation and low temperature shrinkage cracking. Factors affecting performance. Relation between performance & distress.

Design methods for flexible pavement: Group Index method, California bearing ratio (CBR), Triaxial method, Mcleod Method, Benkelman Beam method. Boussiusq's and Burmister's analysis and design method. Design of flexible airport pavements.

Elements in design of Rigid pavements: Wheel load, stresses, Westergaard's analysis. Basic properties of concrete elasticity, shrinkage & creep, durability of concrete, rigid pavement design, concrete mix design.

Temperature stresses: Thermal properties of aggregates and concrete. Effect of temperature variations on concrete pavements, Westergaard's and Tomlinson's analysis of warping stresses. Combination of stresses due to different causes.

Pavement overlays: Flexible overlays and Rigid overlays.

Pavement Construction :

Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction

Subgrade: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests

Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers

Cement Concrete Pavements: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

REFERENCE BOOKS:

1. Kadiyali L.R., " Principles & Practice of Highway Engineering" Khanna Publisher
2. Chakroborty P Das "Principles & Practice of Highway Engineering" (Khanna Publisher 2000)
3. "Highway Engineering", Khanna & Justo, (Nem Chand & Poros, Roorkee.1997)
4. E.J. Yoder, "Principles of Pavement Design," John Wiley & Sons lnc., New York.
5 Relevant IRC, ASTM, AASHTO and other Codes, Manuals and Specifications.
6. Teng – "Functional Designing of Pavements".
7. Huang - "Pavement Analysis & Design (Prentice Hall – 2003)
8. Yoder E,J, and Witezak – "Principles of Pavement Design". (Wiley & Sons, 1975)
9. Ralph Haos, Ronald Hudson & Zaniesuki " Modern Pavement Management (Kneiger Pubication,1994)

10. Sharma, S.C., '**Construction Equipment and its Management'**, Khanna Publishers

1SFTR4 DOCKS HARBOUR AND AIRPORT ENGINEERING

Water Transportation: Scope, Merits, Developments of Water Transportation in India, Inland waterways, River, Canal, Inland water transportation, Development of ports & Harbours, Harbour classification, Site selection, Harbour dimensioning.

Natural Phenomena: Tides, Water waves, Wave decay & port, wave diffraction, breaking, reflection, Littoral drift, sediment transport.

Harbour Infrastructures: Types of breakwaters, jetty, dock fenders, piers, wharves, dolphin, mooring accessories, Repair facilities, wet docks, lift docks, dry docks, gates for graving docks, floating docks, slipways, locks and gates.

Port facility: transit shed, warehouses, cargo handling, container handling, Inland port facility, Navigational aids, types, requirements of signals, lighthouses, beacon light, buoys. Dredging & coastal protection: Types of dredgers, choices, usage of dredged material, sea wall protection-sea wall revetment, bulkhead.

Planning of ports: Planning of ports for regional and intercontinental transportation development, forecasting cargo & passenger demand, regional connectivity, cargo handling capacity of port, economic evaluation of port project, impacts of port activities.

Air Transportation: Characteristics of Air Transportation structure and organization, challenges and the issues, Airport Master Plan, Characteristics of the aircraft, Airport Requirements, site selection, layout plan and financial plan, Forecasting air travel demand, Air freight demand.

Air traffic control, lighting and signing, Airport capacity and configuration, parking configurations and apron facilities ,visual aids.

Geometric Design: of runway, taxiway, aprons, Design of Passenger Terminal, analysis of flow through terminals, Design of air cargo facilities, Airfield pavement and drainage design.

Field Visit:

1. Visit to the Airport terminal building, structures of terminal area and management office.
2. Visit to the major Port: Port area and Harbour area infrastructures.

REFERENCES:

1. Khanna S.K., Arora M.G., Jain S.S., *Airport Planning & Design*, Nemchand Bros.,Roorkee
2. Horenjeff Robert, *The planning & Design of Airports*, McGraw Hill Book Co.

3. Bindra S.P., *Docks & Harbour Engineering*, Dhanpat Rai Publications,
4. Srinivasan R., Harbours, *Docks & Tunnel Engineering*, Charotar Publishing House, Anand,1999.

ELECTIVE-I
1SFTR5 (1) APPLIED SOIL MECHANICS

Introduction: Soil Mechanics applications to Highway Engg. Soil formations, Types, Regional Soil deposits of India, Index properties, their determination, importance, various soil classification systems, HRB classification, problems on these.

Soil Compaction: Introduction, Lab Tests, Factors affecting, Structure & Engg behavior of compacted cohesive soil, Field compaction specifications Field compaction control, Different types of Equipments used for compaction, their choice.

Stability of slopes: Introduction, Types, Different methods of analysis of slopes for Øu=0 & C-Ø soil, Location of most critical circle, Earth dam slopes stability, Taylor s stability number. Effect of Earthquake Force, problems on above.

Shear strength of soil: Introduction, Importance, Measurements, shear strength of clay, Sand, Elastic properties of soil – Tangent, Secant modulus, Stress – Strain curves, Poisson s ratio, Shear Modulus.

Permeability of soil: Darcy s Law, Validity, Soil-water system, Types, Determination of permeability, problems.

Site Investigation: Introduction, Planning exploration programmes, Methods, Samplers, SPT, Subsoil investigation Report, Geophysical methods.

Reinforced Earth structures: Introduction , Components, Advantages, Types of stability – external, Internal,Geo textiles – types, Functions, their uses in road embankments and railway works, other uses.

Highway Drainage: Introduction, Importance, Surface drainage, Sub-surface drainage, methods, Design of subsurface drainage system, Road construction in water logged areas, Land slides – definition, classifies, factors producing.

REFERENCE BOOKS :

1. "Basic and Applied soil Mechanics", Gopal Ranjan, ASR Rao, New Age International Publishers.
2. "Soil Mechanics & Foundation Engg", Dr.B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications (P) Ltd, 16th edition.
3. "Highway Engg", S.K. Khanna, C.E.G. Justo, 5th edition.

4. "Soil Mechanics & Foundation Engg" – K.R. Arora Standard Publishers Distributors.
5. "Soil Mechanics for road Engineers" – HMSO, London.
6. IRC – Relevant Codes.

ELECTIVE-I
1SFTR5 (2) DESIGN OF BRIDGES

Introduction: Principles of Planning of Elevated Rail Transit System, grade separation structures, pedestrian crossing and sub- ways.

Loads on Bridges: Dead loads, live loads, dynamic effects of vehicles, longitudinal forces, centrifugal forces, wind loads, earth quake forces, stream flow pressure, load combinations, design examples

Design of Bridge Slabs: Longitudinally reinforced deck slabs, transversely reinforced bridge slabs

Design of Reinforced Concrete Bridges: Design procedures for T- beam, box girder bridges design examples

Design of Prestressed Concrete Bridges: Design code, design examples

Segmental Box bridges - precast sections, criteria, design examples

Sub-Structure Design: Foundation investigation, bearings, bridge pier design, and abutment design. Examples.

REFERENCE BOOKS:

1. Conrad P. Heins and Richard A. Lawrie, '**Design of Modern Concrete Highway Bridges**, John Wiley and Sons,1999.
2. Baider Bakht and Leslie, G. Jaeger,'**Bridge Analysis Simplied**, Mcgraw Hill Book Co,1998.
3. Johnson Victor, '**Bridge Engineering'**, Oxford IBH, New Delhi,2000.
4. Raina, R.K, **'Principles of Design of RCC Bridges**, Tata McGraw Hill,1999.
5. Krishnaraju „**Bridge Engineering**„, UPD Publishers, New Delhi,2000.

1SFTR6 TRAFFIC ENGINEERING AND FIELD STUDIES - LABORATORY

To achieve the objective the following practical will be conducted;

1. Traffic volume studies.
2. Spot -speed studies.
3. Speed and delay study.
4. Moving observer survey.
5. Parking studies
6. Origin -Destination studies, Desire line diagrams.
7. LOS study using VRT.
8. Problems related to traffic engineering.

1SFTR7 DESIGN & CONSTRUCTION OF PAVEMENT - LABORATORY

1. Plate Bearing Test.
2. Field CBR Test.
3. Pavement Evaluation by Benkelman Beam Method.
4. Road Unevenness Measurement by Bump-Integrator.
5. Valuation of Pavement Roughness by Roughometer / Profilometer.
6. Design of Flexible Pavements for Highway and Runway.
7. Design of Rigid Pavements For Highway and Runway.
8. Design of Overlays
9. Marshal Stability Test
10. Cement Concrete Mix Design

Field Visit:

1. Hot – mix plant visit,
2. Road construction site visit: Earth work construction procedure and bituminous mix laying, spreading and rolling procedure.

REFERENCE BOOKS:

1. Highway Material Testing – S K Khanna- C.E.G. Justo, Nemchand Bros- Rookee, 2000
2. S.K.Khanna & Justo C.E.G., Highway Material Testing Manual
3. A.K. Duggal and Vijay P.Puri, "Laboratory Manual in Highway Engineering,"

SEMESTER-II

2SFTR1 ADVANCED RAIL ROAD ENGINEERING

Introduction: Important development of Indian Railways, organization of Indian Railway, Track, Loco, Traction revolution for traffic growth on Indian Railways.

Track & Track Stresses: Permanent way, Track standards & structure, Track Modulus, Forces on the Track, loads, Hammer blow effect Bending Stresses in rail, stresses in Sleeper, Ballast, coning & Tilting of rails, Type of rails, Defect in rails, Rail failure, welding, methods, ultrasonic testing of thermit welding joints, Fastening of rails, fish plates, spikes, bearing plates, pandrol clips, new type of elastic fastening with S.T.sleeper, Rubber pads.

Formation, Sleeper & Ballast: Functions of formation, profile of Banks & cuttings, Track drainage, failure of bank & remedial measures, soil stabilization & Geotextiles methods, sleeper types, sleeper density, functions & requirement and Ballast types.

Point & Crossing & Turnouts: Turnout, type of switches, tongue rail, details of crossing, reconditioning of points & crossings calculation of elements of turnout coles method and IRS method. Symmetrical split, Diamond crossing, modern trend in design, problems.

Geometric Design of Track: Radius, degree of curve, super elevation, gradients, speed calculation, safe speed, equilibrium speed, permissible speed, cant, cant deficiency, negative cant, Transition curve & its design, Types, shift, laying of T.C., vertical curve & its design, problems.

Tractive power & Train resistance: various power requirements for steam, electric loco, diesel loco, Hauling power, resistances developed for Train & problems.

Signal & interlocking: Types of Signal, details of electrical signaling system, track circuits, Absolute block system, Automatic block system, interlocking & methods, Modern signaling techniques, Route relay interlocking, CTC systems.

Metropolitan Railways: Travel pattern, problems, Different forms of urban Transport, Trolley buses, surface railways, underground railways, elevated railways, mono rail, tube railways.

REFERENCE BOOKS:

1. Saxena & Arora. Railway Engineering Dhanpat Rai. Delhi.2000.
2. Ronald.A.Inglis, „An Introduction to Railway Engineering Chapman & Hall Ltd. London.1995.
3. W.W.Hay. Railway Engineering Chapman & Hall Ltd.London.1995.
4. Mundrey. J.S. Track Modernization.2000.
5. Manual on Signaling & Interlocking by Indian Railway board.

2SFTR2 ROAD SAFETY AND MANAGEMENT SYSTEM

Road accidents, Causes, scientific investigations and data collection. Analysis of individual accidents to arrive at real causes; statistical methods of analysis of accident data, application of computer analysis of accident data.

Safety in Road Design – Accident prevention through better planning and design of roads –planning road networks by land use planning, route planning, traffic planning for different land uses etc., designing for safety through link design, design of road geometrics etc., junction design for safety.

Operating the road network for safety, highway operation and counter-measures, road safety audit, principles- procedures and practice, code of good practice and checklists.

Road safety issues and various measures for road safety. Engineering, education and enforcement measures for improving road safety. Short term and long term measures. Road safety education and training. Traffic calming techniques and innovative ideas in road safety.

Economic evaluation of improvement measures by "before and after studies" Counter measures at hazardous locations – accident investigation,

problem diagnosis, development of counter measures, checklists for counter measures.

Traffic management techniques. Local area management. Transportation sy stem management. Low cost measures, area traffic control. Various types of medium and long term traffic management measures and their uses. Evaluation of the effectiveness and benefits of different traffic management measures, management and safety practices during road works. Case studies.

REFERENCE BOOKS:

1. BABKOV, V.F. 'Road conditions and Traffic Safety', MIR publications, - 1975.
2. K.W. Ogden, 'Safer Roads – A Guide to Road Safety Engg.' Averbury Technical, Ashgate Publishing Ltd., Aldershot, England, 1996.
3. Kadiyali, L.R., 'Traffic Engineering and Transport Planning', Khanna Publications.
4. Pignataro, Louis, 'Traffic Engineering - Theory and Practice', John Wiley.
5. RRL, DSIR, 'Research on Road Safety', HMSO, London.
6. IRC Third 'Highway Safety Workshop', Lecture Notes 1978 and other IRC publications.
7. Papacoastas 'Introduction to Transportation Engineering' – Prentice

2SFTR3 ENVIRONMENTAL IMPACT ASSESSMENT

Introduction: Concepts of environmental impact analysis, key features of National environmental policy act and its implementation, screening in the EIA process, utility and scope of EIA process, Environmental protection acts EIA at national level.

Conceptual approach for environmental impact studies, planning and management of impact studies, matrix and network methodologies for impact identification, description of the affected environmental – environmental indices.

Prediction and Assessment of Impact on Air Environment: Basic information on air quality, sources of air pollutants, effects of air pollutants, key legislations and regulations, conceptual approach for addressing air environment impacts, impact prediction approaches, assessment of significance of impacts, identification and incorporation of mitigation measures.

Prediction & Assessment of Impact on Noise & Social Environment: Basic information on noise, key legislation and guidelines, conceptual approach for addressing noise environment impacts, impact prediction methods, assessment of significance of impacts, identification and incorporation of mitigation measures, Conceptual approach for addressing socio-economic impacts, traffic and transportation system impacts, visual impacts, scoring methodologies for visual impact analysis

Decision Methods for Evaluation of Alternative: Development of decision matrix. Public participation in environmental decision making, Regulatory requirements, environmental impact assessment process, objectives of public participation, techniques for conflict management and dispute resolution, verbal communication in EIA studies

REFERENCE BOOKS:

1. Canter L.W., *Environmental Impact Assessment*, McGraw-Hill, 1997
2. Betty Bowers Marriott, *Environmental Impact Assessment: A Practical Guide*, McGraw-Hill Professional, 1997.
3. Peter Morris & Riki Therivel, *Methods of Environmental Impact Assessment*, Routledge, 2001.
4. Denver Tolliver, *Highway Impact Assessment*, Greenwood Publishing Group, 1993.
5. R. K. Jain, L. V. Urban, G. S. Stacey, H. E. Balbach, *Environmental Assessment*, McGraw-Hill Professional, 2001.
6. Relevant IRC & CPCB codes.

ELECTIVE-II
2SFTR4 (1) GEOMETRIC DESIGN OF TRANSPORTATION FACILITIES

Introduction: Classification of rural highways and urban roads. Objectives and requirements of highway geometric design.: Design Control and Criteria

Design Elements: Sight distances - types, analysis, factors affecting, measurements, Horizontal alignment - design considerations, stability at curves, superelevation, widening, transition curves; curvature at intersections, vertical alignment - grades, ramps, design of summit and valley curves, combination of vertical and horizontal alignment including design of hair pin bends, design of expressways, IRC standards and guidelines for design. problems.

Cross Section Elements: Right of way and width considerations, roadway, shoulders, kerbs traffic barriers, medians, frontage roads;

Facilities for pedestrians, bicycles, buses and trucks, Pavement surface characteristics - types, cross slope, skid resistance, unevenness.

Design Considerations: Design considerations for rural and urban arterials, freeways, and other rural and urban roads - design speeds, volumes, levels of service and other design considerations.

Design Of Intersections: Characteristics and design considerations of at-grade intersections; Different types of islands, channelization; median openings; Rotary intersections; Grade separations and interchanges - types, warrants, adaptability and design details; Interchanges - different types, ramps. Computer applications for intersection and interchange design.

Note : Computer Lab. using highway geometric design software for design of intersections, interchanges and parking lots to be carried out.

REFERENCE BOOKS:

1. AASHO, "A Policy on Geometric Design of Highways and Streets', American

   Association of State Highway and Transportation Officials, Washington D.C.
2. Khanna S.K. and Justo, C.E.G.'Highway Engineering', Nem Chand and Bros.,2000.
3. DSIR, 'Roads in Urban Areas', HMSO, London.
4. Jack E Leish and Associates, 'Planning and Design Guide: At-Grade Intersections'. Illinios.
5. Relevant IRC publications

ELECTIVE-II

2SFTR4 (2) THEORY AND APPLICATION OF GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Geographic information concepts and spatial models – Introduction, spatial information, temporal information, conceptual models of spatial information, representation of geographic information.

GIS Functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

Computer Fundamentals of GIS and Data storage Fundamentals of computers vector/ raster storage character files and binary files, file organization, linked lists, chains, trees. Coordinate systems and map projection: Rectangular, polar and spherical coordinates, types of map projections, choosing a map projection.

GIS Data models and structures – Cartographic map model, Geo-relation model, vector/ raster methods, non – spatial data base structure viz.. hierarchal network, relational structures. Digitizing Editing and Structuring map data – Entering the spatial (Digitizing), the non- spatial, associated attributes, linking spatial and non- spatial data, use of digitizers and scanners of different types.

Data quality and sources of error – Sources of errors in GIS data, obvious sources, natural variations and the processing errors and accuracy. Principles of Spatial data access and search, regular and object oriented decomposition, introduction to spatial data analysis and overlay analysis, raster analysis, network analysis in GIS.

GIS and remote sensing data integration techniques in spatial decision support system land suitability and multioriteria evaluation, rule based systems, network analysis, special interaction modeling, Virtual GIS.

Data base positioning systems, desirable characteristics of data base management systems, components of a data base management system, understanding the data conceptual modeling. Global positioning system, hyper spectral remote sensing, DIP techniques, hardware and software requirements for GIS, overview of GIS software.

REFERENCE BOOKS:

1. Peter A Burrough Rachael A Mc Donnel, "**Principles of GIS"** (Oxford), 2000.
2. Christopher Jones, "**GIS and Computer cartography"** (Longman),2000.
3. Lillesand, "**remote sensing and image interpretation** "(John Wiley and Sons),2000.
4. James L Riggs, **'Engineering Economics**' 4th Edition, Tata McGrawhill, New Delhi, 2005
5. Prasanna Chandra, **Financial Management** 5th Edition, Tata McGrawhill, ND05

ELECTIVE-III

2SFTR5 (1) TRANSPORTATION ECONOMICS AND EVALUATION

Introduction: Concepts and Principles of Engineering Economics, Identification and Measurements of Highway Benefits, Highway Transportation Costs, Road User Costs and Benefits, Road User Cost Study in India.

Cost and Benefits: Capital Cost, Inflation cost, Interest during construction, maintenance cost, Road user cost, Vehicle Operating cost, Accident Cost, Congestion Cost, and Pricing. Non user cost and consequences. Saving and Benefits, Road user benefits, and Consumer surplus. Social Costs and benefits from transportation projects.

Methods of Economic Analysis: Methods- BCR-NPV-IRR –Their Basic Characteristics, Illustrative applications on above Methods of Economic Analysis, Comparison of the Methods of Analysis when Applied to a Group of Mutually Exclusive Alternatives.

Economic Evaluation of Null Alternative, Characteristics and Limitations of the Different Methods of Economic Analysis, Ranking of Independent Projects, Sensitivity Analysis. case studies and problems .

Depreciation Concepts: Depreciation Cost, accounting Methods, Salvage Value Estimation, Depreciation, Taxes, Problems .

Supply and Demand: Concept-Definition-Factors affecting Demand and Supply- Shift in Demand and Supply- Transportation demand Model-Equilibrium-Sensitivity of Travel Demand- Elasticities-Consumer Surplus- Marginal Cost- Average Cost- Pricing .

REFERENCE BOOKS:

1. Robley Winfrey,'**Economic Analysis for Highways'**, International Textbook Company,Pennsylvania.1990.
2. Jotin Khisty and Kent Lall ' **Introduction to Transportation Engineering'** PHI, New Delhi,2001.
3. Kadiyali.L.R.' **Traffic Engineering and Transport planning'**, Khanna publications,New Delhi,2000.
4. Kenneth J. Button, Transport Economics, Elgar
5. David A. Hensher, Ann M. Brewer, Transport : An Economics and Management Perspective, Oxford University Press
6. Emile Quinet, Roger Vickerman, Principles Of Transport Economics, Edward Elgar Pub
7. Road User Cost Study, Central Road Research Institute
8. Dickey J.W, Project Appraisal for Developing Countries, JohnWiley
9. Ian G. Heggie, Transportation Engineering Economics, McGraw Hill

ELECTIVE-III
2SFTR5 (2) TRANSPORTATION SYSTEMS

Technological characteristics of different systems Principles and functions of important systems elements in Highway, Railways, Water ways, Airways, & Rope ways etc.

Historical development of transport in India - 20 year Road Plans, National Transport Policy Recommendations, IRC, CRRI, Vision 2021, NHDP, PMGSY. Characteristics of different modes of transport and their integration and interactions - impact on environment.

Planning of railway - Passenger and goods terminals - layout - passenger facilities – traffic control.

Airport Planning, requirements and components. Design of runway and taxiway - Apron - parking configuration - terminal requirements - Airport marking and lighting - Air traffic control.

Planning of Harbours and ports - cargo handling - Containerization - Navigation aids – Inland waterways - Pipeline transportation.

Urban transportation systems - Mass rapid transit system - Light rail transit - Personal rapid transit, guided way systems, cabin taxi, dual mode bus - Para transit systems – Demand responsive system - Intermediate public transport.

REFERENCE BOOKS :

1. **"An Introduction to Transportation Engineering"** Willian & Hay. John Wiley & Co.
2. **"An Introduction to Transportation Engineering & planning by Edward**. K. Modok. John Wiley & Co"
3. **"An Introduction to Transportation Engineering**" by Evere H.C.Carier. & Wolfgang. S. Homburger Reston Publishing inc.
4. Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, New York,1982.
5. 5Alan Black, Urban Mass Transportation Planning, McGraw-Hill, 1995.

2SFTR6 ROAD SAFETY AND MANAGEMENT SYSTEM - LABORATORY

The field studies on following topics :

1. Transportation management
2. Parking management
3. Road accident studies
4. Public transport route evaluation
5. Traffic signal - capacity evaluation
6. Rotary design

2SFTR7 ENVIRONMENTAL IMPACT ASSESSMENT - LABORATORY

1. Noise emitted by road traffic motor vehicles.
2. Detrimental effects of road traffic motor vehicles on human health.
3. Measurement using sound level meter and methods of prediction of highway traffic noise.

4. Noise pollution and Techniques of road traffic noise reduction.
5. Measurement of air pollution.
6. Perception survey with reference to Noise and Air .

THIRD SEMESTER

3 SFTR1 Seminar & Dissertation

FOURTH SEMESTER

4SFTR1 Seminar & Dissertation

As per given scheme

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SYLLABUS PRESCRIBED FOR
TWO YEAR P. G. DEGREE COURSE IN M.E. (F.T.)
THERMAL ENGINEERING (C.G.S.)

FIRST SEMESTER
1MTE1 ADVANCED MATHEMATICS

SECTION – A

Partial Differential Equations: Linear partial differential equations with constant coefficients and its solution, complimentary function and particular integral.

Applications of Partial Differential Equations: Method of separation of variables, solution of wave equation, one dimensional and two dimensional heat flow equation in steady state (Laplace Equation) and its solution.

SECTION – B

Statistics: -Method of least squares, curve fitting by graphical method. Co-relation regression, probability, axioms of probability, Baye's theorem, conditional probability, probability distribution; Binomial, Poisson's and Normal Distribution

Interpolation: -Newton's interpolation formulae, Newton's and Gauss's forward and backward interpolation formulae, Interpolation with unequal intervals, Lagrange's formula for unequal intervals. Newton's divided difference formula. Inverse interpolation

Numerical Methods: Numerical integration, Newton-Cote's formula, Trapezoidal rule, Simpson's one third and three eighth rule, Waddle's

rule. Numerical solution of ordinary differential equations; Taylor's series, Runge-Kutta's fourth order method, Euler's method, Milne's predictor-corrector method

TEXT BOOKS :

1. Advance Engineering Mathematics by Erwin Kreyszig, 7th and 8th Edition. Wiley Eastern.
2. Higher Engineering Mathematics by B. S. Grewal,

REFERENCE BOOKS :

1. Fundamentals of Statistics by S. C. Gupta.

1MTE2 ADVANCED THERMODYNAMICS

SECTION –A

Introduction And Overview: Introductory Concepts and Preliminaries; Properties of Pure Substances; Energy and the First Law of Thermodynamics, Energy Transfer by Heat, Work, and Mass; Second Law of thermodynamics, Entropy: A Measure of Disorder, Exergy – A Measure of Work Potential.

The Two Laws Combined: Review on some consequences of first Law, Limitations of first Law, Thermodynamic Tempera-ture Scale, Clausius-Clapeyron Equation, Stefan' s Law, Helmholtz and Gibbs Func-tions, Availability in Steady Flow, Irreversibility and Effectiveness, Combined First and Second Laws, Isothermal and Adiabatic Compressibility; Joule-Kelvin Coefficient, Maxwell Equation, Vander Wall's Gas Equation;

The Destruction Of Energy: Lost Available Work, Mechanisms of Entropy Generation or Energy Destruction, Entropy Generation Minimization.

SECTION -B

Multi Phase Systems: General considerations, Dalton & Amagat Model, Mixture of gases and vapors. Changes in Molal Properties upon Mixing, Gibbs Entropy Equation and Gibbs -Duhem Equation

Chemically Reactive Systems: Thermodynamics of reactive Systems and Criterion of Equilibrium, Phase rule. Combustion Process, Enthalpy of formation; First Law Analysis of Reacting Systems; Second Law analysis of Reacting Systems, Equilibrium Constant and its temperature Dependence.

Thermodynamic Optimization: Energy analysis of Vapor and Gas Power Cycles, Guideline for improving Thermodynamic Effectiveness; Energy analysis of Simple Power Plant (Steam Plant)

TEXT BOOKS:

1. Advanced Engineering Thermodynamics, Adrian Bejan, Wiley-Interscience Publication, Second Edition, ISBN 0-471-14880-6.
2. Fundamentals of Engineering Thermodynamics, Michael Moran & Howard Shapiro, Wiley & Sons, Sixth Edition, ISBN 978-0-471-787358

3. Fundamental of thermodynamics, Richard E. Sonntag, Gordon J. Van Wylen, Claus Borgnakke, John Wiley & Sons publication.

REFERENCE BOOKS:

1. Fundamentals of Classical Thermodynamics, Richard Sonntag, Claus Borgnakke, John Wiley & Sons, Seventh Edition, ISBN: 978-0-470-04192-5.
2. Thermodynamics: An Engineering Approach, Yunus A. Cengel & Michael A. Boles, Sixth Edition, ISBN-13 9780073305370.

1MTE3 FLUID DYNAMICS

SECTION - A

Fluid flow concepts: Euler's equations of motion, Navier stoke equation, equation of continuity, Rotational irrotational flows, potential and stream functions, and flow nets circulations. Vorticity.

Basic Function: Uniform stream, sink, vortex, doublet, superposition of functions, flow over half bodies, Rankine bodies, circular cylinder, Magnus effect.

Conformal Mapping: Simple transformation and inverse transformations.

SECTION - B

Boundary layer theory: Boundary layer theory for laminar and Turbulent flow, Blasius solution for flat plate, approximate methods, boundary layer separation and control, Effect of roughness.

Turbulent flow, Semi empirical theories of turbulence, eddy viscosity, Prandtl's mixing length theory, Karman's Similarity hypothesis, Taylor's Vorticity transfer theory.

Compressible Flow: Review of one dimensional compressible flow, approximation to two and three dimensional such as sonic, supersonic flows, small perturbation theory, Shock Waves, Prandtl Mayor's Equation.

TEXT BOOKS :

1. Foundations of Fluid Mechanics, Yuan, S.W., Prentice Hall,
2. Cengel, Y.A. and J.M. Cimbala, Fluid Mechanics, McGraw-Hill, Boston, MA
3. Mechanics of Fluids, Shames, McGraw-Hill.

REFERENCE BOOKS:

1. Boundary Layer Theory, Schlichting, H., McGraw-Hill,.
2. *Fluid Mechanics*, Kundu, P. K., and Ira M. Cohen, 4th ed., Academic Press
3. The Dynamics and Thermodynamics of Compressible Flow, Shappiro, Ronald Press.

1MTE4 ADVANCED HEAT TRANSFER

SECTION – A

Steady state conduction: Basic fundamentals, One dimensional steady state conduction: critical radius of insulation, Cylinder with heat sources, Fins of non-uniform cross section. Multi dimensional steady state conduction: Two dimensional heat conduction analytical, graphical analysis, Conduction shape factor, Numerical analysis, formulation in terms of resistances of elements, Accuracy considerations

Unsteady state heat conduction: Applicability of Heisler charts, Semi-infinite slab and cylinder suddenly exposed to convection, Transient numerical methods. Thermal resistance and capacity formulation .

Convection heat transfer: Energy equation of the boundary layer, thermal boundary layer, turbulent boundary layer heat transfer and thickness, Empirical relations for flow across cylinders and tube banks, Liquid metal heat transfer.

Natural convection systems, heat transfer on a vertical plate, free convection from horizontal cylinders and inclined surfaces, combined free and forced convection, criteria for free or forced convection.

SECTION - B

Radiation: Introduction to basic fundamentals, Radiation shape factor**,** Heat exchange between non-black bodies using network approach, gas radiation, radiation network for an absorbing and transmitting medium, Effect of radiation on temperature measurement, Radiation heat transfer coefficient.

Condensation, Boiling and Heat pipe: heat transfer coefficient during condensation on tube bank Simplified relations for boiling heat transfer with water, transpiration cooling, and ablation; classification,construction and applications of heat pipe.

Note: Heat transfer data book will be permitted in Exam hall

TEXT BOOKS :

1. Heat Transfer by J.P. Holman, Tata McGraw Hill Publication, 9th ed. 2002.
2. Heat Transfer by S.P. Sukhatme, Tata McGraw Hill Publication, 1994.

REFERENCE BOOKS :

1. Heat Transfer by P.K. Nag, Tata McGraw Hill Publication, 2005.
2. Heat and Mass Transfer Data Book Book by C P Kothandaraman, S Subramanyam, New Age International,1994
3. Heat Transfer data book Convective heat & mass transfer by Kays and Crawford, Tata

ELECTIVE - I

1MTE5 1. WASTE MANAGEMENT AND ENERGY GENERATION SYSTEMS

SECTION – A

SOLID WASTE :

Definitions - Sources, Types, Compositions, Properties of Solid Waste - Municipal Solid Waste - Physical, Chemical and Biological Property - Collection - Transfer Stations – Waste Minimization and Recycling of Municipal Waste

WASTE TREATMENT :

Size Reduction - Aerobic Composting - Incineration - Furnace Type & Design, Medical / Pharmaceutical Waste Incineration - Environmental Impacts - Measures of Mitigate Environmental Effects due to Incineration

WASTE DISPOSAL :

Land Fill Method of Solid Waste Disposal - Land Fill Classification, Types, Methods & Siting Consideration - Layout & Preliminary Design of Land Fills - Composition, Characteristics, generation, Movement and Control of Landfill Leachate & Gases - Environmental Monitoring System for Land Fill Gases

SECTION - B

HAZARDOUS WASTE MANAGEMENT

Definition & Identification of Hazardous Waste - Sources and Nature of Hazardous Waste - Impact on Environment - Hazardous Waste Control - Minimization and Recycling - Assessment of Hazardous Waste Sites - Disposal of Hazardous Waste, Underground Storage Tanks Construction, Installation & Closure

ENERGY GENERATION FROM WASTE

Types - Biochemical Conversion - Sources of Energy Generation - Industrial Waste, Agro Residues - Anaerobic Digestion - Biogas Production - Types of Biogas Plant Thermochemical Conversion - Sources of Energy Generation - Gasification - Types of Gasifiers - Briquetting - Industrial Applications of Gasifiers - Utilization and Advantages of Briquetting - Environment Benefits of Biochemical and Thermochemical Conversion

TEXT BOOKS :

1. Parker, Colin, & Roberts, Energy from Waste - An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985
2. Shah, Kanti L., Basics of Solid & Hazardous Waste Management Technology, Printice Hall, 2000

REFERENCE BOOKS :

1. Manoj Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997
2. Rich, Gerald et.al., Hazardous Waste Management Technology, Podvan Publishers, 1987
3. Bhide AD., Sundaresan BB, Solid Waste Management in Developing Countries, INSDOC New Delhi, 1983.

Websites:1. http://www.bical.net ,2. http://www.volund.dk,3. http://www.iswa.org,4. www.wmrc.uiuc.edu

ELECTIVE - I

1MTE5 2. ENERGY CONSERVATION AND POWER PLANT ECONOMICS

SECTION-A

Energy Conservation : Energy Sources – Review of Present Status of Conventional and Renewable Energy Sources**,** Common areas of inefficiency in energy use, principles of energy conservation , energy conservation planning, energy conservation in industries, household, commercial, transport and agricultural fields, energy conservation technologies, energy conservation legislation.

Energy Audit: Energy flow diagram, comparison with standards, energy management team, energy audit of illumination systems and electrical systems, energy audit of various compressed air systems, buildings, steam generation and distribution systems.

Demand Side Management: Scope of Demand Side Management, load management as a Demand Side Management strategy, tariff options of Demand Side Management, Demand Side Management and environment, different types as a captive power plants, energy banking and wheeling, role of private sector in energy management.

SECTION-B

Power Plant Economics: Economic analysis of power plants and targets, Load curves, load duration curve, different terms and definitions; Effect of fluctuating load on operation and design of the plant, methods of meeting fluctuating load, cost of electrical energy; operating costs, generation costs, depreciation cost. Cost benefit analysis, Selection of type of generation; Performance and operating characteristics of power plants; Selection of the generating equipments, Combined operation of power plants; load division between stations, effect of load factor on energy cost, different types of tariffs.

Environmental Aspects of Energy Generation : Well-to-Wheel Emission analysis of Energy Sources**,** Social and economical issues of the power plants, Greenhouse effect, Acid precipitation- acid rain and acid snow, dry

deposition and acid fog. Thermal pollution, air pollution, Radiation from nuclear power plant effluents, clean coal technologies, hydro power plants , environmental clearances.

TEXT BOOKS :

1. Power Station Engineering and Economics **,** B G A Skrotzki , W A Vopat : Tata McGraw Hill Publishing Company Limited, New Delhi,1972.
2. Power Plant Engineering, P K Nag, Tata McGraw Hill Publishing Company Limited, New Delhi ,2006.

REFERENCE BOOKS :

1. Electrical Power Distribution , A S Pabla **,** Tata McGraw Hill Publishing Company Limited, New Delhi ,2004.
2. Generation of Electrical Energy **,** B R Gupta, Eurasia Publishing House Private Limited, New Delhi, 2007.
3. Patterns of Energy Use in Developing Countries, Ashok V Desai, Wiley Eastern limited, Tokyo, 1991

ELECTIVE - I

1MTE5 3. MODERN ENERGY SOURCES

SECTION - A

Solar Energy: Flat plate and concentrating collectors- design, analysis and performance, applications. Thermal Power, Photovoltaic power; Economic Analysis

Tidal and Ocean Energy: Applications, Design aspects, Power generation methods, various cycles and analysis.

SECTION - B

Wind Energy: Atmospheric circulation, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, application, design aspects

Geothermal Energy And Magneto Hydrodynamics: Study of various components, Performance and methods of energy conversion.

Nuclear Energy: Fusion and fission, study of various components, Design aspects, performance and methods of power generation.

TEXT BOOKS :

1. Power Plant Technology by El- Wakil, McGraw Hill publication.
2. Solar Energy : Fundamentals and Applications (1st Revised Edition), Tata McGraw-Hill,

REFERENCES :

1. Solar Energy: Principles of thermal collection and Storage by Suhas P. Sukhatme ,Second Edition, Tata McGraw-Hill, 2006
2. Principles of Solar Thermal Engineering by F.Kreith & J .F.Kreider, McGraw Hill Publications 1978.
3. Solar Engineeering of thermal Processes by J .A.Duffie and W.A.Beckman, John Wiley & Sons publication 1999.
4. Applied Solar Energy by A.B.Meinal & F.P.Meinal, Addison Wesley 1976 publication.

ELECTIVE - I

1MTE5 4. ENVIRONMENT POLLUTION CONTROL

SECTION - A

Air Pollution : Sources and Effect - Acid Rain - Air Sampling and Measurement - Analysis of Air Pollutants - Air Pollution Control Methods and Equipments - Issues in Air Pollution control.

SOLID WASTE MANAGEMENT

Sources and Classification - Characteristics of solid waste-Potential methods of solid waste Disposal – Process and Equipments for Energy Recovery from Municipal Solid Waste and Industrial Solid Waste.

WATER POLLUTION

Sources and Classification of Water Pollutants - Characteristics - Waste Water Sampling Analysis - Waste Water, Treatment - Monitoring compliance with Standards - Treatment, Utilization and Disposal of Sludge.

SECTION - B

OTHER TYPES OF POLLUTION

Noise Pollution and its impact - Oil Pollution - Pesticides - Radioactivity Pollution Prevention and Control

POLLUTION FROM THERMAL POWER PLANTS AND CONTROL METHODS

Instrumentation for pollution control - Water Pollution from Tanneries and other Industries and their control

TEXT BOOKS :

1. G.Masters (1991): Introduction to Environmental Enginering and Science, Prentice -Hall International Editions.
2.. H.S.Peavy, D.R..Rowe, G.Tchobanoglous (1985):Environmental Enginering - McGraw- Hill Book Company,NewYork.

REFERENCE BOOKS :

1. **Environmental Considerations in Energy Development, Asian Development Bank (ADB), Manilla(1991)**
2. H.Ludwig, W.Evans (1991): Manual of Environmental Technology in Developing Countries, W.Y.
3. Brockelman and B.N.Lohani, International Book Company, Absecon Highlands, N.J.

SECOND SEMESTER

2MTE1 ADVANCED INTERNAL COMBUSTION ENGINES
SECTION - A

SPARK IGNITION ENGINES

Spark ignition engine mixture requirements – Fuel – Injection systems – Monopoint, Multipoint injection, Direct injection – Stages of combustion – Normal and abnormal combustion – Factors affecting knock – Combustion chambers.

COMPRESSION IGNITION ENGINES

States of combustion in C.I. Engine – Direct and indirect injection systems – Combustion chambers – Fuel spray behaviour – Spray structure, Spray penetration and evaporation – Air motion – Introduction to Turbo charging.

SECTION - B

POLLUTANT FORMATION AND CONTROL

Pollutant – Sources – Formation of carbon monoxide, Unburnt hydrocarbon, NOx, Smoke and Particulate matter – Methods of controlling Emissions – Catalytic converters and Particulate Traps – Methods of measurements and Introduction to emission norms and Driving cycles.

ALTERNATIVE FUELS

Alcohol, Hydrogen, Natural Gas and Liquefied Petroleum Gas- Properties, Suitability, Merits and Demerits as fuels, Engine Modifications.

RECENT TRENDS

Lean Burn Engines – Stratified charge Engines – homogeneous charge compression ignition engines – Plasma Ignition – Measurement techniques – Laser Doppler, Anemometry.

TEXT BOOK :

1. K.K. Ramalingam, Internal Combustion Engine Fundamentals, Scitech Publications, 2002.
2. R.B.Mathur and R.P. Sharma, Internal combustion Engines.
3. V. Ganesan, Internal Combustion Engines, II Edition, Tata McGraw-Hill, 2002.

REFERENCE BOOKS :

1. Duffy Smith, Auto fuel Systems, The Good Heart Willox Company, Inc.
2. John B. Heywood, Internal Combustion Engine Fundamentals first edition
3. Willard W. Pulkrabek, engineering fundamentals of the Internal Combustion Engine second edition

2MTE2 ADVANCED REFRIGERATION ENGINEERING
SECTION – A

Review of Basic Refrigeration Cycles: Reverse Carnot Cycle, Second Law of Thermodynamics. Vapor Compres-sion Refrigeration. Standard and Actual Compression Cycle.

Multi Pressure Systems: Refrigeration Component Matching and System Integration, Thermodynamics of Va-por Absorption Refrigeration, Non Conventional Refrigeration Systems with elementary analysis.

SECTION -B

Properties of Refrigerants: Green House Effect, Numbering and Color Coding of Refrigerants, Recent Trends in Refrigerants. Air as refrigerant and air refrigeration cycles, Refrigerant Component Matching and Designing Refrigeration Components like Compressor, Condenser, Cap-illary, Condenser, Etc.

TEXT BOOKS :

1. Refrigeration and air conditioning, Ahmadul Ameen, Prentice Hall of India, New Delhi, 2006
2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill, 2nd ed ,2003

REFERENCE BOOKS :

1. 1.Refrigeration and Air Conditioning Technology, Tomczyk, J. A., Whitman, W. C., Johnson, W. M., Pub: Delmar S.Africa, 4th edition, 2000.
2. 2.Electricity For Refrigeration, Heating, and Air Conditioning, Russell E. Smith, Delmar Cengage Learning; 7th edition, 2006
3. The ASHRAE Handbooks with CDs, 2005-2008.

2MTE3 RESEARCH METHODOLOGY

SECTION – A

Research Concept: Concept, meaning, objectives, motivation; Types of research, approaches (descriptive research, conceptual, theoretical, applied and experimental research)

Formulation of Research Task: Literature Review: importance & methods, sources, field study, laboratory experiments, critical analysis of already generated facts, hypothetical proposal for future development and testing, selection of research task, prioritization of research, introduction to hypothesis testing.

Mathematical Modeling and Simulation: Concept of modeling, classification of mathematical models, modeling with ordinary differential equations, differential equations, partial differential equations, graphs. Simulation concept, types (quantitative, experimental, computer, statistical), process of formulation of model based on simulation.

Experimental Modeling: Definition of experimental design, examples, single factor experiments, guidelines for designing experiments.

SECTION - B

General model of process: Input factors/variables, Output parameters/ variables, controllable/ uncontrollable variables, dependent/independent variables, compounding variables, extraneous variables and experimental validity.

Process optimization and designed experiments: methods for study of response surface, First order design. Determining optimum combination of factors, determination of steepest ascent, Taguchi approach to parameter design.

Analysis of Results (Parametric and Non parametric, Descriptive and Inferential Data): types of data, Methods and techniques of data collection, sampling and sample design, Non parametric test, error analysis, analysis of variance, significance of variance, analysis of co-variance, multiple regression, Introduction to Analytical hierarchical process, Factor analysis, Cluster analysis, Fuzzy logic, testing linearity/ non linearity of model, testing adequacy of model.

Report Writing: types of report, layout of research report, interpretation of results, layout and format, style of writing, typing, references, pagination, tables, figures, conclusions, appendices.

Landscape of Creativity: Convergent Vs. divergent thinking, creativity, creativity Vs intelligence, creativity abilities, determination of Creativity, increasing creativity, creative achievement, techniques of creativity, collective creativity.

TEXT BOOKS :

1. Research in Education, John W Besr & James V Kahn, Prentice HalI of India, New Delhi.
2. Theories of Engineering Experiments, Schank Fr, Tata McGraw Hill Publishing Ltd., New Delhi.
3. Experimental design by Cochran & Cocks, John Wielly & sons, New Delhi, 2005.

REFERENCE BOOKS :

1. Research Methodology, C R Kothari, Wiley Eastern publishers, New Delhi, 10th edition, 2006.
2. Design of Experiments, Douglas Montgomary, 1995.
3. Formulation of Hypothesis, Willkinson K, P L Bhandarkar, Himalaya Publishing House, Mumbai, 2005.

ELECTIVE – II

2MTE4 (1) HEAT EXCHANGER DESIGN

SECTION-A

Constructional Details And Heat Transfer

Types - Shell and Tube Heat Exchangers - Regenerators and Recuperators - Industrial Applications Temperature Distribution and its Implications - LMTD – Effectiveness.

Flow Distribution And Stress Analysis

Effect of Turbulence - Friction Factor - Pressure Loss - Channel Divergence Stresses in Tubes - Heater sheets and Pressure Vessels - Thermal Stresses - Shear Stresses - Types of Failures.

SECTION-B

Design Aspects

Heat Transfer and Pressure Loss - Flow Configuration - Effect of Baffles - Effect of Deviations from Ideality - Design of Typical Liquid - Gas-Gas-Liquid Heat Exchangers

Condensers And Evaporators Design

Design of Surface and Evaporative Condensors - Design of Shell and Tube - Plate Type Evaporators

Cooling Towers

Packings - Spray Design - Selection of Pumps - Fans and Pipes - Testing and Maintenance – Experimental Methods.

TEXT BOOKS :

1. Fundamentals of Heat Exchanger Design by Ramesh K. Shah, Dusan P Sekulic, 1st edition, Wiley, 2002.

2. Process Heat Transfer by D.Q. Kern, Tata McGraw Hill Publication, 1999.
3. Mechanical design of hear exchanger design & Pressure vessel component, by Sing K.P. A. I.; Arcturus Publishers Cherry Hill, 2006.

REFERENCE BOOKS :

1. Heat Exchanger Design by Frass & Ozisik, John Wiley and Sons, Newyork, 1997.
2. Convective Heat transfer by Kays and London, Tata McGraw Hill Publication, 1997.
3. ANSI Standards for pipe and nozzle selection, 1996.
4. ASME Section VIII Division for pressure Vessel and Boiler Design Code, 1995.
5. ASME section II, Material Specifications, 1995.

ELECTIVE – II

2MTE4 (2) ADVANCED AIR CONDITIONING SYSTEMS

SECTION - A

Properties of Air Water Mixture, Psychometric Air Conditioning Processes, Dehumidification Processes, Com-fort Air Conditioning, Parameters Affects Comfort Conditions, Cooling Load Calculations, Design Of Air Delivery Sys-tem To Hospital, Auditorium, Hotels Etc., Noise And Vibration Control In Air Conditioning Hall.

SECTION - B

Air Conditioning Component Selection (Component Matching), Designing Air Ducts, Window Air Conditioner / Split Air Conditioner Performance Testing, Energy calculations- Degree-Day procedure, Bin Method, Comprehensive Simulation methods method, Flow- Pump - and piping Design.

Electrical Circuits And Components In Air Conditioner Like Olp, Capacitor, Performance Study Of Motors Used For Fan, Blower, Compressor,

TEXT BOOKS :

1. Refrigeration and air conditioning, Ahmadul Ameen, Prentice Hall of India, New Delhi, 2006
2. Refrigeration and air conditioning, C P Arora, Tata McGraw-Hill, 2nd ed, 2003
3. Air Conditioning Principles and Systems, E G Pita, Prentice Hall of India, 4th edition, 2005.

REFERENCE BOOKS :

1. The ASHRAE Handbooks with CDs, 2005-2008
2. Refrigeration and Air Conditioning Technology, Tomczyk, J. A., Whitman, W. C., Johnson, W. M., Pub: Delmar S. Africa, 4th edition, 2000.

ELECTIVE -II

2MTE4 (3) FINITE ELEMENT METHODS

SECTION - A

Introduction

Overview of numerical methods - Discretised representation of physical systems - thermal resistance, flow resistance networks, thermal capacitance - Governing equations and Boundary conditions for thermal and flow systems.

One Dimentional Heat Conduction

Principles of variations calculus - applications of vibrational approach to one dimensional heat conduction -element matrix contribution and assembly.

Heat Functions And Analysis

Weighted residual methods - Galerkin's approach - Shape functions and interpolations - Application of Galerkin's weighted residual approach to one dimensional heat conduction - Three nodded triangular elements, 2 D steady state, state conduction using triangular elements - Radiation and natural convective boundary conditions - incorporation of variations in thermal properties.

SECTION - B

Convective Heat Transfer

Higher order elements and numerical integration solution of heat conduction and creeping flow using higher order element - Solution of convective heat transfer.

Heat Exchanger Applications

Incompressible laminar flow simulation - Stream function/Vorticity methods,Velocity Pressure formulation, mixed order interpolation for incompressible flow,modifications for turbulent flow. Application to heat exchanger.

Software Codes

Description of programs for heat conduction, fluid flow,Assignment problems using these codes.

TEXT BOOKS :

1. The Finite Element Method in Engg., 2nd ed. S.S.Rao Pergamon Press, 1990.

2. Applied Finite Element Analysis, 2nd ed, Larry Segerlind John Wiley & Sons, 1988.
3. Finite Element Analysis Theory and Programming 2nd ed, C.S.Krishnamoorthy, Tata mcgraw-Hill 1991.
4. Finite Elements Methods, J.N.Reddy, mcgraw-Hill 1988.
5. Finite Element Methods O.C.Zienkiewiez, mcgraw-Hill 1980.
6. Introduction to Finite Elements in Engg., T.R.Chandrapatla and Belegundu, Prentice Hall of India.
7. Finite Element Computational Fluid Mechanics - A.J.Baker, mcgraw-Hill.

ELECTIVE-II
2MTE4 (4) GAS TURBINES & JET PROPULSION

SECTION - A

General Concepts related to Turbo machinery: Classification; Euler's Equation for Turbo machinery; Velocity triangle; Cascade analysis & nomenclature. Shaft Power & Aircraft Propulsion Cycles.

Centrifugal Compressors: Work done and pressure rise; Slip; Compressibility effects; Compressor characteris-tics. Axial Flow Compressors: Stage pressure rise; Blockage in compressor annulus; Degree of reaction; 3- D flow; Stage performance; h-s diagram & efficiency; off design performance; Performance characteristics; Design process. Combus-tion System.

Axial Flow Turbines: Stage performance; Degree of reaction; h-s diagram & efficiency; Vortex theory; Overall turbine performance; Performance characteristics; Blade cooling; Design process. Prediction of performance of simple gas turbines; Off Design performance; Gas turbine blade materials; matching procedure.

Combined cycles: Differences between Single and combined Cycles, characteristics of combined cycles, Performance calculations for Combined Cycle.

SECTION - B

Thermodynamics Of Aircraft Jet Engines
Theory of Jet Propulsion - Thrust and efficiency - Ram Jet - Turbojet and Turbofan engines - Turboprop and Turboshaft Engines - Thrust augmentations - Typical engine performance - Engine - Aircraft matching.

Aero-Thermodynamics Of Jet Propulsion Subsystems
Subsonic inlets - Supersonic inlets - Gas turbine combustors - After burners and Ramjet Combustors -Supersonic Combustion - Exhaust Nozzles.

TEXT BOOKS :

1. Philip G. Hill and Carl R. Peterson, Mechanics and Thermodynamics of Propulsion, Second Edition,
2. Bonney E.A. Zucrow N.J. Principles of Guided Missile Design, Van Nostranc Co., 1985.
3. S.M. Yahya, Gas Dynamics and Jet Propulsion.

REFERENCE BOOKS :

1. Addition - Wesley Publishing Company, New York, 1992.
2. Zucrow N.J. Principles of Jet Propulsion and Gas Turbines, John Wiley and Sons Inc, New York, 1970.
3. Zucrow N.J. Aircraft and Missile Propulsion, Vol.I and Vol.II, John Wiley and Sons Inc, New York, 1975.

ELECTIVE -III
2MTE5 (1) FUEL & COMBUSTION

SECTION - A

Introduction
General, Conventional Energy Sources, Solar Energy, Nuclear Power, Energy from Biomass, Wind Power, Tidal Power, Geothermal Energy, Energy Survey of India, Rocket Fuels

Solid, Liquid & Gaseous Fuels
General, Family of Coal, Origin of Coal, Gasification of Coal, Analysis and Properties of Coal, Action of Heat on Coal, Classification of Coal, Oxidation of Coal, Hydrogenation of Coal, Efficient use of Solid Fuels. Manufactured Fuels, Agro Fuels, Solid Fuel Handling, Properties Related to Combustion, Handling Storage

Theory Of Combustion Process
Origin and Classification of Petroleum, Refining and Other Conversion Processes, Composition of Petroleum with respect to Combustion, Property & Testing of Petroleum Products, Various Petroleum Products, Nature of Indian Crudes & Petroleum Refining in India, Liquid Fuels from Other Sources, Storage and Handling of Liquid Fuels, Liquid Fuels Combustion Equipment. Types of Gaseous Fuels, Natural Gases, Methane from Coal Mines, Manufactured Gases, Producer Gas, Water
Gas, Carburetted Water Gas, Blast Furnace Gas Fuels, Through Non-Thermal Route - Biogas, Refinery Gas, LPG, Cleaning and Purification of Gaseous Fuels.

SECTION - B

Stoichiometry

Stoichiometry and Thermodynamics, Combustion Stoichiometry General, Rapid Methods of Combustion

Stoichiometry, Combustion Thermodynamics, Problem, Combustion Problems with Chemical Reactions Burners Stoichiometry Relations, Theoretical Air Required for Complete Combustion, Calculation of Minimum Amount of Air Required for a Fuel of known Composition, Calculation of Dry Flue Gases if Fuel Composition is Known, Calculation of the Composition of Fuel & Excess Air Supplied,from Exhaust Gas Analysis, Dew Point of Products, Flue Gas Analysis (O 2, CO 2, CO, NO x, SO x).

Burner Design

Ignition, Concept of Ignition, Auto Ignition, Ignition Temperature. Flame Propagation, Various Methods of Flame Stabilization, Incorporation in Burner Design, Basic Features and Types of Solid, Liquid and Gaseous Fuel Burner, Design Consideration of Different Types of Coal - Oil and Gas Burners, Recuperative & Regenerative Burners

TEXT BOOKS :

1. Samir Sarkar, Fuels & Combustion, 2nd Edition, Orient Longman, 1990
2. Bhatt ,vora Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1984
3.. Sharma SP, Mohan Chander, Fuels & Combustion, Tata Mcgraw Hill, 1984

REFERENCE BOOKS :

1. Blokh AG, Heat Transfer in Steam Boiler Furnace, Hemisphere Publishing Corpn, 1988
2. Civil Davies, Calculations in Furnace Technology, Pergamon Press, Oxford, 1966

Websites:
http ://shop.ieee.org.
http ://opus.utah.edu
http ://www.creada..org

ELECTIVE-lll
2MTE5 (2) SOLAR ENERGY
SECTION -A

Radiative Properties and Characteristics of Materials

Reflection from ideal specular, ideal diffuse and real surfaces, Selective Surfaces: Ideal coating characteristics; Types and applications; Anti-

reflective coating; Preparation and characterization. Reflecting Surfaces and transparent materials.

Solar Thermal Energy Storage

Types: Sensible storage; Latent heat storage; Thermo-chemical storage. Design of storage System. Solar Thermal Energy system: Solar still; Solar cooker: Solar pond; Solar passive heating and cooling systems: Trombe wall; Greenhouse technology: Fundamentals, design, modeling and applications.

PHOTOVOLTAIC SOLAR CELL

P:N Junction - Metal - Schottky Junction, Electrolyte - Semiconductor Junction, Types of Solar Cells - their Applications - Experimental Techniques to determine the Characteristics of Solar Cells - Photovoltaic Hybrid Systems Photovoltaic Thermal Systems – Storage Battery - Solar Array and their Characteristics Evaluation - Solar Chargeable Battery.

Solar Energy for Industrial Process Heat

Industrial process heat: Temperature requirements, consumption pattern; Applications of solar flat plate water heater & air heater for industrial process heat; Designing thermal storage; Transport of energy.

SECTION-B

Solar Heating & Cooling System

Solar water heating systems, Liquid based systems for buildings, Solar air heating systems, Methods of modeling and design of Solar heating system, Cooling requirements of buildings, Vapour absorption refrigeration cycle; Water, ammonia & lithium bromide-water absorption refrigeration systems; Solar desiccant cooling.

Performances of solar collectors

ASHRAE code; Modeling of solar thermal system components and simulation; Design and sizing of solar heating systems: f – chart method and utilizability methods of solar thermal system evaluation; Development of computer package for solar heating and cooling applications;

Flat-plate Collectors

Energy balance for Flat Plate Collectors; Thermal analysis; Heat capacity effect; Testing methods; Types of Flat Plate Collectors: Liquid Flat Plate Collectors, Air flat-plate Collectors- Thermal analysis; Evacuated tubular collectors.

Concentrating Collector Designs

Classification, design and performance parameters; Tracking systems; Compound parabolic concentrators; Parabolic trough concentrators; Concentrators with point focus; Heliostats; Comparison of various designs: Central receiver systems, parabolic trough systems; Solar power plant; Solar furnaces

TEXT BOOKS :

1. S.P.Sukhatme-Solar Energy: principles of Thermal Collection and Storage, Tata McGraw-Hill
2. J.A.Duffie and W.A.Beckman-Solar Engineering of Thermal Processes-John Wiley, (1991).

REFERENCE BOOKS :

J.F.Kreider and F.Kreith-Solar Energy Handbook McGraw-Hill (1981).

ELECTIVE-III

2MTE5 (3) MECHATRONICS

SECTION - A

Introduction: Scope, sensors, transducers, selection, contact & non contact optical types, performance, examples.

Actuators : Principal, types-hydraulic, pneumatic, electrical, contact speed,multispeed, step and continuous variable, actuators with stepping motors.

Computer process controls : Computer process interface, interface hardware, direct digital control, supervisory computer control.

Design of mechatronics elements: Measuring system, control software and user interface, gauging, tool monitoring system, spindle drives, feed drives, servo principles, configuration CNC systems, interfacing, monitoring, diagnostics.

Automatic loading and unloading devices, magazines, bunkers, orientors, feeders, separators, etc.

SECTION - B

Pneumatic systems: Different control components of pneumatic systems and there conversion valves, auxiliary devices, synchronizing, clamping, declamping, application to robotics.

Hydraulic systems: Different control components of hydraulic systems, valves and auxiliary devices, design and analysis of hydraulic circuits sequencing, synchronizing, pneumo-hydraulic, CNC lubrication, machine tool applications.

TEXT BOOKS :

1. Industrial Automation by Turgam, Mir Publication.
2. Pneumatics and Hydraulics by Stewar

REFERENCE BOOKS :

1. Mechatronics by HMT
2. Introduction to Mechatronics and Measurment Systems by Michal B. Histand & David G. Aiciatore.

ELECTIVE -III

2MTE5 (4) COMPUTATIONAL FLUID DYNAMICS

SECTION – A

Review of Governing Equations: Governing Equations of Fluid flow and heat transfer, review of numerical methods.

Discretization: Introduction to finite differences, difference equations, explicit and implicit approaches: definition and contrasts, errors and analysis of stability.

Classification of Partial Differential Equations: Explicit and Implicit methods, solution of select model equations; Laplace heat and wave equation, laminar boundary layer solution

SECTION - B

CFD Techniques: The lax -wendroff technique, Mac Cormack's technique, Relaxation technique and its use with low speed inviscid flows, aspects of numerical dissipation and dispersion; artificial viscosity, Alternating Direction Implicit (ADI) technique, pressure correction technique with application to incompressible viscous flow.

Initial And Boundary Value Problems: Free falling of a spherical body, two dimensional motions of a body through a fluid radial flow.

TEXT BOOKS :

1. Computational Fluid Flow and Heat Transfer, Muralidhar, K. and Sundararajan, T., Narosa Pub., 2004.
2. Computational Fluid Dynamics: The Basics with Applications, Anderson, J. D., Jr. McGraw Hill, 2002.
3. Computational Fluid Dynamics: An Introduction for Engineers, Abbot, M. B. and Basco, D. R., John Wiley & Sons, 2006.
4. Computational Fluid Dynamics: Principles and Applications, Blazek, J., Elsevier Science, 2001.

THIRD SEMESTER

3 MTES Seminar & Dissertation

FOURTH SEMESTER

4MTEP Seminar & Dissertation

As per given scheme

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SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
MECHANICAL ENGINEERING (ADVANCED MANUFACTURING
& MECHANICAL SYSTEMS DESIGN)

SEMESTER-I

1MMD1 ADVANCED MANUFACTURING PROCESSES

SECTION - A

Advance machining theory: mechanics of chip formation, shear angle relations, and theoretical determination of cutting force in orthogonal cutting, analysis of turning, drilling, and milling operations. Mechanics of grinding, dynamometry, thermal aspects of machining, tool life and tool wear, economics of machining.

NC/CNC: basic concept, NC control, special features of CNC machine: turret head, tool magazine, servomotors, ball lead screw, automatic tool changer (ATC), and classification of CNC machines, cutting tool and tool holders, point to point, straight cut and continues path, control codes, machine control units, closed system, NC, machine components, CNC, DNC, Manual part programming, formats, coding, programming languages. APT, ADAPR, EXAPT etc. sensors and adaptive control, Manual part programming for drilling, milling and lathe, examples in APT. applications and economics of CNC.

Metal casting: Metal casting processes, pattern and mould, moulding materials, elements of gating system design, riser design, solidification structure, solidification shrinkage structure, defects and properties of finished casting, heat treatment.

SECTION - B

Welding process, heat flow in welding, metallurgy of fusion weld, welding stresses and distortions, preheat and post weld heat treatment weld ability tests, weld defects, weld inspection and quality control. Electron beam welding, ultrasonic welding, laser beam welding.

Metal forming: Nature of plastic deformation, fundamentals of plasticity, mechanics of metal forming processes like rolling, forging, drawing, extrusion etc. various forming operations, defects in metal forming, local instability and tearing, bending of sheets, hydro forming. Electro magnetic forming, explosive forming, electro hydraulic forming, stretch forming, contour roll forming.

Unconventional machining process: parametric study, applications and fundamentals of Ultrasonic Machining USM, Abrasive Jet Machining AJM, Water Jet Machining WJM, Abrasive Water Jet Machining AWJM, Electro- chemical Machining ECM, Electro Discharge Machining EDM, Electron Beam Machining EBM, Laser Beam Machining LBM.

Books Recommended:
TEXT BOOKS:

1. Juneja, Fundamentals of metal cutting
2. A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi “Manufacturing Science”

REFERENCE BOOKS:

1. Arshinov, Metal cutting theory & cutting tool design
2. Mikhal Groover, CAD/CAM
3. N. K. Mehta, Machine tool design
4. E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi (ISBN 0-02-
5. 978760) “Materials and Processes in Manufacturing” (8th Edition), ,
6. G.F. Benedict, Marcel Dekker, Inc. New York (ISBN 0-8247-7352-7) “Nontraditional Manufacturing Processes”.

1MMD2 ADVANCED MACHINE DESIGN
SECTION-A

Introduction: Role of failure prevention analysis in mechanical design, Modes of mechanical failure, Review of failure theories for ductile and brittle materials including Mohr’s theory and modified Mohr’s theory, Numerical examples.

Fatigue of Materials: Introductory concepts, High cycle and low cycle fatigue, Fatigue design models, Fatigue design methods, Fatigue design criteria, Fatigue testing, Test methods and standard test specimens, Fatigue fracture surfaces and macroscopic features, Fatigue mechanisms and microscopic features.

Stess-Life (S-N) Approach: S- N curves, Statistical nature of fatigue test data, General S-N behavior, Mean stress effects, Different factors influencing S-N behaviour, S-N curve representation and approximations, Constant life diagrams, Fatigue life estimation using S-N approach.
Strain-Life(-N)approach: Monotonic stress-strain behavior ,Strain controlled test methods ,Cyclic stress-strain behavior, Strain based approach to life estimation, Determination of strain life fatigue properties, Mean stress effects, Effect of surface finish, Life estimation by N approach.

SECTION-B

LEFM Approach: LEFM concepts, Crack tip plastic zone, Fracture toughness, Fatigue crack growth, Mean stress effects, Crack growth life estimation.

Statistical Aspects of Fatigue: Definitions and quantification of data scatter, Probability distributions, Tolerance limits, Regression analysis of fatigue data, Reliability analysis, Problems using the Weibull distribution.

Fatigue from Variable Amplitude Loading: Spectrum loads and cumulative damage, Damage quantification and concepts of damage fraction and accumulation, Cumulative damage theories, Load interaction and sequence effects, Cycle counting methods, Life estimation using stress life approach.

Surface Failure: Introduction, Surface geometry, Mating surface, Friction, Adhesive wear, Abrasive wear, Corrosion wear, Surface fatigue spherical contact, Cylindrical contact, General contact, Dynamic contact stresses, Surface fatigue strength.

Books Recommended:

TEXT BOOKS:

1. Robert L. Norton, Pearson: "Machine Design"
2. S. Suresh: "Fatigue of Materials" - Press, Cambridge, U.K.

REFERENCE BOOKS:

1. Jack. A. Collins, John Wiley, Newyork: "Failure of Materials in Mechanical Design"- 1992.
2. Julie. A. Benantine: "Fundamentals of Metal Fatigue Analysis"- Prentice Hall,1990
3. ASM Hand Book: "Fatigue and Fracture"- Vol. 19, 2002.
4. Ralph I. Stephens, Ali Fatemi, Robert .R. Stephens, Henry Fuchs, John: "Metal Fatigue in Engineering"- Wiley Newyork, Second edition. 2001.

1MMD3 COMPUTER AIDED DESIGN AND ENGINEERING

SECTION - A

CAD – Introduction, typical Product Cycle, Implementation of a typical CAD process, Application of CAD and their Advantages

3D modeling and viewing: Introduction, Modeling Approaches, Types of Geometric Models, Coordinate System, sketching and Sketch Planes,

Parameters and Dimensions, Basic Features, Datum Features, Geometric Constraints, Modeling Operations and Strategies

Modeling Aids and Tools: Introduction, Geometric Modifiers, Layers, Colors, Grids, Groups, Dragging and Rubbering, Clipping, Entity Selection methods, Geometric Arrays, Transformations, Editing.

Geometric Modeling: Types of Curves and Curve Manipulations, Types of Surfaces and Surface Manipulations, Solids: Introduction, Geometry and Topology, Solid Entities, Fundamentals of Solid Modeling, Boundary Representation (B-rep), Constructive Solid Geometry (CSG) examples, Sweeps and Solid Manipulations, Feature based Modeling: Introduction, Feature Entities, Parametrics, Feature Manipulations

CAD/CAM Data exchange and data storage: Introduction, graphics and computing standards, data exchange standards like IGES, STEP

Assembly Modeling: Introduction, Assembly Modeling, Assembly Tree, Assembly Planning, Mating Conditions, Bottom – Up and Top – Down Assembly Approaches with examples, Tolerance Analysis and Mass Property calculations

SECTION - B

Review of One Dimensional FEM: FEM Methodology – Modeling and discretization Interpolation, elements, nodes and degrees-of-freedom-applications of FEA. One-Dimensional Elements: Bar element – truss element – assembly of elements – properties of stiffness matrices-boundary conditions-solution of equations-mechanical loads and stresses-thermal loads and stresses-example problems.

Review of Two and Three Dimensional FEM: Interpolation and shape functions - element matrices-linear triangular elements (CST)-quadratic triangular elements – bilinear rectangular elements solid elements-higher order elements – stress calculations.

Applications to Field Problems: Solution to problems in linear elasticity- plane problems in elasticity- plates and shells- solution of problems in heat-transfer and fluid mechanics- numerical examples-discussion on error estimates

Books Recommended:

TEXT BOOKS:

1. Ibrahim Zeid, Matering CAD/CAM, Tata McGraw Hill Publishing Co. Ltd., New Delhi.

2. Chandrupatla & Belagundu, Finite Elements in Engineering, Prentice Hall of India Private Ltd., 1997.

REFERENCE BOOKS:

1. P. N. Rao, CAD/CAM, Prentice Hill, International
2. Daryl L. Logan, A first course in the Finite Element Method, Fourth edition, Thomson
3. Ibrahim Zeid, CAD/CAM – Theory and Practice, MGH International
4. Mikell P Groover and Emory W Zimmers Jr., CAD/CAM – Computer Aided Design and Manufacturing, Prentice Hill, International
5. P. Radhakrishnan, S. Subramanayan and V.Raju, CAD/CAM/CIM, New Age International (P) Ltd., New Delhi.
6. Rogers, D.F. and Adams, A., Mathematical Elements for Computer Graphics, McGraw Hill Inc, NY, 1989
7. Cook, Robert Davis et al "Concepts and Applications of Finite Element Analysis ", Wiley, John & Sons, 1999.
8. Bathe, K.J., Finite Element Procedures in Engineering Analysis, 1990.
9. S. S. Rao, Finite Element Analysis, 2002 Edition.
10. David V Hutton, Fundamentals of Finite Element Analysis, McGraw-Hill International Edition, 2004.

1MMD4 DESIGN OF MATERIAL HANDLING EQUIPMENTS

SECTION-A

Introduction: Transmission and its requirements. Matching of load and prime mover. Types of material equipment's – Characteristics applications selection of the system.

Design Of Hoists: Design of hosting elements – ropes, chains, pulleys, sheaves, hoists of different types. **Design Of Elevators**: Types – Design of chair and bucket elevators – belt and bucket elevators - discharges.

SECTION-B

Design Of Conveyors: Types of conveyors – design of belt, pneumatic, hydraulic, screw and vibratory conveyors – selection of the conveyors.

Selection Of Drives: Types of drives – rails traveling mechanism – slewing with rotary pillar, fixed pillar and turn tablets – traveling gear. Selection of

Grabbing Attachments: Cranes grabs – grabbing attachments for loose pieces – lifting magnets grab buckets and liquid handling buckets. Design of Arresting Mechanism: Brakes – Shoes, Band, cone disc and Centrifugal types.

Books Recommended:

TEXT BOOKS:

1. Spivakovsky, A. & Dychnov, V.K., "Conveying Machines Volumes I & II", MIR Publishers Moscow.
2. Rudenko, N., "Material Handling Equipments", MIR Publishers, Moscow

REFERENCE BOOKS:

1. Boltz, Hord, A., "Material Handling Handbook ", The Ronald Press CO.
2. V. Dobrovolsky et. al, "Design of Machine Elements", MIR Publishers
3. Spivakovsky, F. and Dyachkov, V.,"Conveyours and Related Equipments". MIR Pulishers, Moscow.
4. Duglas, R WOODLEY, "Encyclopaedia of Materials Handling – Vol 1 Pregmen.
5. Hudson Wilbur, G., "Conveyors and Related Equipments ", Join Wiley and Sons.
6. M. F. Spotts and T. E. Shoup, " Design of Machine Elements", PHI
7. J.E.Shiegley, "Mechanical Engg Design", Mc-Graw Hill Book Co
8. D.N. Reshetov, "Machine Design", MIR Publishers.

1MMD5 ELECTIVE-I

(1) RELIABILITY, MAINTENANCE MANAGEMENT & SAFETY

SECTION-A

Reliability Engineering: System reliability - series, parallel and mixed configuration, Block diagram, r-out-of-n structure,Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability,Method of improving reliability during design, different techniques available to improve reliability, Optimization, Reliability – Cost trade off, Prediction and analysis, Problems.

Maintainability, Availability & Failure Analysis: Maintainability & Availability – Introduction, formulae, Techniques available to improve

maintainability & availability, trade off among reliability, maintainability & availability, simple problems, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis, TA, FMEA, FMECA.

Maintenance Planning and Replacement: Maintenance planning – Overhaul and repair; Meaning and difference,Optimal overhaul/Repair/ Replace maintenance policy for equipment subject to breakdown, Replacement decisions –Optimal interval between preventive replacements of equipment subject to breakdown, group replacement.

SECTION-B

Maintenance Systems: Fixed time maintenance, Condition based maintenance, Operate to failure, Opportunity maintenance, design out maintenance, Total productive maintenance, Inspection decision – Optimal inspection frequency, non-destructive inspection, PERT & CPM in maintenance, Concept of terrotechnology.

Condition Monitoring: Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies, Examples of monitoring and diagnosis, Control structure for machine diagnosis.

Safety Aspects: Importance of safety, Factors affecting safety, Safety aspects of site and plant, Hazards of commercial chemical reaction and operation, Instruments for safe operation, Safety education and training, Personnel safety, Disaster planning and measuring safety effectiveness, Future trends in industrial safety.

Books Recommended:

TEXT BOOKS :

1. Concepts in Reliability Engineering L.S. Srinath Affiliated East West Press
2. Maintainability and Reliability Handbook Editors: Ireson W.A. and C.F. Coombs McGraw Hill Inc.

REFERENCE BOOKS:

1. Failure Diagnosis and Performance Monitoring L.F. Pau Marcel Dekker
2. Industrial Maintenance Management S.K. Srivastava S. Chand & Co Ltd.
3. Management of Industrial Maintenance Kelly and M.J. Harris Butterworth and Co.

4. Maintenance, Replacement and Reliability A.K.S. Jardine Pitman Publishing
5. Engineering Maintainability: How to Design for Reliability and Easy Maintenance B.S. Dhillon Prentice Hall of India

1MMD5 ELECTIVE-I

(2) NEW PRODUCT DESIGN

SECTION - A

Introduction: Types of design, importance of design, design considerations, product life cycle, technology life cycle, benchmarking and mass customisation, stages, objectives, success factors, concurrent approach in NPD

Product Development Process & Methodologies: Integrated Product development process - *Identifying Customer Needs***:** Gather raw data from customers, interpret raw data in terms of customer needs, organize the needs into a hierarchy, establish the relative importance of the needs and reflect on the results and the process, *Conceive* – Specification, Concept design: the activities of concept generation, Concept Selection**:** Overview of methodology, concept screening, and concept scoring, *Design* - Detailed design, Validation and analysis (simulation), Tool design, *Realize* - Plan manufacturing: Factors influencing material and process selection, approaches, tools and software used in selection, Manufacture, Build/ Assemble, Test (quality check), *Service* - Sell and Deliver, Use, *Maintain and Support*, *Dispose*

Product Development Approaches: Bottom-up design, Top-down design, Front-loading design workflow, Design in context, Modular design. Concurrent engineering, partnership with supplier, collaborative and Internet based design, work structuring and team deployment, Product and process systemization, problem, identification and solving methodologies, improving product development solutions

SECTION - B

Prototyping: Prototyping basics, principles of prototyping, technologies, planning for prototypes, practical examples

Design Analysis Tools: Product Reliability, Mortality Curve. Design for Manufacturing: machining, casting, forging and metal forming, optimum design, Design for Assembly and Disassembly, Design for Six Sigma, Design for reliability, Design for product life cycle Deign for maintainability and serviceability, Design for environment, Design for aesthetic, Design for packaging, Design for handling, Design for safety, etc., Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Probabilistic Design Concepts: FMEA, QFD, Taguchi Method for design of experiments, Estimation of Manufacturing costs, Reducing the component costs and assembly costs, Minimize system complexity.

Books Recommended:

TEXT BOOKS:

1. Dieter George E., Engineering Design, McGraw Hill Pub. Company, 2000.
2. Chitale A. K. and Gupta R. C., Product Design and Manufacture, Prentice-Hall of India, New Delhi.

REFERENCE BOOKS:

1. Ulrich Karl T and Eppinger Steven D., Product design and development, McGraw Hill Pub. Company, 1995.
2. Bralla, James G., Handbook of Product Design for Manufacturing, McGraw Hill Pub. 1986

1MMD5 ELECTIVE-I

(3) LEAN MANUFACTURING

SECTION -A

Introduction: Introduction, background, and lean thinking. Importances of philosophy, strategy, culture, alignment, focus and systems view.

Toyota Production System: Discussion of Toyota Production System. Lean production preparation – System assessment, process and value-stream mapping – Sources of waste.

Lean production processes: Lean production processes, approaches and techniques.—Importance of focusing upon flow. Tools include: Workplace organization, Stability. Just-In-Time – One piece flow – Pull.

SECTION -B

Cellular systems: Cellular systems, Quick change and set-up reduction methods.

Total productive maintenance: Total productive maintenance, Poka-Yoke – mistake proofing, quality improvement. Visual management. Startup of lean processes, examples and applications.

Sustaining improvement: Sustaining improvement and change, auditing, follow-up actions

Books Recommended:

TEXT BOOKS:

1. N. Gopalkrishnan, Simplified Lean Manufacture, PHI Learning Private Limited. New Delhi

2. B.S Nagendra Parashar, Cellular Manufacturing system: An integrated approach, PHI Learning Private Limited. New Delhi

REFERENCES BOOKS:

1. William M. Feld , Lean Manufacturing: Tools, Techniques, and How to Use Them ,The st Lucie Press.
2. Lonnie Wilson, How To Implement Lean Manufacturing: by McGraw Hill, August 2009.
3. Walter W Mc Intyre, Lean and Mean Process Improvement:
4. Dale H. Besterfield, Total Quality Management, Pearson Educations.

1MMD5 ELECTIVE-I

(4) DESIGN FOR MANUFACTURING AND ASSEMBLY

SECTION – A

Introduction: Design philosophy steps in Design process , General Design rules for manufacturability , basic principles of design Ling for economical production , creativity in design. Materials: Selection of Materials for design Developments in Material technology , criteria for material selection , Material selection interrelationship with process selection process selection charts.

Machining process: Overview of various machining processes , general design rules for machining - Dimensional tolerance and surface roughness , Design for machining , Ease ,Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

Metal casting: Appraisal of various casting processes, selection of casting process, - general design considerations for casting , casting tolerances , use of solidification simulation in casting design , product design rules for sand casting.

SECTION – B

Metal joining: Appraisal of various welding processes, Factors in design of elements, general design guidelines , pre and post treatment of welds , effects of thermal stresses in weld joints , design of brazed joints. Forging, Design factors for Forging , Closed die forging design , parting lines of die5 drop forging die design , general design recommendations. Extrusion & Sheet Metal Work: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, Deep Drawing, Keeler Goodman Forming Line Diagram, and Component Design for Blanking.

Assemble advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

Automatic assembly transfer systems: Continuous transfer, intermittent transfer, indexing mechanisms, and operator - paced free – transfer machine.

Design of manual assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

Books Recommended:

TEXT BOOKS:

1. Geoffrey Boothroyd, "Assembly Automation and Product Design", Marcel Dekker Inc., NY, 1992.
2. Geoffrey Boothroyd, "Hand Book of Product Design" Marcel and Dekken, N.Y. 1990.

REFERENCE BOOKS:

1. Engineering Design – Material & Processing Approach – George E. Deiter, McGraw Hill Intl. 2nd Ed.2000.
2. A Delbainbre "Computer Aided Assembly London, 1992.

1MMD5 ELECTIVE-I
(5) ERGONOMICS OF MANUFACTURING
SECTION -A

Introduction: Introduction and Human performance - Interdisciplinary nature of ergonomics, modern ergonomics. Information input and processing, factors affecting human performance, physical work load and energy expenditure, heat stress, manual lifting.

Work Space Design: Work Space Design, Anthropometry, Workspace designs for standing and seated workers, arrangement of components within a physical space, interpersonal aspect of workplace design.

SECTION -B

Design of Equipments: Design of Equipments, Ergonomic factors to be considered, design of displays and controls, design for maintainability.
Design of Environment: Design of Environment, Illumination – climate – Noise – motion

TEXT BOOKS:

1. Martin Helander,A guide to Ergonomics of Manufacturing, TMH, 1996.
2. Bridger, R.S., "Introduction to Ergonomics", McGraw Hill, 1995.

REFERENCES BOOKS:

3. McCormick, J., Human Factors in Engineering and Design, McGraw Hill, 1992.
4. W Karwowski, Ergonomics in Manufacturing: Raising Productivity through Workplace Improvement, Engineering and management press.

1MMD6 ADVANCED MANUFACTURING PROCESSES -LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Demonstration of job setting on CNC turning center and vertical machining center.
2. Preparation of program for plain turning of shaft.
3. Preparation of program for taper turning.
4. Preparation of program for grooving.
5. Preparation of program for threading.
6. Preparation of program for pocket milling.
7. Preparation of program for drilling.
8. Preparation of program for 2D profile cutting.
9. Preparation of program for boring and tapping.

Practical Examination:
Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

1MMD7 COMPUTER AIDED DESIGN AND ENGINEERING -LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Study of at least one CAD software in each of the following category,
    a. High-End CAD like UG/NX, CATIA, Pro/E
    b. Middle-range CAD like Solid Edge, AIP, Solid Edge
    c. Low-end CAD like AutoCAD, Turbo CAD, AutoCAD LT
2. Assembly modeling (for any 2 assemblies or sub-assemblies) using top down and bottom-up approaches inclusive of sketching, parts modeling (using solid and surface modeling/styling toolboxes), drafting (parts and assemblies)
3. Part families and design table creation using spreadsheet interface
4. CAD File/data exchange amongst the various CAD software and software for CMM, CAE, CNC, CAM
5. Customization/Program development for parts modeling and drafting using API and other development tools
6. **FEA:** Using any FEA software packages solve 2 problems each on structural mechanics and heat transfer, Introduction to nonlinear analysis

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

SEMESTER-II

2MMD1 ADVANCED MATERIALS TECHNOLOGY

SECTION - A

Materials and Classification: Solid materials- Classification, Ceramics, composites and metal glasses, selection and application of tool steel, Magnetic alloys, Copper, aluminum and magnesium alloys, Bearing alloys, Super hard materials, Plastics, Alloying techniques-Thermal, mechanical and chemical methods, Power metallurgy techniques.

Mechanical Properties: Strengthening mechanism of materials, elements of dislocation theories, Strain hardening, Grain size control, Single crystal growth, Reinforcing fibres for polymers, Composite structure, determination of mechanical properties of materials, Dynamic tests, Fracture and toughness tests, Low temperature and high temperature tests, Creepm characteristics, Hot hardness tests.

SECTION - B

Processing of Materials for Casting and Joining: Plastic working of materials, Strain hardening, Recovery and recrystallisation, Formability, Forgibility and drawability of materials, Powder processing of materials, Ceramic processing, Composite processing, Features controlling machinability of materials, thermal treatment for better mach inability of metals, Universal mach inability index.

Modern Materials and Alloys: Super alloys-refractory materials, Ceramic and their applications, Low melting alloys, Shape memory alloys, Advanced Composites-Particulate and dispersioned composites, Metal matrix and ceramic matrix composites, Carbon-Carbon composites, Ti and Ni based alloys for gas turbine applications, Managing and cryogenic steels, smart and nano materials.

Non metallic materials: Polymeric materials - Formation of polymer structure - Production techniques of fibres, foams, adhesives andcoatings - Structure, properties and applications of engineering polymers - Advanced structural ceramics, WC, TiC, TaC, AI2O3, SiC, Si3N4, CBN and diamond – properties and applications.

Books Recommended:

TEXT BOOKS:

1. Engineering Materials and Applications P. Flinn and P.K. Trojan MIR Publications
2. Engineering Materials: Polymers, Ceramics and Composites A.K Bhargava Prentice Hall of India

REFERENCE BOOKS:

1. Manufacturing processes for Engineering Materials Serope Kalpakjian Wesley Publishing Co.
2. An introduction to Physical Metallurgy S.H. Avner McGraw Hill
3. Advances in Materials and Their Applications P. Rama Rao Wiley Eastern
4. Mechanical Metallurgy Dieter McGraw Hill:
5. P.C.Shrma, Production technology
6. Thomas H.Courtney, " Mechanical Behaviour of Materials ", (2nd Edition), McGraw-Hill,
7. Charles J.A., Crane, F.A.A and Furness, J.A.G., " Selection and use of Engineering Materials ", (3rd Edition), Butterworth-Heiremann, 1977.

8. Flinn, R.A. and Trojan, P.K., " Engineering Materials and their Applications ", (4th Edition),
Jaico, 1999.
9. George E.Dieter, " Mechanical Metallurgy ", McGraw Hill, 1988.
10. Metals Hand Book, Vol.10, " Failure Analysis and Prevention ", (10th Edition), 1994.

2MMD2 RAPID PROTOTYPING AND TOOLING

SECTION-A

Introduction: Need for time compression in product development, Product development conceptual design, Development, Detail design, Prototype, Tooling, Applications of RP.

Stereolithography systems: Principle, Process parameters, Process details, Machine details, Applications.

Laser sintering systems: Principle, Process parameters, Process details, Machine details, Applications. Fusion deposition modeling: Principle, Process parameters, Process details, Machine details, Applications.

SECTION-B

Laminated object manufacturing: Principle, Process parameters, process details, Machine details, Applications. Laser engineering net shaping (lens): Ballistic Particle Manufacturing (BPM), 3D printing. Principle, introduction to rapid tooling, Direct and indirect method. Commercial softwares for RP, STL file generation. Rapid tooling techniques- vacuum casting, DMLS, etc. Introduction to reverse engineering.

Books Recommended:

TEXT BOOKS:

1. Ghosh A., "Rapid Prototyping: A Brief Introduction", Affiliated East West,
2. Kenneth G. Cooper, "Rapid Prototyping Technology: Selection and Application", CRC Press, 2001.

REFERENCE BOOKS:

1. Pham, D.T. & Dimov.S.S., "Rapid manufacturing", Springer - Verlag, London, 2001.
2. Terry wohlers, "Wohlers Report 2007", Wohlers Associates, USA, 2007.

3. Chua Chee Kai, Leong Kah Fai, Lim Chu -Sing, "Rapid Prototyping:
4. Principles and Applications", World Scientific, 2003.

2MMD3 MECHATRONICS IN SYSTEM DESIGN

SECTION - A

Fundamentals of Mechantronics: Evolution, Definition and concepts of Mechatronics, Conventional system vs. mechatronic system, Need and Role of Mechantronics in Design, Manufacturing and Factory Automation. Hardware components for Mechatronics. Transducer signal conditioning and Devices for Data conversion programmable controllers.

Sensors and Actuators: Transducers and Sensors – Tactile sensor – Proximity and range sensors – Sensing joint forces –Position and velocity sensing devices – Design of drive systems – Hydraulic and Pneumatic drives – Linear and rotary actuators and control valves – Electro hydraulic servo valves, electric drives – Motors – Robot End effectors– Vacuum, magnetic and air operated grippers, Micro sensors in Mechatronics.

Pneumatic Systems: Physical concepts of pneumatics, electro pneumatic components, operation and application, valves, auxiliary devices, actuation, synchronizing, clamping, declamping etc. Design of pneumatic logic circuit.

SECTION - B

Hydraulic Systems: Study of different control components of Hydraulic Systems, Valves and auxiliary devices, design and analysis of Hydraulic circuits sequencing Synchronizing, hydropneumatics, Design of electrohydraulic circuits.

Programmable Logic Controller: Comparison between microprocessor and microcontroller organization of microcontroller system Review of logic gates, basic structure, features, input/output processing, programming, functional block diagram (FBD), ladder diagram, logic functions, latching, sequencing, jumps, internal relays, counters, shift registers, master and jump control, data handling, data movement, data comparison, arithmetic operations, code conversion, analog input and output, applications of PLC

Books Recommended:

TEXT BOOKS:

1. C.W. De Silva, "Mechatronics: An Integrated Approach, Publisher: CRC.
2. Harry Stewart, "Pneumatics & Hydraulics", D. B. Taraporewala Sons and Co.,

3. M.P. Groover, "Automation, Production Systems and CIM by, PHI

REFERENCE BOOKS :

1. M. B. Histand & D. G. Aiciatore, "Introduction to Mechatronics & Measurement Systems by McGraw Hill.
2. Moh Mazidi and J. Mazidi, "The 8051 Microcontrollers and Embedded Systems", Prentice Hall
3. A. Malov, Y. Ivanov, " Principles of Automation" Automation by, MIR Publication
4. B.W. Anderson, "The Analysis and Design of Pneumatic Systems Wiley Eastern
5. D.V. Hall, "Microprocessor and It's Applications", Tata McGraw Hill
6. Anthony Esposito, "Fluid Power with Applications Prentice Hall of India
7. Phillipe Collet, "Robotic Technology", Prentice Hall
8. Y. Koren, "Robotics for Engineers", McGraw Hill

2MMD4 EXPERIMENTAL STRESS ANALYSIS

SECTION-A

Introduction to Photoelasticity: Photo elasticity, Light and Optics as Related to Photoelasticity Behavior of Light, Plane and circularly polarized light, Bright and dark field setups, Polariscope-Plane Polarizers, Wave Plates, Arrangement of Optical Elements in a Polariscopic, Constructional Details of Diffused Light and Lens, Photo elastic materials

Theory of Photoelasticity: Stress Optic Law in Two Dimensions at Normal Incidence, Effects of a Stressed Model in a Plane Polariscope, Effects of a Plane Model in a Circular Polariscope with Dark and Light Field Arrangements.

Analysis Techniques: Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, separation Techniques, Sealing Model to Prototype Stresses.

Three Dimensional Photoelasticity: Introduction, locking in model deformation, materials for three-dimensional photo elasticity, machining cementing and slicing three-dimensional models, slicing the model and interpretation of the resulting fringe patterns, effective stresses, the shear difference method in three dimensions, applications of the Frozen-stress method, the scattered light method.

SECTION-B

Strain Measurement Methods: Basic Characteristics of a Strain Gauge, Various types of strain gauges , Types of Shell Gauge, Moire Method of Strain Analysis, Grid Method of Strain Analysis.

Electrical Resistance Strain Gauge: Factors Influencing Strain sensitivity in Metallic Alloys, Gauge Construction Temperature Compensation, Factors-Influencing Gauge Section Gauge Sensitivity and Gauge Factor, Correction for transverse Strain Effects, Semiconductor Strain Gauges. Strain gauge circuits-Rosette Analysis - three element rectangular Rosette, the four Element Delta Rosettee, Stress Gauge, Strain Circuits, Potentiometer Circuits, Wheatstone Bridge.

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

Brittle Coating Method: Introduction, Coating Stresses, Failure Theories, Brittle Coating Crack Patterns Produced by Direct Loading, Brittle Coating Crack Patterns Produced by refrigeration Techniques, Brittle Coating Crack, Pattern Produced by Releasing the Load, Double Crack Pattern, Crack Detection, Ceramic based brittle coatings, Resin based brittle coatings, Test procedures for brittle coatings analysis, Calibration procedures, analysis of brittle coating data. Load-Time Relation and Its influence on the threshold Strain Effects of a Biaxial stress Field.

Birefringent Coatings

Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation methods.

Books Recommended:

TEXT BOOKS:

1. J.W. Dally and W.F. Riley, Experimental Stress Analysis, 2nd Ed. MGH.
2. K. Ramesh, Published by IIT Madras, India, Experimental Stress Analysis, 2009.

REFERENCE BOOKS:

1. A Mubin, Khanna Publications, Experimental Stress Analysis, 2003.
2. Sadhu Singh, Khanna Publishers, Experimental Stress Analysis, 1982

3. Mark B. Moore, Prentice-Hall , Principles of experimental stress analysis, 1954
4. Dureli, An Introduction to Experimental Stress and Strain Analysis.
5. Srinath , An Introduction to Experimental Stress Analysis - MGH.
6. Experimental Stress Analysis - Dally and Riley, McGraw Hill.
7. Photoelasticity Vol I and Vol II - M.M.Frocht,. John Wiley and sons.
8. Strain Gauge Primer - Perry and Lissner.
9. Photo elastic Stress analysis - Kuske, Albrecht and Robertson John Wiley & Sons.
10. Motion Measurement and Stress Analysis - Dave and Adams,
11. Hand Book of Experimental Stress Analysis AS. Kobayassin (Ed), SEMNCH, II edition.

2MMD5 ELECTIVE - II

(1) OPTIMIZATION METHODS IN ENGINEERING DESIGN

SECTION - A

Introduction: Historical Developments, Engineering applications of Optimization

Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasible directions, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

SECTION – B

Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem from arithmetic-geometric inequality point of view, constrained minimization problems, generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

Novel methods for Optimization: Introduction to simulated annealing, selection of simulated annealing parameters, simulated annealing

algorithm; Genetic Algorithm (GA), Design of GA, Key concepts of GA, Neural Networks, A frame work for Neural Network models, Construction of Neural Network algorithm, Examples of simulated algorithm, genetic annealing and Neural Network method.

Books Recommended:

TEXT BOOKS:

1. Engineering Optimization, S. S. Rao New Age International
2. Optimization for Engineering Design, Kalyanmoy Deb Prentice Hall of India

REFERENCE BOOKS:

1. Applied Optimal Design, E. J. Haug and J.S. Arora Wiley, New York
2. Optimization, G.V. Reklaites, A. Ravindran and K.M. Rogsdeth Wiley, New York

2MMD5 ELECTIVE - II

(2) ADVANCED MACHINE TOOL DESIGN

SECTION - A

Machine Tool Drive: working and auxiliary motion in machine, Machine tool drives, Hydraulic transmission, Mechanical transmission, General requirements of machine tool design, Layout of machine tools.

Regulation of Speed and Feed Rates: Aim of speed feed regulation, stepped regulation of speed, design of speed box, Design of feed box, Special cases of gear box design, Set stopped regulation of speed and feed rates.

Design of Machine Tool Structure: Fundamentals of machine tool structures and their requirements, Design criteria of machine tool structure, Static and dynamic stiffness, Design of beds and columns, Design of housing models, Techniques in design of machine tool structure.

SECTION - B

Design of Guide-ways and power Screws: Function and type of guide-ways, design of slide-ways, Protecting devices for slide-ways, Design of power screws.

Design of Spindles and Spindle Supports: Materials for spindles, Design of spindles, Antifriction bearings, Sliding bearings.

Dynamics of Machines Tools: General procedure of assessing dynamic stability of EES, Cutting processing, Closed loop system, Dynamic characteristics of cutting process, Stability analysis.

Books Recommended:

TEXT BOOKS:

1. N.K. Mehta Tata McGraw Hill "Machine Tool Design"
2. Acherkan, N., "Machine Tool Design", Vol. 3 & 4, MIR Publishers, Moscow, 1968

REFERENCE BOOKS:

1. CMTI Banglore "Machine Tool design Handbook"
2. Koenisberger, F., "Design Principles of Metal cutting Machine Tools", Pergamon Press, 1964.
3. Sen. G. and Bhattacharya, A., "Principles of Machine Tools", Vol.2, NCB.Calcutta, 1973

2MMD5 ELECTIVE - II
(3) TOTAL QUALITY MANAGEMENT
SECTION – A

Introduction: Quality – Basic concepts, dimensions, economics of quality, quality Gurus.

TQM: Definition, evolution, journey from inspection to TQM, comparison at different stages, dimensions of TQM, TQM viewpoints, reasons for adopting TQM.

Introspection to TQM environment: Sphere of TQM, components of TQM, TQM – Managing Total Quality, Factors affecting TQM environment, Classification and interaction among factors, Researchers' viewpoint, TQM as a system, steps in TQM implementation, Roadblocks in TQM implementation, Reasons for TQM failure.

Role of soft options in TQM: Hard vs. Soft factors, Role and expectation of employer, employee, customer and supplier from organization and vice versa. Human factors in TQM, Role of top management commitment, work culture,motivation,coordination,attitude,innovation.

Section – B

Quality initiatives in organizations: Role of tools and techniques in TQM, Classification of tools and techniques – Problem identification, Data analysis, Graphical, Creativity, Companywide. Brief description of Quality awards: – MBNQA, Deming award, European quality award, Australian quality award.

TQM Effectiveness: Impact of TQM, Need and difficulty in measuring TQM effect, Parameters governing effect of TQM.

Books Recommended:

TEXT BOOKS:

1. Oakland "Total Quality Management" Butterworth – Heinamann Ltd.
2. Waller Jenny, Allen Derek and Burna Andrew "The TQM toolkit – a guide to practical techniques for TQM"

REFERENCE BOOKS:

1. Logothetis N. "Managing for total quality from Deming to Taguchi and SPC" by (PHI)
2. Feigenbaum A.V. "Total Quality Control" (MGH)
3. Besterfield Dale H "Total Quality Management" (Pearson Education)
4. John Gilbert "A slice by slice guide to TQM" (Affiliated East West Press)

2MMD5 ELECTIVE-II
(4) COMPUTER ASSISTED PRODUCTION MANAGEMENT
SECTION-A

Computer aided process planning: Approaches to CAPP, basic part representation methods, shape producing capabilities, Process economics

Computer assisted QC: co-ordinate measuring machines construction and types, automated dimensional gauging and in process gauging

Capacity planning: Roll of capacity planning in manufacturing, planning and control systems, hierarchy of capacity planning decisions links to other system modules, capacity planning and control techniques.

SECTION-B

Just in time: JIT in manufacturing planning and control, leveling the production, pull system introduction, product and process design, JIT applications

Computer aided inventory control: Computer aided purchasing procedure, simulation of inventory problems Computer aided materials management: Material requirement planning, computer integrated materials management.

Books Recommended:
TEXT BOOKS:

1. Groover M.P.- Automation, Production Systems and CIM.

2. CAD/CAM theory and concepts, by Kuldeep Sareen and Chandandeep Grewal, S. Chand & company Ltd.

REFERENCE BOOKS:

1. David Bedworth, M.R. Handerson & Philip Wilze- Computer Integrated Design and manufacturing

2MMD5 ELECTIVE - II

(5) CONCURRENT ENGINEERING & PRODUCT LIFE CYCLE MANAGEMENT

SECTION -A

Introduction: Extensive definition of Concurrent Engineering (CE), CE design methodologies, Review of CE techniques like DFM (Design for manufacture), DFA (Design for assembly), QFD (Quality function deployment), RP (Rapid prototyping), TD (Total design), for integrating these technologies, Organizing for CE, CE tool box, Collaborative product development.

Use of Information Technology: IT support, Solid modeling, Product data management, Collaborative product commerce, Artificial Intelligence, expert systems, Software hardware component design.

Design Stage: Lifecycle design of products, Opportunities for manufacturing enterprises, Modality of concurrent engineering design, Automated analysis Idealization control, CE in optimal structural design, Real time constraints.

SECTION -B

Need for PLM: Importance of PLM, Implementing PLM, Responsibility for PLM, Benefits to different managers, Components of PLM, Emergence of PLM, Lifecycle problems to resolve, Opportunities to seize.

Components of PLM: Components of PLM, Product lifecycle activities, Product organizational structure, Human resources in product lifecycle, Methods, techniques, Practices, Methodologies, Processes, System components in lifecycle, slicing and dicing the systems, Interfaces, Information, Standards.

Books Recommended:

TEXT BOOKS:

1. Anderson and LHein , Integrated Product Development M.M. IFS Publications

2. Prasad , Concurrent Engineering Fundamentals: Integrated Product Development Prentice hall India

REFERENCE BOOKS:

3. I Moustapha , Concurrent Engineering in Product Design and Development New Age International. Michael Grieves, Product Lifecycle Management McGraw Hill
4. Andrew Kusiak , Concurrent Engineering: Automation tools and Technology Wiley Eastern Publications

2MMD6 MECHATRONICS IN SYSTEM DESIGN - LAB

At least four practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Sensors applications in Mechanical System
2. Design and testing of sequencing circuits.
3. Design and testing of Different types of Speed control Circuits.
4. Design and testing of Continuous reciprocation of Double acting Cylinder.
5. Study of different components of a CNC Machine-tool
6. Application of Microcontroller in a Mechatronic system

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

2MMD7 EXPERIMENTAL STRESS ANALYSIS - LAB

At least five practicals (study/trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students

List of Practicals:-

1. Determination of Fringe constant of photoelastic material using.
2. Circular disc subjected to diametric compression.
3. Pure bending specimen (four point bending)
4. Determination of 3- dimensional experimental stress analysis using polariscope.
5. Determine slopes of plates by experimental technique.
6. Determination of Principal stresses 1 and 2 in magnitude and direction
7. Study of effect of pressure on principal stresses.

8. Determination of stress concentration using photo elasticity for simple component like plate with a hole under tension. 2D crane hook.
9. Determination of stress frozen and a slice of cross section are taken to analyze stress & no separate loading frame required.
10. Experiments using strain gauges.
11. Measurement of strain, temperature effects
12. Fixing of gauges on surfaces.
13. Experiments using photoelastic bench.
14. Setting of polariscope and calibration of disc, beam and tension model.

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

SEMESTER - III

3MMDS SEMINAR & DISSERTETION
(As per given Scheme)

Project

SEMESTER-IV

4MMDP PROJECT SEMINAR & DISSERTETION
(As per given Scheme)

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SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING (FULL TIME)
M.E. (ELECTRICAL & ELECTRONICS ENGINEERING)

SEMESTER-I
1EEEME1 ADVANCED CONTROL SYSTEMS

Unit I : Signal Processing in Digital Control: Configuration of the Basic Digital Control Scheme, Principles of Signal Conversion, Basic Discrete-Time Signals, Time-Domain Models for Discrete-Time Systems, z-transform, Transfer Function Models, Frequency Response, Stability on the z-plane and the Jury stability criterion, Sample-and-Hold Systems, Sampled Spectra and Aliasing, Reconstruction of Analog Signals, Principles of Discretization.

Unit II: Models of Digital Control Devices and Systems: z-domain description of Sampled Continuous-Time Plants, z-domain description of Systems with Dead-Time, Implementation of Digital Controllers, Tunable PID Controllers, Digital Temperature Control System, Digital Position Control System, Stepping Motors and their Control.

Unit III: Design of Digital Control Algorithms: Introduction, z-plane specifications of Control System Design, Digital Compensator design using Frequency Response Plots, Digital Compensator design using Root Locus Plots, z-plane synthesis.

Unit IV: Control System Analysis Using State Variable Methods: Vectors and Matrices, State Variable Representation, Conversion of state variable models to transfer functions, Conversion of transfer functions to Canonical State Variable Models, Eigen values and Eigen vectors, Solution of state equations, Concepts of Controllability and Observability.

Unit V: State Variable Analysis of Digital Control Systems: State descriptions of Digital Processors, State Description of Sampled Continuous-Time Plants, State Description of Systems with Dead-Time, Solution of State Difference Equations, Controllability and Observability, Multivariable Systems.

Unit VI: Pole-Placement Design and State Observers: Stability Improvement by State Feedback, Necessary and Sufficient Conditions for arbitrary Pole-Placement, State Regulator

Design, Design of State Observers, State Feedback with Integral Control, Digital Control Systems with State Feedback.

TEXT BOOK:

M. Gopal, Digital Control and State Variable Techniques, TMH.

REFERENCE BOOKS:

1. Katsuhiko Ogata Digital Control Engineering, PHI.
2. Kuo B. C. Digital Control Systems, Wiley & Sons
3. Ioan Dor Landau and Gianluca Zito, Digital Control Systems, Springer.
4. M. Sami Fadali, Antonio Visioli, Digital Control Engineering: Analysis and Design , AP.

1EEEME2 ADVANCED POWER ELECTRONICS

Unit I: Semiconductor Devices: Review of Semiconductor devices like Power BJT, SCR, MOSFET, IGBT, GTO, MCT; Static and dynamic characteristics of these devices; Single quadrant, Two quadrant and bid-directional switches.

Unit II: Switching Voltage Regulators: Linear voltage regulators; Switching voltage regulators; Review of basic dc-dc voltage regulator configurations -Buck, Boost, Buck-Boost converters and their analysis for continuous and discontinuous mode; Fly back converter, Forward converter, Push-pull converter, Cuk converter, Sepic Converter; Design criteria for SMPS; Multi-output switch mode regulator.

Unit III: Design of Magnetic Components: Design of power transformer; high frequency transformers for fly back, forward, half-bridge–full Bridge and push pull converters; Design of inductors for various converter topologies; Design of current transformers; Different types of core materials.

Unit IV: DC-AC converters/Inverters: Classification; Review of line commutated inverters; Bridge inverters with 120°,180°,and 150° modes of operation; Harmonic reduction techniques; Sine-triangular PWM; Space Vector Pulse Width Modulation; Current Source Inverters.

Unit V: Gate and Base drive circuits: Preliminary design considerations; DC coupled drive circuits with uni polar and bipolar outputs; Importance of isolation in driver circuits; electrically isolated drive circuits; Some commonly available driver chips (based

on boot-strap capacitor); Cascade connected drive circuits; Thyristor drive circuits; Protection in driver circuits; Blanking circuits for bridge inverters.

Unit VI : Three phase AC voltage controllers and Cyclo-converters: Review of On-off and phase control; Three phase half-wave and full wave controllers and their analysis with resistive loads; three phase bi-directional delta connected controllers; 3-phase cyclo-converter circuits; circulating current operation; non-circulating current operation; mean output voltage and harmonics in supply current waveform

TEXT BOOK:

1. Ned Mohan, Undeland and Robbins, Power Electronics: Converters, Applications and Design (Wiley)

REFERENCE BOOKS:

1. Rashid M.H., Power Electronics, Pearson Education
2. G.K. Dubey, Doradla, Joshi, Sinha, Thyristorised Power Controllers Wiley
3. Sen P.C., Power Electronics, Tata McGraw Hill.
4. Philip T.Krein, Elements of Power Electronics, Oxford University Press.

1EEEME3 ADVANCED DIGITAL SIGNAL PROCESSING

Unit-I : Review of Discrete time systems, LTI systems, Impulse response and frequency response. Discrete convolution. Discrete Fourier Transform and Fast Fourier Transforms, Inverse DFT, Algorithms for efficient computation of DFT and FFT. Fast convolution. Correlation.

Unit-II : Implementation of DSP algorithms, Block diagram and signal flow graph representations, Basic IIR and FIR filter structures, Cascaded, parallel and lattice realizations, computational complexity. Finite word length effects and quantization errors.

Unit-III : Digital filter design. FIR and IIR filters, linear phase filters, design techniques for IIR filters using analog filter transformation methods, design techniques for FIR filters using windowing method. Analysis of finite word length effects.

Unit-IV : Estimation of Auto-correlation and Power Spectra of random signals. Nonparametric methods – averaging periodograms,

Welch method, Blackman and Tukey method, Parametric methods, AR, MA and ARMA models, Yule Walker method, Levinson-Durbin algorithm.

Unit-V: Multi-rate digital signal processing. Poly-phase decomposition, multistage decimators and interpolators, Digital filter banks. Adaptive filtering, minimum mean square error criterion, Wiener filter, LMS adaptive algorithm.

Unit-VI: General purpose DSP processors, Implementation of DSP algorithms on General purpose processors: issues, advantages & disadvantages . Special purpose DSP processors –Hardware digital filters and FFT processors.

TEXT BOOK:

Proakis and Manolakis Digital Signal Processing: Principles, Algorithms and Applications: 3rd Ed.-Prentice-Hall (India)

REFERENCE BOOKS:

1. S.Mitra, Digital Signal Processing: A Computer Based Approach: Tata McGraw Hill
2. Oppenheim & Schafer, Discrete Time Signal Processing, PHI.
3. Defatta, Digital Signal Processing, Wiley Inter-Science.
4. Ifeachor & Jervis, Digital Signal Processing , Pearson Education

1EEEME4 VLSI DESIGN

Unit-I : VLSI and Moore's Law. CMOS technology. Hierarchical design. The VLSI design process.IP-based design. Fabrication methods. Transistor structures. Characteristics of transistors and wires. Design rules. Layout design. Reliability.

Unit-II : Combinational logic.Static logic gates.Basic Gate Layout. Delay and power consumption .Alternate gate structures: switch, domino. Wire delay models. Design-for-yield. Gates as IP.

Unit III : Combinational Logic Networks: Layouts for logic networks. Delay through networks. Logic and interconnect design. Power consumption and power optimization. Switch logic networks. Combinational logic testing.

Unit-IV: Sequential Machines: Latches and flip-flops. structures and Clocking disciplines.Performance analysis. Sequential system design. Power optimization. Verification and testing of FSMs.

Unit-V : Subsystems Design: Pipelines and data paths. Adders. Multipliers. Memory. PLAs. FPGAs. Image sensors. Buses and networks-on-chips. Data paths.

Unit-VI: Floor planning: Floorplanning styles and methodology.Global routing.
Clock distribution.Power distribution.Packaging and pads. Register-transfer design.Pipelining. High-level synthesis.

TEXT BOOK:

Wayne Wolf: "Modern VLSI Design", Prentice-Hall.

REFERENCE BOOKS:

1. Vai M.M. "VLSI Design", CRC Press.
2. Weste N, Eshraghian, "Principles of CMOS VLSI Design" , Pearson Education.
3. Chandrasetty V A "VLSI Design", Springer.
4. Esteban Tlelo-Cuautle and Sheldon X.-D. Tan, "VLSI Design", InTech, Croatia.

1EEEME5 MODELING & ANALYSIS OF ELECTRICAL MACHINES

Unit-I: Introduction to the theory of basic two pole machine applicable to DC Machines, Three-phase induction machines and synchronous machine. Kron's primitive machine, Need of modeling, Introduction to modeling of electrical machines, Voltage and Torque equations.

Unit-II: Concept of transformation: change of variable & machine variable and transform variable for arbitrary reference frames. Application to DC machine for steady state and transient analysis, Equation of cross field commutator machine.

Unit-III : Polyphase Induction Machines: Voltage and torque equations, Equivalent circuit, Steady state analysis, Dynamic performance during sudden change in load torque and three phase fault at the machine terminals.

Unit-IV: Polyphase synchronous Machine: Voltage and Torque equations in stator, rotor and air gap field reference frame. Transformation and transformed equations. Park transformation, Voltage and power equation for salient and non-salient alternator, their phase diagrams.

Unit-V: Dynamic analysis of interconnected Machines: Machine interconnection Matrices. Transformation of voltage and torque equation using interconnection matrix. Large signal transient analysis using transformed equations. The DC generator/DC Motor system. The alternator/synchronous system.

Unit- VI : Linearized machine equations: Linearization of machine equation, small displacement stability: Eigen values of typical induction machine and synchronous machine, transfer function formulation.

TEXT BOOK :

Paul C. Krause, O Wasynczuk, S D. Sudhoff, "Analysis of Electric Machinery", IEEE Press.

REFERENCE BOOKS:

1) B. Adkins, "The Generalized theory of Electrical Machine", McGraw-Hill.
2) P.S. Bhimbra , "Generalised theory of Electrical Machines", Khanna Publishers.
3) C. V. Jones, Butterworth "The Unified theory of Electrical Machines" , Wiley.
4) Boldia and S.A. Nasar , "Electrical Machine Dynamics" , Macmillan Press.

1EEEME6 SEMINAR

The Seminar shall be based on the recent trends in the field of electrical and electronics engineering preferably related to the subjects 1EEEME1 to 1EEEME5. It should be surveyed from the technical literature published in international /national journals. A report should be prepared following the guidelines of IEEE paper format, submitted and followed by the presentation.

1EEEME7 VLSI DESIGN - LAB

Minimum Eight experiments based on the syllabus of 1EEEME4 VLSI Design using appropriate hardware and software.

2EEEME1 DIGITAL INSTRUMENTATION

Unit -I : Introduction: The basis of measurement, International unit system, Measurement &Electrical standards, Measurement errors, Factors influencing measurement errors, Enabling technologies: Processor based components and system components, Semicustom and custom ICs, Display devices.

Unit-II : Data converters: Sampled data systems, A-to-D converter errors, Basic SHA operation, ADC architectures, D to A converters, DAC architectures, Data acquisition system interfaces.

Unit-III : Waveform parameters and amplitude related measurements, Digital multimeters. DMM specifications. Pulse parameters and measurements, Fundamentals of oscilloscopes: basic operation, Digital storage oscilloscopes.

Unit-IV : Electronic counters: Basic counter circuitry, Modes of operation, Accuracy of counters, High frequency measurements and down conversion techniques, Modulation domain analysers. Signal generators. Arbitrary waveform generators (AWG).

Unit-V : Spectrum analysis: Dynamic signal analysis, Types of spectrum analyser, Superheterodyne spectrum analyser, Logic analysers: Basic operation, Types of analysis, Probing, Clocking, Triggering. Advanced features and measurement techniques.

Unit-VI : Instrument buses and VLSI testing: IEEE-488 bus, major specifications, GPIB operation, GPIB devices and interface functions, GPIB applications. VXIbus. The RS 232 interface. VLSI testing and automatic test equipment. Digital telecommunication transmission systems and associated Measurements: ADSL standard – ANSI T1.413, ADSL measurements.

TEXT BOOK:

Nihal Kuluratna "Digital and Analog Instrumentation" The Institution of Engineering and Technology, London.

REFERENCE BOOKS:

1. Bouwens ,A.J."Digital instrumentation." McGraw Hill, 1984.
2. John Lenk,D."Handbook of Microcomputer based instrumentation and control",PHI1984
3. Doebelin "Measurement System ,Application and Design",(4/e),McGraw Hill,1990.
4. Evans D. S. " Fundamentals of Digital Instrumentation", Hilger & Watts.

2EEEME2 EMBEDDED SYSTEMS DESIGN

Unit-I : Embedded systems introduction: Processor technologies, implementation technologies, and design technologies. General-purpose processors and the 8051: Architecture, instruction set and programming environment.

Unit-II: Single-purpose processors: Standard peripheral processors :timers/counters, UARTs, A/D, D/A, PWM, etc. and designing custom processors ,combinational logic design, sequential logic design, custom processor design.

Unit-III : System Integration: Memories (ROM, RAM, compositions), Interfacing (serial/parallel, interrupt-driven, parallel), Arbiters. Common interfacing protocols: PCI, ISA, I2C, CAN.

Unit-IV: Computational models and describing behavior: sequential program, state machines, dataflow. Finite state machines. Concurrent process model. Implementation technologies: Custom VLSI, standard cell and gate array, programmable logic devices (including FPGAs).

Unit-V : Real time Operating System Concept: Architecture of kernel, task scheduler, Process and Threads. ISR, Inter Process Communication through Semaphores, mailbox, message queues, pipes. Events, timers and memory management, RTOS services in contrast with traditional OS.

Unit-VI : Embedded Linux; Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, Linux file systems, Types of file system: Disk, RAM, Flash, Network. TCP/IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Inter Process Communication- Linux process model and IPCs.

TEXT BOOKS:

Frank Vahid, Tony Givargis “Embedded System Design “, PHI.

REFERENCE BOOKS:

1. Rajkamal, “ Embedded Sytems “ TMH
2. David Simon “Embedded Systems Software Primer” Pearson.
3. Steve Heath, “Embedded System Design”, Elsevier.
4. Marwedel, Peter. “Embedded Systems Design” , Springer.

2EEEME3 NEURO FUZZY CONTROL

Unit-I : Fuzzy Logic for Control :Fuzziness and linguistic rules , Fuzzy sets in control ,Combining fuzzy sets , Sensitivity of functions Combining fuzzy rules ,Truth tables for fuzzy logic , Fuzzy partitions , Fuzzy relations ,Defuzzification Level curves and alpha-cuts ,Universal approximation.

Unit-II : Fuzzy Control: A fuzzy controller for an inverted pendulum, Main approaches to fuzzy control, Stability of fuzzy control systems. Fuzzy controller design.

Unit-III : Neural Networks for Control: Introduction to neural network, Implementing neural networks , Learning capability ,The delta rule ,The back propagation algorithm ,Practical issues in training.

Unit-IV : Neural Control : Neural networks in control ,Inverse dynamics ,Neural networks in direct neural control A neural network for temperature control , Simulating PI control with a neural network Neural networks in indirect neural control ,System identification, Instantaneous linearization.

Unit-V : Fuzzy-Neural and Neural-Fuzzy Control : Fuzzy concepts in neural networks, Basic principles of fuzzy-neural systems ,Basic principles of neural-fuzzy systems ,Adaptive network fuzzy inference systems ,ANFIS learning algorithm ,Generating fuzzy rules

Unit-VI : Applications of neural control to current control and speed control of induction motors, Fuzzy logic control of a synchronous generator set. Applications of neuro fuzzy control: Cooling scheme for laser materials, Color quality processing, Identification of trash in cotton and Integrated pest management systems.

TEXT BOOKS:

1. Hung T. Nguyen, A first course in Fuzzy and Neural Control, CRC Press.
2. M.N. Cirstea, A. Dinu, J.G. Khor,M. McCormick, Neural and Fuzzy Logic Control of Drives and Power Systems, Newnes Press.

REFERENCE BOOKS:

1. Fuller Robert; Introduction to Neuro Fuzzy Systems, Springer.
2. Lamba V. K. Neuro Fuzzy Systems, Laxmi Publications.
3. Jang, sun & Mizutani , Neuro-fuzzy And Soft Computing, PHI.
4. D. Nauck, F. Klawonn, R. Kruse: Foundations of Neuro-Fuzzy Systems, John Wiley.

2 EEEME4 ELECTIVE-I
(1) POWER ELECTRONIC CONTROLLED DRIVES

Unit I : Phase-Controlled DC Motor Drives: Principles of DC Motor Speed Control, Armature and Field Controls, Four Quadrant operation, Phase controlled converters, Control modeling of the Three-Phase converter, Converter configuration for a Four-Quadrant DC Motor Drive, Three-Phase Converter-Controlled DC Motor Drive, Design of Controllers.

Unit II : Chopper-Controlled DC Motor Drive**:** Principle of operation of the Chopper, Four quadrant Chopper circuit, Model of the Chopper, Steady-State analysis of Chopper-Controlled DC Motor Drive, Pulsating Torques, Closed-Loop operation, Speed-Controlled DC Motor Drive.

Unit III : Phase-Controlled Induction Motor Drives: Stator-Voltage Control, Steady-state analysis, Approximate analysis, Torque-Speed Characteristics with Phase Control, Slip-Energy Recovery Scheme, Steady-state analysis, Starting, Rating , Closed-Loop Control.

Unit IV : Frequency-Controlled Induction Motor Drives: Voltage-Source Inverter, Voltage-Source Inverter-Driven Induction Motor, Speed control, Constant Volts/Hz Control, Constant Slip-Speed Control, and Constant-Air Gap-Flux Control.

Unit V : Vector-Controlled Induction Motor Drives: Principle of Vector control, Direct Vector control, Derivation of Indirect Vector-Control Scheme, Indirect Vector-Control Scheme, and Implementation of Indirect Vector-Control Scheme.

Unit VI: PM Brushless DC Motor (PMBDCM): Modeling of PM Brushless DC Motor, PMBDCM Drive Scheme, Phase Advancing, Half-Wave PMBDCM Drives, Sensorless Control of PMBDCM Drive, Design of Current and Speed Controllers.

TEXT BOOK :

R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Pearson Education.

REFERENCE BOOKS:

1. Ned Mohan, Undeland, Robbins, "Power Electronics" ,Wiley.
2. G.K. Dubey, Doradla, Joshi, Sinha, "Thyristorised Power Controllers", Wiley.
3. Rashid M.H., "Power Electronics", Pearson Education.
4. B.K.Bose, "Power Electronics and Motor Drives", Elsevier.

2 EEEME4 ELECTIVE-I
(2) DIGITAL COMMUNICATIONS

Unit I : Digital Modulation Schemes- Representation of Digitally Modulated Signals, Memory-less Modulation Methods, Signaling Schemes with Memory, Power Spectrum of Digitally Modulated Signals.

Unit II : Waveform and Vector Channel Models, Waveform and Vector AWGN channels, Optimal Detection and Error Probability for Band-Limited Signaling, Optimal Detection and Error Probability for Power-Limited Signaling, Optimal Detection in Presence of Uncertainty, Comparison of Digital Signaling Methods.

Unit III : Carrier and Symbol Synchronization- Signal Parameter Estimation, Carrier Phase Estimation, Symbol Timing Estimation, Joint Estimation of Carrier Phase and Symbol Timing, Performance Characteristics of ML Estimators.

Unit IV : Linear Block Codes- Basic Definitions, General Properties of Linear Block Codes, Some Specific Linear Block Codes, Optimum Soft Decision Decoding of Linear Block Codes, Hard Decision Decoding of Linear Block Codes, Comparison of Performance between Hard Decision and Soft Decision Decoding.

Unit V : Trellis Codes- The Structure of Convolutional Codes, Decoding of Convolutional Codes, Distance Properties of Binary Convolutional Codes, Punctured Convolutional Codes, Other Decoding Algorithms for Convolutional Codes, Practical Considerations in the Application of Convolutional Codes.

Unit VI: Digital Communication Through Band-Limited Channels – Characterization of Band Limited Channels, Signal Design for Band Limited Channels, Optimum Receiver for Channels with ISI and AWGN, Linear Equalization.

TEXT BOOK:

John Proakis, Masoud Salehi, "Digital Communications", (5/e), McGraw Hill International.

REFERENCE BOOKS:

1. Bernard Sklar, " Digital Communication" (2/e). Pearson Education.
2. Simon Haykins, "Digital Communication" John Wiley & Sons.
3. K Sam Shanmugam, "Digital Communications", John Wiley & Sons.

2EEEME5 ELECTIVE-II

1) FLEXIBLE AC TRANSMISSION SYSTEMS

UNIT –I : Introduction to Facts Controllers**:** Reactive power control: Reactive power, uncompensated transmission line, reactive power compensation – Principles of conventional reactive power compensators: Synchronous condensers, saturated reactor, phase angle regulator, and other controllers.

UNIT–II: Thyristor Controlled Shunt Compensator**:** SVC Objective of shunt compensation – Principle and operating characteristics of Thyristor Controlled Reactor – Thyristor Switched Capacitor – TSC-TCR static Var Compensators –

UNIT-III: SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping, mitigation of sub synchronous resonance.

UNIT–IV: Thyristor Controlled Series Compensator**:** TCSC Series compensation – Principles of operation of TCSC – Capability characteristics of TCSC – Modeling of TCSC – TCSC control system – enhancement of system damping – mitigation of sub synchronous resonance.

UNIT–V: Voltage Source Converter Based Shunt and Series Compensator**:** STATCOM: (Static Synchronous Compensator) Principle of operation, VI Characteristics, Harmonic performance – Steady state model. SSSC: (Static Synchronous Series Compensator) Principle of operation and characteristics of SSSC– control scheme for SSSC.

UNIT–VI: Unified Power Flow Controller**:** Basic operating principles – conventional transmission control capability of UPFC – Independent real and reactive power flow control – control scheme for UPFC – Basic control system for P and Q control – dynamic performance.

TEXT BOOK:

Narani.G.Hingorani and Laszlo Gyugyi, "Understanding FACTS", First Indian Edition, 2001, IEEE Power Engineering Society Sponsor, IEEE Press.

REFERENCE BOOKS :

1. T J E Miller, "Reactive Power Control in Electric Systems", John Wiley.

2. Hingorani N G, "High Power Electronics and Flexible AC Transmission Systems", IEEE High Power Engineering Review, 1998.
3. Padiyar K R "FACTS Controllers in Power Transmission & Distribution", New Age.
4. R. Mohan and R.K.Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems", IEEE Press.

2EEEME5 ELECTIVE-II

(2) DIGITAL IMAGE PROCESSING

UNIT -I : Introduction & Image Transforms: Introduction to Image processing System, Human Visual System, and Elements of an Image Processing System. Image Transforms: Fourier Transform, 2-D discrete Fourier Transform, Hadamard Transform, Discrete Cosine Transform, KL Transform, SVD.

UNIT- II : Image Enhancement: Introduction, Image Enhancement in spatial domain, Enhancement through point operation, Types of point operation, Histogram manipulation, Linear Gray –Level Transform, Non Linear Gray Level Transform, Local or neighborhood operation, Median Filter.

UNIT-III: Image Restoration and Denoising: Introduction, Types of Image Blur, Linear Image-restoration Techniques, Non-linear Image-restoration Techniques, Blind Deconvolution, Classification of Blind-Deconvolution Techniques. Classification of Noise in Image, Median Filtering, Trimmed Average Filter, Performance Metrics in Image Restoration, and Applications of Digital Image Restoration.

UNIT-IV: Image Segmentation: Introduction, Classification of Image segmentation techniques, Region Approach to Image segmentation, Clustering Techniques, Image segmentation based on Thresholding, Edge-based Segmentation, Classification of Edges, Edge detection, Edge Linking, Hough Transform, Active Contour, Watershed Transform, Shape Representation Techniques.

UNIT-V: Image Compression: Need for Image Compression, Redundancy and Classification of redundancy in images, Classification of Image Compression Schemes, Fundamentals of Information Theory, Run-length Coding, Shannon-Fano coding, Huffman Coding, Arithmetic Coding, Dictionary-Based Compression,

Predictive Coding, Transform Based Compression, Image Compression Standard, Scalar Quantization, Vector Quantization.

UNIT VI: Wavelet Based Image Processing: Introduction to Wavelet Transform, Continuous Wavelet Transform, 2D Continuous Wavelet Transform, Multi-resolution analysis, Wavelet based Image Compression, JPEG2000 Compression Standard. Digital Image Watermarking: Classification of watermarking methods, watermarking in spatial domain, watermarking in frequency domain, applications of digital water marking.

TEXT BOOK:

Jayaraman, Esakkairajan, Veerkumar, "Digital Image Processing", TMH Publication.

REFERENCE BOOKS:

1. R.C Gonzales & Woods, "Digital Image Processing" –Addison Wesley.
2. A.K.Jain "Fundamental Digital Image Processing "–Prentice Hall Inc.
3. W.K Pratt, "Digital Image Processing" John Wiley.
4. B Chanda and D.Mujumdar, "Digital Image Processing and Analysis" PHI.

2EEEME6 SEMINAR

The Seminar shall be based on the recent trends in the field of electrical and electronics engineering preferably related to the subjects 2EEEME1 to 2EEEME5. It should be surveyed from the technical literature published in international /national journals. A report should be prepared following the guidelines of IEEE paper format, submitted and followed by the presentation.

2EEEME7 EMBEDDED SYSTEMS DESIGN LAB

Minimum Eight experiments based on the syllabus of 2EEEME2 Embedded Systems Design using appropriate hardware and software.

SEMESTER - III

3EEEME 1 SEMINAR & DISSERTETION

(As per given Scheme)

SEMESTER-IV

4EEEME 1 SEMINAR & DISSERTETION

(As per given Scheme)

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SYLLABUS PRESCRIBED FOR TWO YEAR P.G. COURSE IN MASTER OF ENGINEERING (FULL TIME) M.E. (COMPUTER SCIENCE & INFORMATION TECHNOLOGY)

1RNME1 ADVANCED COMPUTER ARCHITECTURE

Unit I: Fundamentals: Technology & Computer usage trends, costs, Performance measurements. Quantitative principles of Computer design. Concepts of memory hierarchy. Instruction set architectures. Memory addressing. Operations in the instruction set. Encoding. Role of compilers. DLX architecture.

Unit II: Pipelining: Basic principles & DLX. Various hazards: Pipelines, data, control hazards. Implementation issues. Multicycle operations. Crosscutting issues. Instruction set design and pipelining. MIPS R4000 pipeline architecture.

Unit III: Advanced pipeline and instruction - level parallelism: concepts & challenges. Data hazards & dynamic scheduling. Dynamic Hardware prediction. Compiler support for ILP. Hardware support for parallelism. Studies of ILP. Power PC620.

Unit IV: Memory- hierarchy design : Basics of caches, Reducing cache miss & hit time. Main memory. Virtual memory. Protections Examples of virtual memory. Issues in the design of memory hierarchies. Alpha APX 21064 Memory hierarchy.

Unit V: Storage Systems: Types of storage devices, Buses & their types, performance I/O performance measures. Reliability, Availability and RAID. Interfacing to an Operating system. Designing an I/O system. Unix file system performance.

Unit VI: Interconnection networks: Introduction & basic concepts, Computer connection to interconnection network. Interconnection network media. Practical issues. Examples of interconnection networks. Issues for interconnection networks. Internet working. An ATM network of workstation.

TEXT BOOK:

Hennessy J.L. & Patterson D.A."Computer Architecture : A Quantitative Approach" 2/e (Harcourt Asia).

REFERENCE BOOKS:

1. Hayes J.P., "Introduction to Computer Architecture", (McGraw Hill)).
2. Tenanbaum A. S., "Computer Organisation and Architecture", (PHI).
3. Hwang K., "Advanced Computer Architecture", (McGraw Hill).
4. Hamacher V.C, "Computer Organization", (McGraw Hill).

1RNME2 DISTRIBUTED OPERATING SYSTEM DESIGN

Unit I: Introduction : Distributed Computing Models, Software Concepts, Issues in Designing Distributed systems, Client Server Model, Case studies, review of n/w communication, protocols for distributed system.

Unit II: Interprocess communication : Message passing, case study, group communication, case study
Remote Communication : Introduction, RPC – Implementation, Communication, Issues, RMIs, Java RMs.

Unit III: Synchronization : Introduction, Clock synchronization, logical clocks, Mutual Exclusion, Election Algorithm, Deadlocks in distributed systems.

Unit IV: Distributed System Management : Introduction, Tash assignment, Load Balancing, Load sharing, Process Management, Process Migration, Threads, Fault tolerance.

Unit V: Distributed Shared Memory : Introduction, Basic Concepts, Design Issues in DSM, Issues in Implementation.

Unit VI: Distributed file management : Introduction, Distributed file system design.
Naming : Introduction, Designing, Human Oriented Names
Security in Distributed Systems : Introduction, Case Studies
Realtime distributed OS : Introduction, Design of RTDOS

TEXT BOOKS :

1) Distributed Systems : "Concepts & Design Coreterous, Dollimore, Kindberge – Addison-Wesley.

REFERENCE BOOKS :

1) Jose Garrido, Schlesiger, Hongson : "Principle of Mdern Operating Systems",
Pub : Jones & Bartlet Learning ((VIVA Books)
2) Tang : "Security Scrategies in Linux Platforms and applications" ,
Pub : Jones & Bartlet Learning ((VIVA)
3) Soloman : "Security Strategies in Windows Platforms and Applications",
Pub : Jones & Bartlet Learning ((VIVA)
4) Lunch : "Distributed Algorithms", Pub : CBS

1RNME3 DISTRIBUTED DATABASE SYSTEMS

Unit I: **Review of DBMS :** Introduction to Database Processing, ER models, Database Models, Symentic Object Models, Relational Model, Normalization, Database Designs Using ER models, Managing multiusers databases, ODBC, OLE, DB, ADO, Webserver Data Environment, ODBC, JDBC, JSP with reference databases, Relational Data Manipulation with SQL, MySQL & Oracle.

Unit II: **Distributed Databases Management Systems :**
Introduction to DDBMS, Parallel DBMS, DDBMS Architecture, Data storage, Distributed Catalogue Management, Distributed Query Processing, Distributed transactions, Distributed concurrency control, Distributed Databases Recovery, Mobile Databases, Case Study.

Unit III: **Emerging Trends in Distributed Computing :**
Introduction to Grid Computing, SOA, Cloud Computing
Dataware Housing : Need, Benefits, Subject oriented Data, Data granularity, Information flow mechanism.

Unit IV: **Meta Data** : Rele, Classification, Management, DWH architecture, DWH and data marts, DWH Scheme, Keys in DWH schema, OLAP in DWH, OLAP Design considerations, OLAP models, Security Issues.

Unit V: **Data Mining :** Introduction, Fundamentals, Classifications, Major Issues, Mining frequent patterns, association & correlation, clustor analysis, evolution analysis

Unit VI: Market Basket Analysis, Apriori Algorithm, Association Regeneration, constraint based association rules
Classification and Prediction, Bay's Theorem, Rule Based classification.

BOOKS RECOMMENDED :

1) C.J. Date : "Database Processing", Addison Wesley
2) Mahajan : " Distributed Computing"
3) M.H. Danham : "Data mining Introductory & Advance topics", PE
4) Han, Kamber : "Data Mining", Morgan Kaufmah
5) Dataware Housing : OUP
6) Dataware Housing : John Wiley

1RNME4 WIRELESS COMMUNICATION & NETWORK COMPUTING

Unit I: Wireless Communication present scenario, fundamentals, Introduction to source coding and channel coding

Unit II: Radio propagation over wireless channels, Brief overview of channel models.

Unit III: Wireless Communication Systems Standards, MAN, WLAN, WMAN, Introduction to mimo, Brief Overview of simulation.

Unit IV: Spread spectrum technology, multiple access wireless communication, GSM.

Unit V: GPRS, imode, UmTS, Wireless data networks, RFID.

Unit VI: Connecting the last mile, wireless Information Security, convergence-3G, Future Trends, 4G.

TEXT BOOKS :

1) Upen Dalal : Wireless Communication, Offord.
2) Vern A D : Wireless Data Technologies, Wiley

REFERENCE BOOKS:

1. Vern A.D."Wireless Data Technologies" : Wiley
2. Ray ES : "Space/Tererestrial Mobile Network Internet access & QOS, : Wiley
3. Rai Zing : "Multihop Wireless Networks, Wiley
4. Yu Kwang, Ricky Klark, Vincnt K.N.Lau : wireless Internet & Mobile Computing Interoperability & Performance" : Wiley

1RNME5 ELECTIVE I
(1) EXPERT SYSTEM DESIGN & INTELLIGENT SYSTEMS

Unit I: Introduction to ES : Overview of AI, Intelligent systems, knowledge representation, principles & techniques evaluating & comparising ES, TMS, Nonmonotonic justification, maintaining multiple contacts.

Unit II: Rule based systems : Canonical systems, production systems, production systems, associate nets & frame systems, OOAD for ES.
University Issues, knowledge acquisition, ES shells, knowledge acquisition methods, tools for building ES.

Unit III: Fuzzy Systems : introduction, foundation of fuzzy systems, fuzzy relations, arithmetic operations of fuzzy numbers, linguistic

descriptions and their analytical forms, defuzzification methods, fuzzy logic in control and decisionmaking applications, hardware realization of the analog fuzzy controller.

Unit IV: Artificial Neural Networks : introduction, Neuron physiology, artificial neurons, artificial neural networks, features of artificial neural networks, backpropagation training algorithms, functional link neural networks, cascasde correlation neural networks.

Unit V: Genetic Algorithms and Evolutionary Programming : introduction, genetic algorithms, procedures of genetic algorithms, the working of genetic algorithms, the logic behind genetic algorithms, evolutionary programming, the working of evolutionary programming, genetic-algorithmbased machine learning classifier system.

Unit VI: Swarm Intelligent Systems : introduction, background of Ant intelligent systems, importance of the ant colony paradigm, ant colony systems, development of the ant colony systems, application of ant colony intelligence, the working of ant colony systems, particle Swarm intelligent systems, engineering applications of PSIS and future research.

TEXT BOOKS :

1) Peter Jackson "Introduction to Expert System" PE 3rd Ed., 2003
2) N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford.

REFERENCE BOOKS :

1) Hakin, Simon 2003, "Neural Networks : A Comprehensive Foundation", PHI, New Delhi.
2) Kosko B. 1997, "Neural Networks and Fuzzy Systems", PHI, New Delhi.
3) Rajasekaran S. and G.A.Vijayalakshmi Pai, 2003, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, New Delhi.
4) Sriram, Ram D. 1977, "Intelligent Systems for Engineering - AKnowledge-Based Approach", Springer, London.

1RNME5 ELECTIVE I
(2) ALGORITHMICS

Unit I: Introduction: Mathematical Notations, Proof techniques, Elementary algorithmics, Efficiency of algorithms : Examples. Asymptomatic notations: conditional asymptomatic

notations. Notation with several parameters. Operations on asymptomatic notations.

Unit II: Algorithm analysis: Analysing control structures. Examples. Average-case analysis. Amortized analysis. Solving recurrences. Review of data structures: Arrays, Stacks, Queries, Records & Pointers, Lists, Graphs, Trees, Associative tables, Heaps.

Unit III: Greedy Algorithms: Some characteristics, Graphs: Minimum spanning trees, Shortest paths. The knapsack problem, Scheduling, Divide & Conques : Introduction - general template, Binary search, sorting, median finding & matrix multiplication. Exponentiation. Cryptograph.

Unit IV: Dynamic programming: Examples, Principle of optimality, Knapsack problem & shortest paths. Chained matrix multiplication, Recursion, Memory function. Graphs: Traversing trees. Depth-first-search : Directed & undirected graphs : Breadth-first-search. Back tracking. Branch-and-Bound. Minimax principle.

Unit V: Probability algorithms: Introduction, pseudorandom generation. Numerical probabilistic algorithms. Monte Carlo algorithms. Las Vegas algorithms. Parallel algorithms: Basic techniques. Work & efficiency. Examples. Parallel evaluations of expressions. Parallel sorting networks & parallel sorting.

Unit VI: Computational complexity. Introduction. Information-theoretic arguments. Adversary arguments. Linear reduction, Introduction to NP-completeness. Heuristic algorithms. Approximate algorithms. NP-hard approximation problems. Approximation schemes.

TEXT BOOK:

G. Brassard, P.Bratley, "Fundamentals of Algorithmics", (PHI).

REFERENCE BOOKS:

1. Horowitz & Sahni, "Fundamentals of Algorithms", (Galgotia).
2. Aho, Ullman, "Analysis & Design of Computer Algorithms", (Addison-Wesley).
3. Donald E.Knuth, "The Art of Computer Programming", Vol.I, Vol.II, Vol.III, (Addison-Wesley).

1RNME 5 ELECTIVE I

(3) INFORMATION TECHNLOGY MANAGEMENT

Unit-I : IT and Strategy : Information revolution, Business and strategy. IT Strategy, Strategy and Success, Design Parameters, Strategic

positioning, Evolution of strategy sequences and getting the right, development of a strategy ,types of strategy ,context and strategy.

Unit-II : Managing IT :IT management and its roles, It governance, It governance and strategy, Technology management process, Technology selection, Strategic aspects of technology. IT and business alignment, Risk Management ,Exploiting IT Capabilities, Deploying IT in strategic manner ,Strategic planning for information technology and frameworks , Measuring IT, Performance Measures : Balanced Score Card.

Unit-III : E- strategy : What is e- strategy. E-business and E-strategy, E- business objectives ,E-Commerce and E-Business, Making e- strategy work, E-strategy and the E-economy.
IT strategies for IT companies: Project Vs Product Companies , Strategies aspects for an IT product company, IT Strategic perspective for product company ,IT Strategies for Product company information Technology Strategy development, Product life cycle and project life cycles.

Unit-IV : IT strategies for Knowledge Management
Knowledge Management, Knowledge Management and IT strategies, role of Knowledge Management in IT strategies for IT companies, knowledge industry and knowledge strategy knowledge workers, IT strategic services ,product and consulting .
IT strategies for non –IT companies : Role of IT in non –IT companies , IT Investment decision, measurement of IT,IT strategies for Non-IT companies, IT supply chain management and constraint management, IT enabled supply chain management.

Unit-V : IT Strategies in specific scenario, Enterprise resource planning implementation, mapping IT strategies initiatives to ERP ,supply chain contribution and business strategy, IT strategies for business process outsourcing,
IT strategy implementation : IT strategy implementation, Development and need of it strategic plan ,IT strategy implementation to gain competitive advantage, IT strategy and leadership, IT strategy and differentiation , Execution and IT strategy .

Unit-VI : Global dimension of It Strategy : IT strategies in global environment, Global product cycle, Making It global scenario, globalization and competitive strategy, global project management, Mergers and acquisitions ,IT compatibility in M&A.

TEXT BOOK:

Parag Kulkarni,Pradip K Chande "IT Strategy for Business", OXFORD University Press.

REFERENCE BOOKS:

1. Earl. M, "Management Strategies for Information Technology ",Prentice Hall.
2. Gottschalk , P " Strategic Knowledge Managements Technology " IGP USA
3. Hill , C and G Jones " Strategic management " Houghton Miffen USA
4. Honeycutt J " Knowledge management Strategies" , Microsoft Press USA.

2RNME1 REAL TIME EMBEDDED SYSTEMS

Unit I: Introduction to ES : Application, categories, architecture overview, specialties, Recent Trends.
Architecture : Hardware Architecture, Software Architecture

Unit II: Programming of ES : Memory Management, Timing, Device Drivers, Productivity Tools, Code Optimization, Coding guidelines, C++ & Java for ES.
ES development process & design, Implementation, Integration, testing, Packaging, Configuration management, projects.

Unit III: Hardware Platforms and Communications : Types of hardware platforms, microcontrollers, communication interfaces, RS232, RS422, US, Infrared, IEEE, Ethernet, Bluetooth.

Unit IV: RTOS & ES : Kernel architecture, Tash scheduler, ISRs, Semaphones, Mutex, Mailboxes, Message Censes, Event Registers, Pipes, Signals, Timers, Memory Management, Priority Inversion, Embedded OS, RTOS, Handheld OS, OS S/W, Embedded winXP, Perting RTOS on ES Board.

Unit V: Sample ES : Representative OS, Es programming in Linux, Shell programming, system programming, project overview for navigation system, protocol convertor, Database applications, Mobile Java applications.

Unit VI: Embedded S/W development for Microcontroller : Development Environment, Tools, Application development, RFID System, DSP based system, Future Trends.

TEXT BOOK :

1) Embedded / Real Time Systems : "Concept, Design & Programming", Black Book – Prasad Dreamtech Pub.

REFERENCE BOOKS:

1. Null & Labour : Essentials of Computer Architecture & Organization",
Pub : Jones & Bartlet (VIVA Pub.)
2. Heath :"Embedded System Design", Pub : CBS
3. Shaw : Real Time Systems & Softwares" : Pub : CBS
4. Zurawaski : "Embedded Systems Handbook", Pub : CBS

2RNME2 PERFORMANCE ANALYSIS FOR IMAGING SYSTEMS

Unit I Basic Principles of Imaging, Imerging System, Performance, Imaging System Isues

Unit II Acquisition of Images, Image quality, Signal Processing, Performance evolution

Unit III Signal & Image processing, Image resampling performance issues

Unit IV Super resolution, Image debluzzing, performance analysis

Unit V Image contrast Enhancement, Non uniformity correction, performance issues

Unit VI Time Scale, Image Function, Performance measurement

TEXT BOOK :

"Signal Processing and Performance Analysis of Image Systems" : S. Susan Young, Renald GD, Edlie L.J., Artech House Inc.

REFERENCE BOOKS:

1. Gomes : "Image Processing for Computer Graphics" Pub : CBS
2. Abut : "DSP for in-vehicle and mobile systems" Pub: CBS
3. Adali : "Adaptive Signal Processing : Next Generation Solution" Pub : CBS

2RNME3 INFORMATION TECHNOLOGY & SECURITY

Unit I Introduction, Security, Public key cryptography, Hash function, quantum, cryptography, cryptography protocols.

Unit II PKD, wireless network access, mobile security, Secure software Engineering, ICT Security.

Unit III ICT & forensic, Risk Asessment, IS management, Hacking & cracking, Reconnaissance

Unit IV Scanning tools, sniffers, TCP/IP vulnerability, Password cracking, spooling

Unit V Session Hacking, Hacking N/W devices, Trojan Horses, Dos Attacks, Buffer Overflows.

Unit VI Programming experts, mail vulnerability, Web Application Vulnerability, Windows Vulnerability, Linux Vulnerability, Incident Handling.

TEXT BOOKS :

1) Multidisciplinary Introduction to Information Security Stig FM – CRC Press
2) Computer Seciruty, Concepts, Issues & implementation – Cenage Learning.

REFERENCE BOOKS:

1. Workman, Phelps, Gathegi :"Information Security for Managers" Pub : Jones & Bartlet (VIVA Pub.)
2. Newman: "Computer Security" Pub: Jones & Bartlet (VIVA Pub.)
3. Johnson & Merkov : "Security Policies and Implementation Issues" , Pub: Jones & Bartlet (VIVA Pub.)
4. Gibson : "Managing Risks in Information Systems", Pub: Jones & Bartlet (VIVA Pub.)
5. Basworth : "Computer Security Handbook", Pub : Jones & Bartlet (VIVA Pub.)

2RNME4 SOFTWARE ENGINEERING, TESTING & RELIABILITY

Unit I: Software Engineering Reviews : Software Process models, requirements Engineering, Introduction to UML, Meta Model, Extensibility Mechanism, Introduction to OCL, Behivirol Model, Design Engineering, OOD.

Unit II: Software Testing : Introduction to Testing Methodology, Terminology, Methodology, Verification, Validation.

Unit III: Testing Techniques : Dynamic Testing – Black Box & White Box, Static Testing, Validation Activity, Regression Testing.

Unit IV: Test Management & Quality Management :
1st organization, Test Planning, Software Metrics, Software Quality, Quality Management, Quality factors, Test process maturity models. Testing Tools, OOT Basics, Testing of Web Based systems, Debugging.

Unit V: Reliability Engineering : Introduction, Reliability maths, Life data analysis and Problem plotting,, Monte Carlo in simulation.

Unit VI: Software Reliability : Introduction, Load strength Inferences, Reliability Prediction and modeling, software reliability model, patterns.

BOOKS RECOMENDED:

1) Sommerville : "Software Engineering", 7th Ed., Addison-Wesley 2004
2) Grandy Booch, Ram Bough, Jacobson, "Onified modeling language users guide", 2nd Ed., Addison-Wesley
3) Marsh Chauhan : Software Testing, Principle & Practice", Publishing.
4) Pratric DT " Practical Reliability Engineering" Wiley

REFERENCE BOOK :

1. Richardson & Thies :"Secure Software Design, Pub : Jones & Bartlet (VIVA Pub.)

2RNME5 ELECTIVE II
(1) ADVANCED COMPILING TECHNIQUES

Unit I: Symbol-Table Structure: Storage Classes, Visibility, and Lifetimes, Symbol Attributes and Symbol-Table Entries, Local Symbol-Table Management, Global Symbol-Table Structure, Storage Binding and Symbolic Registers, Approaches to Generating Loads and Stores.

Unit II: Intermediate Representations: Issues in Designing an Intermediate Language, High-Level, Medium-Level and Low-Level Intermediate Languages, Multi-Level Intermediate Languages, Sample Intermediate Languages: MIR, HIR, and LIR, Representing MIR, HIR and LIR. ICAN Naming of Data Structures, Routines to Manipulate Intermediate Code.

UnitIII: Run-Time Support: Data Representations and Instructions, Register Usage, The Local Stack Frame, The Run-Time Stack, Parameter-Passing Disciplines, Procedure Prologues, Epilogues, Calls, and Returns, Code Sharing and Position-Independent Code, Symbolic and Polymorphic Language Support.

Unit IV: Producing Code Generators Automatically: Introduction, need and applications to Automatic production of Code Generators, a Syntax- Directed Technique. Introduction to Semantics-Directed Parsing, Tree Pattern Matching and Dynamic Programming.

Unit V: Control-Flow Analysis: Various Approaches, Depth-First Search, Preorder Traversal, Post order Traversal, Breadth-Firs Search, Dominators and Post dominators, Loops, Strongly Connected Components, Reducibility, Interval Analysis, Control Trees, Structural Analysis.

Unit VI: Data-Flow Analysis: Basic Concepts, Taxonomy of Data-Flow Problems, Solution Methods: Iterative, Lattices of Flow Functions and Control-Tree-Eased. Structural Analysis, Interval Analysis,

Du- Chains, Ud-Chains, Webs, SSA Form. Dealing with Arrays, Structures, and Pointers. Automating Construction of Data-Flow Analyzers.

TEXT BOOK:

Steven S. Muchnick, "Advanced Compiler Design Implementation" (Hartcourt Asia- Morgan Kaufman).

REFERENCE BOOKS:

1. Aho, Sethi, Ullman, "Compilers: Principles Techniques and Tools" (Pearson).
2. D. M. Dhamdhere, "Compiler Construction" (2/e), Macmillan.
3. Cooper & Torczon, "Engineering a Compiler" Elsevier.
4. K C. Louden, "Compiler Construction: Principles and Practice" Cengage.

2RNME5 ELECTIVE II

(2) MOBILE COMPUTING

Unit I: Characteristics, Fundamentals and Infrastructure of cellular system, Satellite system, Network protocol, Ad Hoc and sensor network, Wireless MAN's, LAN's and PAN's.
Mobile Ratio Propagation: Types of Radio waves, Propagation mechanism, Free space propagation, Land propagation, Path loss, Slow fading, Fast fading, Doppler effect, Delay spread, Coherence Bandwidth ,Inter symbol and Co-channel Interferences.

Unit II: Cellular Concept: Cell area, Signal strength and cell parameter, Capacity of a cell, Frequency reuse, Cluster, Co-channel Interference, Cell Splitting, Cell sectoring. Channel allocation: Static allocation verses Dynamic allocation, fixed channel allocation (FCA), Dynamic channel allocation, Hybrid channel allocation (HCA), Allocation in specialized system structure, System Modeling.

Unit III: Mobile communication systems: Cellular system infrastructure, Registration, Handoff parameter and underlying support Roaming support, Multicasting, Security and privacy, Firewall and system security. Exiting wireless system: AMPS, IS-41, GSM, IMT-2000.

Unit IV: Ad hoc And sensor network: Characteristic of MANET, Applications, Routing, Table – driven routing protocol, Source initiated On- demand Routing, Hybrid protocol, Wireless sensor network, Fixed wireless sensor networks.

Unit V: Wireless MANs, LANs and PAN's**:** Wireless metropolitan area networks (WMANs), Wireless Local Area networks (WLANs),

and Wireless Personal Area networks (WPANs), Recent Advances, Introduction, and Ultra –wideband technology.

Unit VI: Multimedia services requirement, Push –to-talk (PTT) technology, Mobility and resources management for Integrated system, Multicast in Wireless networks, Directional and smart antennas, Design issue in sensor networks, Bluetooth network, Low - power design, XML, Threat and security issue..

TEXT BOOK:

Agrawal D P and Zeng Q A, "Introduction to Wireless and Mobile Systems", (CENGAGE) (2/e).

REFERENCE BOOKS:

1. Jochen Schiller, "Mobile Communication", (Pearson Education) Second Edition.
2. C.K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols & Systems", (Pearson Edu.)
3. Rajkamal, "Mobile Computing" (Oxford University Press).
4. George A, "Mobile Ad Hoc Networks: From Wireless LANs to 4G Networks" (TMH).

2RNME5 ELECTIVE - II

(3) DIGITAL MEDIA DEVELOPMENT

Unit I : Introduction to Multimedia Systems design, Elements,Systems architechture & technologies , Objects for multimedia systems , Multimedia data interface standards, Multimedia Databases, Data Compression need, lossy and lossless compression, binary image compression Schemes, color, grey and still video image compression , Full motion video compression , audio compression.

Unit II : Data and file format standards RTF, TIFF,RIFF, MIDI , JPEG ,AVI, MPEG Standards, video and image display systems, image scanners , Digital voice and audio, Digital camera, video images and animation, Full motion video

Unit III : Telecommunications considerations for Multimedia, Specialised processors , ISDN, LAN and WAN for Enterprise Multimedia Applications, Distibuted Object Model, Multimedia communication protocols (UDP , RTP , RTCP , TELNET) Multimedia Applications and Design issues,,Virtual Reality Design,Componects of Multimedia Systems,, Application Workflow & Distributed Application Design Issues

Unit IV : Multimedia Authoring and User Interface, Design Considerations, Hypermedia Applications, Information Access,

Object display, Hypermedia Messaging, Integrated document management

Unit V : Distributed Multimedia Systems, Components, Client-server Operation, Object Server, Network Performance Issues, Distributed Multimedia databases, Managing distributed Objects

Unit VI : System Design: Design issues,requirements, feasibility, Performance Analysis, Design for performance , Multimedia Systems Design , Extensibility and example.

BOOKS RECOMMENDED:

1. Prabhat K Andleigh and Kiran Thakrar "Multimedia Systems Design" (PHI Publications).
2. Fred Halsall," Multimedia Communications by (Pearson Publications).
3. Ze-Nian Li, Mark S.Drew,"Fundamentals of Multimedia" (Pearson Publications).
4. John K.Koegel Buford, "Multimedia Systems" (Pearson Education)

REFERENCE BOOKS:

1. Game Engineering Design & Implementation - Alan Thorn, Pub : Jones & Bartlet (VIVA Pub.)
2. Fundamentals of Game Development : Chandler & Chandler, Pub : Jones & Bartlet (VIVA Pub.)

2RNME 6 CSIT LAB - III: This lab shall be based on 2RNME1 - Real Time Embedded System
AND **2RNME2** - Performance Analysis for Imaging Systems

2 RNME 7 CSIT LAB - IV : This lab shall be based on 2RNME 3- Informn.Tech.& Security
AND **2RNME4** - Software Engineering, Testing & Reliability
AND/OR **2 RNME5 (E-2**) Mobile Computing (if offered)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

BOARD OF STUDIES IN COMPUTER SCIENCE &ENGINEERING

B.E. III & IV Semester

Computer Science & Engineering

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: FIRST/SECOND "GROUP A"

			Teaching Scheme					Examination Scheme								
			Hours per Week			Total Hours/Week	Credit	Theory					Practical			
													Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D			Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																
1	1A1	Engineering Mathematics - I	3	1		4	4	3	80	20	100	40				
2	1A2	Engineering Physics	4			4	4	3	80	20	100	40				
3	1A3	Engineering Mechanics	3	1		4	4	3	80	20	100	40				
4	1A4	Computer Programming	3			3	3	4	80	20	100	40				
Practicals																
5	1A5	Workshop Practice			4	4	2						25	25	50	25
6	1A6	Engineering Physics Laboratory			2	2	1						25	25	50	25
7	1A7	Engineering Mechanics Laboratory			2	2	1						25	25	50	25
8	1A8	Computer Programming Laboratory			2	2	1						25	25	50	25
		Total	**13**	**2**	**10**	**25**	**20**				**400**				**200**	
														Total	**600**	

Three Week Induction Program to be undertaken as suggested by AICTE

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: FIRST/SECOND "GROUP B"

			Teaching Scheme					Examination Scheme									
			Hours per Week			Total Hours/Week	Credit	Theory					Practical				
													Max Marks				
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D			Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																	
1	1B1	Engineering Mathematics - II	3	1		4	4	3	80	20	100	40				
2	1B2	Engineering Chemistry	4			4	4	3	80	20	100	40				
3	1B3	Basic Electrical Engineering	3	1		4	4	3	80	20	100	40				
4	1B4	Engineering Graphics	3			3	3	3	80	20	100	40				
Practicals																	
5	1B5	English Communication Skill Lab			4	4	2						25	25	50	25
6	1B6	Engineering Chemistry Laboratory			2	2	1						25	25	50	25
7	1B7	Basic Electrical Engineering Lab			2	2	1						25	25	50	25
8	1B8	Engineering Graphics Laboratory			2	2	1						25	25	50	25
		Total	**13**	**2**	**10**	**25**	**20**				**400**				**200**	
														Total	**600**	

Three Week Induction Program to be undertaken as suggested by AICTE

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: THIRD

			Teaching Scheme						Examination Scheme								
			Hours per Week			Total Hours/Week	Credit		Theory					Practical			
														Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																	
1	3KS01	Mathematics-III	3	1		4	4		3	80	20	100	40				
2	3KS02	Discrete Structure & Graph Theory	3			3	3		3	80	20	100	40				
3	3KS03	Object Oriented Programming	3			3	3		3	80	20	100	40				
4	3KS04	Data Structures	3			3	3		3	80	20	100	40				
5	3KS05	Analog & Digital Electronics	3			3	3		3	80	20	100	40				
6	4ES06	Environmental Studies *	2			2	0										
Practicals																	
7	3KS06	Object Oriented Programming (Java) Lab			2	2	1							25	25	50	25
8	3KS07	Data Structures Lab			2	2	1							25	25	50	25
9	3KS08	Analog & Digital Electronics Lab			2	2	1							25	25	50	25
10	3KS09	C Skill-Lab I (#)			2	2	1							25	25	50	25
		Total	**17**	**1**	**8**	**26**	**20**					**500**				**200**	
															Total	**700**	

* As per the Ordinance No. 42 of 2005

C Skill Lab I - based on technology like -**Python/Django** etc. to be decided by Individual Dept. of respective College

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: FOURTH

			Teaching Scheme						Examination Scheme									
			Hours per Week			Total Hours/Week	Credit		Theory					Practical				
														Max Marks				
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																		
1	4KS01	Artificial Intelligence	3			3	3		3	80	20	100	40				
2	4KS02	Data Communication & Networking	3			3	3		3	80	20	100	40				
3	4KS03	Operating System	3			3	3		3	80	20	100	40				
4	4KS04	Microprocessor & Assembly Lang. Prog.	3			3	3		3	80	20	100	40				
5	4KS05	Theory of Computation	3	1		4	4		3	80	20	100	40				
6	4ES06	Environmental Studies *	2			2	2		3	80	20	100	40				
Practicals																		
7	4KS06	Data Communication & Networking Lab			2	2	1							25	25	50	25
8	4KS07	Operating System Lab			2	2	1							25	25	50	25
9	4KS08	Microprocessor & Assembly Lang. Prog. Lab			2	2	1							25	25	50	25
10	4KS09	C Skill-Lab II (#)			2	2	1							25	25	50	25
		Total	**17**	**1**	**8**	**26**	**22**					**600**				**200**	
															Total	**800**	

* As per the Ordinance No. 42 of 2005

C Skill Lab II - based on technology like -**PHP, Web Technology, Raspberry Pi/Ardino**, etc. to be decided by Individual Dept. of respective College

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: FIFTH

			Teaching Scheme						Examination Scheme								
			Hours/Week						Theory					Practical			
														Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D	Total Hours/ Week	Credit		Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																	
1	5KS01	Database Management Systems	4			4	4		3	80	20	100	40				
2	5KS02	Compiler Design	3			3	3		3	80	20	100	40				
3	5KS03	Computer Architecture & Organization	3			3	3		3	80	20	100	40				
4	5KS04	Professional Elective-I (#)	3			3	3		3	80	20	100	40				
5	5KS05	Open Elective - I ($)	3			3	3		3	80	20	100	40				
Practicals																	
6	5KS06	Database Management Systems Lab (@)			2	2	1							25	25	50	25
7	5KS07	Compiler Design Lab			2	2	1							25	25	50	25
8	5KS08	Emerging Technology Lab# I			2	2	1							25	25	50	25
9	5KS09	C Skill Lab III (*)			2	2	1							25	25	50	25
		Total	**16**	**0**	**8**	**24**	**20**					**500**				**200**	
															Total	**700**	

Track	# Professional Elective-I
AI	Cognitive Technologies
DS	Data Science and Statistics
IoT	Internet of Things
Cy. Security	Introduction to Cyber Security

$ Open Elective - I
Fundamentals of Finance & Accounting
Principles of Marketing for Engineering
Entrepreneurship

@ Practicals using MongoDB,MySQL

FOSS Tools & Technology for Practicals

Track	Emerging Technology Lab# I
AI	IBM Watson, Microsoft Cognitive Toolkit , TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph
DS	R, Python, Cassandra, Apache Hadoop
IoT	Arduino, DeviceHive, Kaa, Home Assistant
CS	Kali Linux, OpenVPN, NMAP, Metasploit Framework

* C Skill Lab III - based on technology like - **Angular & React, Express, Node.js** etc. to be decided by Individual Dept. of respective College

An Orientation Program of 15 hours duration /MOOC on Indian Constitution to be offered to the students during the Vth Semester

Open Elective I to be opted from the courses offered by other engineering technology boards of the university /Massive Open learning Courses (MOOC) such as SWAYAM pertaining to the profession

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER: SIXTH

			Teaching Scheme						Examination Scheme									
			Hours per Week			Total Hours/Week	Credit		Theory					Practical				
														Max Marks				
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																	
1	6KS01	Security Policy & Governance	3			3	3		3	80	20	100	40				
2	6KS02	Design & Analysis of Algorithm	4			4	4		3	80	20	100	40				
3	6KS03	Software Engineering	3			3	3		3	80	20	100	40				
4	6KS04	Professional Elective-II (#)	3			3	3		3	80	20	100	40				
5	6KS05	Open Elective - II ($)	3			3	3		3	80	20	100	40				
Practicals																	
6	6KS06	Design & Analysis of Algorithm Lab			2	2	1							25	25	50	25
7	6KS07	Software Engineering Lab		v	2	2	1							25	25	50	25
8	6KS08	Emerging Technology Lab# II			2	2	1							25	25	50	25
9	6KS09	C Skill Lab IV (*)			2	2	1							25	25	50	25
		Total	**16**		**8**	**24**	**20**					**500**				**200**	
															Total	**700**	

Track	# Professional Elective-II
AI	Natural Language Processing
DS	Big Data Analytics
IoT	Sensors & Actuators
Cy.Security	Cryptography

$ Open Elective - II
Computational Biology
Cyber Law & Ethics
Intellectual Property Right

FOSS Tools & Technology for Practicals

Track	Emerging Technology Lab# II
AI	Natural Language Toolkit (NLTK),SpaCy, PyTorch-NLP, Natural, Retext, TextBlob
DS	KNIME, Spark, Neo4J, MongoDB, Hive, Storm,
IoT	Devicehub, Zetta, Node-RED, Flutter, M2MLabs Mainspring
CS	VeraCrypt, ModSecurity, AdBlocker, CheckShortURL, SPAMfighter, SpamBully

* C Skill Lab IV - based on technology like - **DevOp to be decided by Individual Dept. of respective College**

An Orientation Program of 15 hours duration /MOOC on Indian Constitution to be offered to the students during the Vth Semester

Open Elective II to be opted from the courses offered by other engineering technology boards of the university /Massive Open learning Courses (MOOC) such as SWAYAM pertaining to the profession

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: SEVENTH

			Teaching Scheme						Examination Scheme								
			Hours per Week			Total Hours/Week	Credit		Theory					Practical			
														Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																	
1	7KS01	Social Science & Engineering Economics	3			3	3		3	80	20	100	40				
2	7KS02	Computer Graphics	3			3	3		3	80	20	100	40				
3	7KS03	Cloud Computing	4			4	4		3	80	20	100	40				
4	7KS04	Professional Elective-III (#)	3			3	3		3	80	20	100	40				
5	7KS05	Professional Elective-IV ($)	3			3	3		3	80	20	100	40				
Practicals																	
6	7KS06	Computer Graphics Lab			2	2	1							25	25	50	25
7	7KS07	Emerging Technology Lab# III			2	2	1							25	25	50	25
8	7KS08	Emerging Technology Lab# IV			2	2	1							25	25	50	25
9	7KS09	Project & Seminar			8	8	4								50	50	25
		Total	**16**		**14**	**30**	**23**					**500**				**200**	
															Total	**700**	

Track	# Professional Elective-III
AI	Robotics
DS	Data Warehousing & Mining
IoT	Embedded Systems
Cy.Security	Digital Forensics

Emerging Technology Lab# III
ROS, YARP, MRPT, Gazebo, OROCOS.
RapidMiner, Weka, Scrapy, Pandas
ThingsBoard, Kinoma, SiteWhere
Security Onion, LastPass,KeePAss

Emerging Technology Lab# V
Ethereum,BigchainDB, Corda
OpenCV, SimpleCV, Keras, Caffe
OpenEaagles, Repast, OpenSimulator

← FOSS Tools & Technology for Practicals ↑

$ Professional Elective-IV	Blockchain Fundamentals	Image Processing	Optimization Techniques

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH: COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: EIGHTH

			Teaching Scheme						Examination Scheme								
			Hours per Week			Total Hours/Week	Credit		Theory					Practical			
														Max Marks			
Sr No	Subject Code	Subject Name	Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Theory Paper	Max Marks College Assessment	Total	Min Passing Marks	External	Internal	Total	Min Passing Marks
Theory																	
1	8KS01	Object Oriented Analysis & Design	3			3	3		3	80	20	100	40				
2	8KS02	Professional Ethics & Management	3			3	3		3	80	20	100	40				
3	8KS03	Professional Elective-V (#)	3			3	3		3	80	20	100	40				
4	8KS04	Professional Elective-VI ($)	3			3	3		3	80	20	100	40				
Practicals																	
5	8KS05	Emerging Technology Lab# V			**2**	2	1							25	25	50	25
6	8KS06	Emerging Technology Lab# VI			**2**	2	1							25	25	50	25
7	8KS07	Project & Seminar			12	12	6							75	75	150	75
		Total	**12**		**16**	**28**	**20**					**400**				**250**	
															Total	**650**	

Track	# Professional Elective-V	Emerging Technology Lab# IV	Emerging Technology Lab# VI
AI	Virtual & Augmented Reality	Google's ARCore, AR.js, ARToolKit, DroidAR, Brio, Adobe Aero	Hyperledger, HydraChain, MultiChain, Elements
DS	Machine Learning and AI	R Studio, Orange, D3.js, Ggplot2, Jupyter Notebooks	Google Colab, GPUImage, Cuda, Aforge/Accord.NET
IoT	Wireless Sensor Networks	DSA,Thinger,RIOT, OpenRemote,Anjay	OR-Tools, Locust.io, httperf, Apache JMeter, Siege
Cy.Security	System & Software Security	Wireshark, Burp Suit, Nessus	

FOSS Tools & Technology for Practicals

$ Professional Elective-VI			
	Distributed Ledger Technology	Multimedia Computing	Modeling & Simulation

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING

Baskets for Open Electives & Professional Electives

Open Elective - I	Open Elective - II
Fundamentals of Finance & Accounting	Computational Biology
Principles of Marketing for Engineering	Cyber Law & Ethics
Entrepreneurship	Intellectual Property Right

Track	Professional Elective-IV		Professional Elective-VI
	Blockchain Fundamentals		Distributed Ledger Technology
	Image Processing		Multimedia Computing
	Statistics using R		Modeling & Simulation

Track	Professional Elective-I		Professional Elective-II
AI	Cognitive Technologies		Natural Language Processing
DS	Data Science		Big Data Analytics
IoT	Internet of Things		Sensors & Actuators
Cyber Security	Introduction to Cyber Security		Cyptography

Track	Professional Elective-III		Professional Elective-V
AI	Robotics		Virtual & Augmented Reality
DS	Data Warehousing & Mining		Machine Learning and AI
IoT	Embedded Systems		Wireless Sensor Networks
Cyber Security	Digital Forensics		System & Software Security

Specialization option can be supported by Professional Electives I, II, III, IV, V & VI can also be opted through SWAYAM which needs to be mentored by Faculty.

C Skill Lab I - IV covers the technology essentials for ***Full Stack Developer*** Skill set

Wherever possible students should be encouraged to opt for Virtual Labs apart from the normal Physical Labs for all the subjects specifically from Professional electives baskets. (Various Virtual Labs were floated by Ministry of HRD http://www.vlab.co.in/)

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI
FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH: COMPUTER SCIENCE & ENGINEERING

Tentative FOSS Tools & Technology for Practicals
(Free and open-source software)

Track	Emerging Technology Lab#1
AI	IBM Watson, Microsoft Cognitive Toolkit , TensorFlow, Apache SystemML, Caffe, OpenNN, Torch, Neuroph
DS	R, Python, Cassandra, Apache Hadoop,
IoT	Arduino, DeviceHive, Kaa, Home Assistant
Cyber Security	Kali Linux, OpenVPN, NMAP, Metasploit Framework

Emerging Technology Lab#2
Natural Language Toolkit (NLTK),SpaCy, PyTorch-NLP, Natural, Retext, TextBlob
KNIME, Spark, Neo4J, MongoDB, Hive, Storm,
Devicehub, Zetta, Node-RED, Flutter, M2MLabs Mainspring
VeraCrypt, ModSecurity, AdBlocker, CheckShortURL, SPAMfighter, SpamBully

Track	Emerging Technology Lab#3
AI	ROS, YARP, MRPT, Gazebo, OROCOS.
DS	RapidMiner, Weka, Scrapy, Pandas
IoT	ThingsBoard, Kinoma, SiteWhere
Cyber Security	Security Onion, LastPass,KeePAss

Emerging Technology Lab#4
Google's ARCore, AR.js, ARToolKit, DroidAR, Holokit. Mixare, Brio, Adobe Aero
R Studio, Orange, D3.js, Ggplot2, Jupyter Notebooks
DSA,Thinger,RIOT, OpenRemote,Anjay
Wireshark, Burp Suit, Nessus

Track	Emerging Technology Lab# V
Block Chain	Ethereum,BigchainDB, Corda
Image Processing	OpenCV, SimpleCV, Keras, Caffe
Optimization	OpenEaagles, Repast, OpenSimulator

Emerging Technology Lab# VI
Hyperledger, HydraChain, MultiChain, Elements
Google Colab, GPUImage, Cuda, AForge.NET/Accord.NET
OR-Tools, Locust.io, httperf, Apache JMeter, Siege

3KS02 Discrete Structure and Graph Theory

Course Prerequisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure and Graph Theory by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Perform combinatorial analysis to solve counting problems.
5. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: Foundations: Logic and Proofs **Hours: 7**

Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan‟s Laws, Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements; Proofs Terminology, Methods, Direct Proofs, Proof by Contraposition and Contradiction;

Unit II: Sets, Functions and Relations **Hours: 7**

Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations; Inverse Functions, Compositions and Graphs of Functions, Important Functions, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Properties of Relations, Combining Relations; n-ary Relations, Operations on n- ary Relations; Representing Relations Using Matrices; Closures, Transitive Closures

Unit III: Number Theory and Induction **Hours: 6**

Division, The Division Algorithm, Modular Arithmetic, Arithmetic Modulo m; Primes, Trial Division, Conjectures and Open Problems About Primes, GCD and LCM, The Euclidean Algorithm, gcds as Linear Combinations; Linear Congruences, The Chinese Remainder Theorem, Fermat‟s Little Theorem, Pseudoprimes, Primitive Roots and Discrete Logarithms, Applications: Hashing Functions, Mathematical Induction and Examples of Proofs, Mistaken Proofs, Guidelines for Proofs; Strong Induction, Examples of Proofs.

Unit IV: Algebraic Structures **Hours: 7**

Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange‟s Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations.

Unit V: Counting **Hours: 7**

Basic Counting Principles, Complex Counting Problems, Subtraction and Division Rule, The Pigeonhole Principle, The Generalized Pigeonhole Principle, Applications; Permutations, Combinations, Generating Permutations, Generating Combinations.

Unit VI: Graphs **Hours: 6**

Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits, Hamilton Paths and Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler‟s Formula, Kuratowski‟s Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.

Text Book:

Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.
2. Norman L. Biggs: Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Seymour Lipschutz and Marc Lars Lipson: Schaum‟s Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum‟s Outlines Series, McGraw-Hill.
4. C. L. Liu and D. P. Mohapatra: Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

3KS03 Object Oriented Programming

Course Prerequisite: Computer Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.
2. To use the object-oriented paradigm in program design.
3. To Provide programming insight using OOP constructs.
4. To lay a foundation for advanced programming

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply Object Oriented approach to design software.
2. Implement programs using classes and objects.
3. Specify the forms of inheritance and use them in programs.
4. Analyze polymorphic behaviour of objects.
5. Design and develop GUI programs.
6. Develop Applets for web applications

Unit I: Introduction to Object Oriented Programming **Hours:7**

Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. Java Programming Constructs: Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, ,Flow of Control.

Unit II: Classes and Objects **Hours:7**

Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: Inheritance, Interfaces and Packages **Hours:6**

Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, Implementing interfaces, Accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type.

Unit IV: Exception handling and Input/Output **Hours:7**

Exception: Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. Input/Output: The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: Applets **Hours:7**

Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, getDocumentBase() and getCodeBase () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: Unit Title:Event Handling **Hours:6**

Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. Abstract Window Toolkit: Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Books:

1. SachinMalhotra and SaurabhChoudhary: Programming in Java, Oxford University Press 2010.
2. Herbert Schildt: Java Complete References (McGraw Hill)

Reference Books:

1. H.M.Dietel and P.J.Dietel, “Java How to Program” Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java An Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer‟s Guide to Java Certification, 3rdEdition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KS04/3KE04 Data Structures

Course Prerequisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

Unit I: Introduction to Data Structures **Hours: 7**

Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit II: Array & Record Structure **Hours: 7**

Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays. Record structures and Matrices.

Unit III: Linked lists **Hours: 6**

Linked lists: Memory Representation of Linked List, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion & deletion operations on linked lists. Header linked lists, Two- way linked lists.

Unit IV: Stack & Queue **Hours: 7**

Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.

Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues.

Unit V: Trees **Hours: 7**

Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heapsort, Path length & Huffman˝s algorithm.

Unit VI: Graphs & Sorting Algorithms **Hours: 6**

Introduction to Graphs, Memory representation of graphs, Warshalls˝ algorithm, operations on Graphs, Breadth First Search, Depth First Search

Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort.

Text Book:

1. Seymour Lipschutz: Data Structures , Schaum˝s Outline Series, McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, SartajSahni: Fundamentals of Data Structures, CBSPublications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.

3KS05 Analog & Digital Electronics

Course Prerequisite: Basic Physics.

Course Objectives:

1. To get the introductory knowledge of PN Junction Diode, Bipolar Junction Transistor, Field Effect Transistor.
2. To understand number systems and conversion between different number systems.
3. To get basics knowledge about digital ICs and digital systems.
4. To study the design of combinational circuits and sequential circuits

Course Outcomes(Expected Outcome): At the end of course students will able to

1. Explain basic concepts of semiconductor devices and its application.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization technique to obtain minimized expression.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: PN Junction Diode and Bipolar Junction Transistor **Hours: 7**

PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics

Unit II: Field Effect Transistors **Hours: 7**

Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion_Enhancement MOSFET, Comparison of p-channel and n-channel FETs, Introduction to CMOS.

Unit III: Number System **Hours: 6**

Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, r˝s and (r-1)˝s Complements Representation, Subtraction using 1˝s and 2˝s Complements, BCD, Gray Code, Excess 3 Code and Alpha numeric codes.

Unit IV: Minimization Techniques **Hours: 7**

Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 5 variable), Limitation of Karnaugh Map, Quine- McCluskey Minimization Technique (up to 5 variable).

Unit V: Combinational Circuits **Hours: 7**

Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Sequential Circuits **Hours: 6**

Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Book:

1. David A. Bell: "Electronic Devices and Circuits", 5e , Oxford University Press.
2. Jain R.P. "Modern Digital Electronics", 3e, TMH.

Reference Books:

1. Millman&Halkies: "Electronic Devices & Circuits", 2e, McGraw Hill.
2. Sedra& Smith: "Microelectronics Circuits", 5e, Oxford University Press.
3. Anand Kumar: "Switching Theory and Logic Design", 3e, PHI Learning Private Limited
4. Wakerly, "Digital Design: Principles and Practices", 3 e, Pearson Education, 2004.

3KS06 Object Oriented Programming Lab

Course Prerequisite: Basic Computer Programming

Course Objectives: Design, implement, test, and debug simple programs in an object-oriented programming language.

1. To develop the knowledge of object-oriented paradigm in the Java programming language.
2. To evaluate classical problems using java programming.
3. To develop software development skills using java programming for real world applications.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Interpret the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
3. Build applications in Java by applying concepts like interfaces, packages and exception handling.
4. Make use of Java concepts like API, Applets, AWT.

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java**.**
4. Develop a Program to study and implement Selection Statements belonging to Java**.**
5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement concept of Constructor in Java.
9. Develop a program to study and implement concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.
11. Develop a Program on various ways to accept data through keyboard(Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

3KS07 Data Structure Lab

Course Prerequisite: Basics of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structure.
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find it‟s location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list
   (a) Traversing the linked list.
   (b) Insert a node at the front of the linked list.
   (c) Delete a last node of the linked list.
   (d) Searching a Linked list.
9. To study and implement following operations on the doubly linked list.
   (a) Insert a node at the front of the linked list.
   (b) Insert a node at the end of the linked list.
   (c) Delete a last node of the linked list.
   (d) Delete a node before specified position.
10. To study and implement following operations on the circular linked list.
    (a) Insert a node at the end of the linked list.
    (b) Insert a node before specified position.
    (c) Delete a first node of the linked list.
    (d) Delete a node after specified position.
11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.
15. To study and execute Quick sort method.
16. Understand the Tree structure and implement the Pre-order, In-order, post-order traversing operations on it.
17. Understand the concept of Recursion and write a program to calculate factorial of a number using Recursion.
18. Understand the Heap sort and implement it on given data.
19. Understand the Insertion sort and implement it on given data.
20. Understand the Selection sort and implement it on given data.
21. To study and execute Merge sort method.
22. To study and execute Radix sort method.
23. Write a Program to implement the concept of BFS algorithm.
24. Write a Program to implement the concept of DFS algorithm.
25. To study and execute Josephus problem.

3KS08 Analog & Digital Electronics Lab

Course Prerequisite: Students should have the knowledge of Basic Physics.

Course Objectives:

1. To impart the concepts of analog and digital electronics practically.
2. To provide students basic experimental experiences in the operation of semiconductor device and Digital ICs.
3. To learn the operation of various logic gates and their implementation using digital IC‟s.
4. To learn the realization of various combinational and sequential circuits.

Course Outcomes(Expected Outcome): After successfully completing the lab, the students will be able to

1. Apply practically the concepts of analog and digital electronics.
2. Explain the operation and characteristics of semiconductor devices.
3. Illustrate the operation of various logic gates and their implementation using digital IC‟s.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits

List of Experiments:

This is a sample list of Experiments; minimum 10 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2. To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3. To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4. To Sketch and Study the input and output characteristics of transistor connected in Common Collector (CC) configuration.
5. To plot static characteristics of FET & calculate its parameters g_m, r_d and μ.
6. To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
7. Study and verify the truth table of half adder and full adder using logic gates.
8. Study and verify the truth table of half subtractor and full subtractor using logic gates
9. To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
10. Implementation of 4×1 multiplexer using logic gates.
11. Implementation and verification of Demultiplexer and Encoder using logic gates.
12. Implementation of 4bit parallel adder using 7483 IC.
13. Design and verify the 4 bit synchronous counter.
14. Design and verify the 4 bit asynchronous counter.
15. Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiment beyond syllabus:

1. Design and Implementation of Op-amp as an inverting amplifier.
2. Design and Implementation of Op-amp as a non-inverting amplifier.
3. To design and find frequency of Astablemultivibrator using IC 555.

3KS09 C-Skill-Lab I

Course Prerequisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format “Sun May 29 02:26:23 IST 2017”
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.
14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.

23. Plotting various graphs using Python.
24. Developing basic GUI using Python.
25. Developing web applications using Django framework or Flask

Reference Books

1. "Core Python Programming", R. NageswaraRao, dreamtech press.
2. "Python Programming A Modular Approach With Graphics, Database, Mobile and Web Applications", Sheetal Taneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison-Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey , " Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O"Reilly Publishers
6. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
7. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", Wiley
8. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher, Revised and Expanded version (Referred by MIT)

4KS01 Artificial Intelligence

Course Prerequisite: Basic concepts of Data Structures, Algorithms, Programming

Course Objectives:

1. To present an overview of Artificial Intelligence (AI) principles and approaches.
2. To understand the historical evolution of Artificial Intelligence.
3. To learn various searching techniques and identify to address a particular problem).

Course Outcomes (Expected Outcome): On completion of the course, the students will be able to

1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem & efficiently solve them.
3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.
4. Apply AI techniques in applications which involve perception, reasoning and learning.
5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

Unit I: Introduction to AI **Hours: 7**

Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI,

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Problem Solving Through AI **Hours: 7**

Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems

Unit III: Uninformed Search Strategies **Hours: 6**

Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bidirectional Search, Depth Limited Search, Iterative Deepening Depth-First Search

Unit IV: Informed Search Strategies **Hours: 7**

Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis

Unit V: Adversarial Search & Games **Hours: 7**

Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms

Unit VI: Introduction to Knowledge **Hours: 6**

Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by RajendraAkerkar (PHI Learning Pvt. Ltd.)

4KS02 Data Communication and Networking

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To evaluate the errors using various error detection & correction techniques.
6. To understand network based protocols in data communication and networking.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Describe data communication Components, Networks, Protocols and various topology based network architecture
2. Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
4. Illustrate and realize the data link control and data link protocols.
5. Describe and demonstrate the various Local area networks and the IEEE standards.

Unit I: Introduction to Data Communication **Hours: 7**

Introduction: Data Communication, Components, Networks, Network types: Local Area Network,Wide Area Network, Switching, The Internet, Accessing the Internet, Standards and Administration: Internet Standards, Internet Administration, Network Models:TCP/IP Protocol Suite, TheOSI Model, Transmission media: Introduction, Guided media & Unguided media-Wireless. Switching: Introduction, Circuit Switched Networks, Packet Switching.

Unit II: Data link Layer **Hours: 6**

Data Link Layer: Introduction, Nodes & Links, Services , Two categories of link, Two sub-layers, Error detection and correction: Introduction, Block Coding, Cyclic codes, Checksum, Forward Error Correction, Data link control: DLC services, Data-Link Layer Protocol, HDLC, Point-To-Point Protocol, Media Access Control (MAC): Random Access, Controlled Access, Channelization.

Unit III: Network Layer **Hours: 7**

Introduction to Network layer Network Layer Services: Packetizing, Routing and Forwarding, Other Services Packet Switching: Datagram Approach: Connectionless Service, Virtual-Circuit Approach: Connection-Oriented Service , Network Layer performance: Delay, Throughput, Packet Loss, Congestion Control, IPV4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT), Forwarding of IP packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches

Unit IV: Network Layer Protocol **Hours: 7**

Network Layer Protocols: Internet Protocol (IP),Datagram Format, Fragmentation, Security of IPv4 Datagrams,ICMPV4: Messages, Debugging Tools, ICMP Checksum,Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP,Routing algorithms: Distance Vector routing, Link State Routing, IPV6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering, Transition from IPV4 to IPV6: Strategies, Use of IP Addresses

Unit V: Transport Layer **Hours: 6**

Introduction to Transport layer: Introduction, Transport-Layer Services, Connectionless and Connection-Oriented Protocols, Transport-Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking,User Datagram Protocols: User Datagram, UDP Services, UDP Applications,Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP: SCTP Services, SCTP Features

Unit VI: Application layer **Hours: 7**

Introduction to Application layer:Providing Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication Using UDP, Iterative Communication Using TCP, Concurrent Communication,World wide web and HTTP: World Wide Web, Hyper-Text Transfer Protocol (HTTP) FTP: Two Connections, Control Connection, Data Connection, Security for FTP,Electronic Mail:Architecture, Web-Based Mail, E-Mail Security,Domain Name System (DNS):Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, Security of DNS, Network Management: Introduction. Configuration Management, Fault Management, Performance Management, Security Management, Accounting Management,SNMP: Managers and Agents, Management Components, ASN.1: Language Basics, Data Types, Encoding.

Text Book:

Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber : Data Communication, McGraw Hill
3. J.Freey : Computer Communication & Networks, AEW Press
4. D. Corner: Computer Networks & Internet, Pearson Education.

4KS03 Operating System

Course Prerequisite: Discrete Structures, Data Structure, Any programming Language

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

Unit I: Introduction to OS **Hours: 7**

Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit II: Process Scheduling **Hours: 7**

Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization **Hours: 6**

Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management **Hours: 7**

Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: Unit Title: File System **Hours: 7**

File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery

Unit VI: Unit Title: I/O System **Hours: 6**

I/O Systems : Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations , Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book: Avi Silberschatz, P. B. Galvin, G. Gagne: "Operating System Concepts" (9/e) John-Wiley & Sons.

Reference Books:

1. A.S. Tanenbaum "Modern Operating Systems" Pearson Education.
2. William Stallings "Operating Systems" Prentice-Hall.
3. D. M. Dhamdhere "Operating Systems" Tata McGraw-Hill.
4. P. Balkrishna Prasad: "Operating Systems" Scitech Publications (I) Pvt.

4KS04 Microprocessor & Assembly Language Programming

Course Prerequisite: Computer Programming and Computer Fundamentals

Course Objectives:

1. To explore 8086 microprocessor and its architecture.
2. To introduce interfacing techniques of 8086 microprocessor.
3. To introduce basics of Internet of Things

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
2. Design and Test assembly language programs using 8086 microprocessor instruction set.
3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.
4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
5. Explain the basic concepts of Internet of Things

Unit I: 8086 Architecture **Hours: 7**

8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction Set **Hours: 7**

8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 Instruction Set **Hours: 6**

8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: Subroutines& Macros **Hours: 7**

The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 Interrupt **Hours: 7**

8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. 8086 microprocessor interrupt programming.

Unit VI: Internet of Things (IoT) **Hours: 6**

Internet of things: An overview, IoT conceptual framework, IoT Architectural View, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT.

Text Book:

1. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors & Peripherals, Third Edition (TMH).

2. Raj Kamal: Internet of Things, Architecture and Design Principals, McGraw Hill Education (India) Private Limited

Reference Books:

1. W. A. Triebel& Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor Architecture Programming and Interface (6/e) (PHI)

4KS05 Theory of Computation

Course Prerequisite: Discrete Mathematics, Data Structures

Course Objectives:

1. To understand different automata theory and its operation.
2. To understand mathematical expressions for the formal languages
3. To study computing machines and comparing different types of computational models
4. To understand the fundamentals of problem decidability and Un-Decidability

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. To construct finite state machines to solve problems in computing.
2. To write regular expressions for the formal languages.
3. To construct and apply well defined rules for parsing techniques in compiler
4. To construct and analyze Push Down, Turing Machine for formal languages
5. To express the understanding of the Chomsky Hierarchy.
6. To express the understanding of the decidability and un-decidability problems.

Unit I: Finite State Machines **Hours: 8**

Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines.
Minimization of Finite Automata. (Construction of Minimum Automaton)

Unit II: Regular Expression and Regular Grammar **Hours: 8**

Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden"s Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs(proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

Unit III: Context Free Grammar and Languages **Hours: 8**

Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

Unit IV: Pushdown Automata **Hours: 8**

Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion , Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

Unit V: Turing Machines **Hours: 8**

Formal definition of a Turing Machine, Design of TM, Computable Functions, Church"s hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

Unit VI: Decidability and Un-Decidability **Hours: 8**

Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, Post Correspondence Problem, Introduction to Recursive Function Theory

Text Book:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation
2. Peter Linz: An Introduction to Formal Languages and Automata

Reference Books:

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra &Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013

4KS06 Data Communication & Networking Lab

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the working principle of various communication protocols
2. To understand and analyze the signal flow in a digital communication system.
3. To analyze error performance of a digital communication system in presence of noise and other interferences.
4. To evaluate the errors using various error detection & correction techniques.
5. To understand network based protocols in data communication and networking.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement Configure various network protocols.
3. Compare IP Address classes of networks

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study various LAN topologies and their creation using network devices, cables and computers. .
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC(Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING / Tracer and Net stat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN (TCP/IP Configuration)

4KS07 Operating System Lab

Course Prerequisite: Basic computer programming

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study Linux Operating System along with its installation.
2. To Study and Execute basic file commands and process related open source Ubuntu commands
    a. Commands to view all executing, block and suspended process.
    b. Command to check and change the priority of process CPU utilization for executing processes.
    c. Commands to check for child process, sub-processes, process tree, abort & end process and all other basics commands related to processes
3. Write a program for multithreading using C.
4. To simulate First Come First Serve & Shortest Job First process scheduling algorithm
5. To simulate Shortest Job First process scheduling algorithm
6. To simulate Preemptive Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement Priority Based Process scheduling Algorithm
9. To implement and analyze multi-level queue scheduling algorithm
10. To implement the following file allocation strategies.
11. To simulate paging technique of memory management.
12. To implement the FIFO page replacement policy
13. To implement the LRU page replacement policy
14. To implement the optimal page replacement policy
15. To simulate producer-consumer problem using semaphores.
16. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
17. To implement contiguous memory allocation strategies to detect fragmentation using: First Fit, Best Fit and Worst Fit.
18. To implement FCFS Disk Scheduling algorithm
19. To implement SCAN Disk Scheduling algorithm
20. To implement C-SCAN Disk Scheduling algorithm
21. To simulate Bankers algorithm for deadlock avoidance
22. To implement following memory management techniques
    Implement MVT and MFT where memory block size is 100 for 5 processes. Enter no. of blocks for each process and calculate internal fragmentation.
23. To simulate LFU page replacement algorithms

24. To simulate the Single level directory file organization techniques.
25. To Simulate bankers algorithm for Dead Lock Avoidance (Banker,,s Algorithm)

4KS08 Microprocessor & Assembly Lang. Prog Lab

Course Prerequisite: Computer Programming, Number System

Course Objectives: In this lab student will learn about‟ Microprocessor and Interfacing‟ in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals**.**

Course Outcomes(Expected Outcome): On completion of the course, the students will be able to

1. Analyze the internal workings of the microprocessor
2. Design and develop programs in Assembly Language Programming
3. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
4. Design and Test assembly language programs using 8086 microprocessor instruction set.
5. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language
6. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor

List of Experiments:

This is a sample list of Experiments; minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Installation and Introduction of TASM Assembler.
2. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
3. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
4. Write a program for multiplication of two 8-bits numbers.
5. Write a program for division of two 8-bits numbers
6. Write a program to check whether a given number is even or odd.
7. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
8. Write a program to check whether a given number is positive or negative.
9. Write a program to find greatest of two 8-bits signed &unsigned numbers.
10. Block Transfer Program
11. Write a program to find Factorial of a number using loop instruction.
12. Write a program to find cube of a given number using Subroutine.
13. Write a program to find square of a given number using Subroutine.
14. Write a program to find square of a given number using Macro.
15. Write a program to find whether the string is palindrome or not.
16. To convert BCD Number Program
17. Write a program to perform Reverse of the String
18. Write a program to transfer 10-bytes from one memory bank to another memory bank.
19. Program for sorting an array for 8086 microprocessor.
20. To write an assembly language program to arrange the given numbers in descending order.
21. Program for searching for a number/character in a string for 8086 microprocessor.

4KS09 C-Skill-Lab II

Course Prerequisite: Basic knowledge of scripting language, Programming language. Basic understanding of Electronic concepts.

Course Objectives: To develop an ability to design and implement static and dynamic website and to develop embedded systems with the help of Raspberry Pi/Ardino.

Course Outcomes(Expected Outcome): On completion of the course, a student will be able to

1. Develop client server program and web applications
2. Make use of project-based experience for web application development.
3. Create embedded systems using Raspberry Pi/Ardino

List of Experiments:

This is a sample list of Experiments, minimum 12 experiments are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to PHP and configure it to work with Apache Web Server.
2. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
3. Create your class timetable using table tag.
4. Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
5. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
6. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
7. Develop a JavaScript to display today‟s date.
8. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
9. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).

10. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a PHP program to display a digital clock which displays the current time of the server.
12. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix.
13. Write a PHP program to sort the student records which are stored in the database using selection sort.
14. Study and Install IDE of Arduino and different types of Arduino.
15. Write program using Arduino IDE for Blink LED.
16. Write Program for RGB LED using Arduino.
17. Study the Temperature sensor and write a Program for monitor temperature using Arduino.
18. Study and Implement RFID, NFC using Arduino. • Study and implement MQTT protocol using Arduino.
19. Study and Configure Raspberry Pi.
20. WAP for LED blink using Raspberry Pi.
21. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
22. Create Smart Plugs with Arduino and Raspberry Pi.
23. Interfacing digital sensors with raspberry pi.
24. Creating a webpage to control I-O devices, Reading data from sensor and passing to web page.
25. Implement a program to access Analog sensor via wifi with HTML Web server.

Bachelor of Engineering **Prospectus No. 121741**
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SYLLABUS

PRESCRIBED FOR

BACHELOR OF ENGINEERING

CIVIL ENGINEERING EXAMS.

SEMESTER PATTERN (CREDIT GRADE SYSTEM)

THIRD SEMESTER

Inpalnt Training & Industrial Visit in the faculty of Engineering & Technology

1)
a) the inplant training shall not be compulsory,
b) the inplant training shall be taken by students strickly during Summer vacation. after IVth or VIth Semester examination and /or during Winter vacation after Vth or VIIth Semester examinations,
c) the inplant training shall not be part of examination system, however, student shall prepare and submit report after completion of training to the concerned Head of Department alongwith certificate issued by the industry,
d) the inplant training shall be of minimum two weeks duration,
e) there shall not be any liability whatsoever on the Institution with respect to implant training of the students,
f) students shall undertake inplant training on their own risk and cost. An undertaking in this regards signed by student and parents shall be submitted before proceding for training to the concerned Head of Department/ Head of Institution.
g) the students shall complete inplant training under the supervision of concerned person in the industry,
h) Institutes shall help students to organise inplant training by way of correspondance,

2) Industrial Visit : Industrial visit may be organised for the students. Students should prepare & submit the report on Industrial visit to the concerned Head of Department/Head of Institution.

3CE01 MATHEMATICS-III

SECTION - A

Unit I : Ordinary Differential Equations.

Complete solution, Operator D, rules for finding the complementry function, the inverse operator , Rules for finding particular integral. Method of variation of parameters, Cauchy's and Legendre's Linear Differential equations. Simultaneous linear differential equations with constant coefficients Applications to civil engineering.

Unit II: Laplace transforms :

Definition and elementry properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary and simultaneous differential equation using Laplace transform of periodic functions. Application to problems of beams.

Unit III Partial Differential Equations.

P.D.E. of first order and first degree of types i) f(p,q) = O ii) f(p,q,z)=0, iii) f(p,q,x,y)=O iv) f(p,q,x,y,z)=O i.e. (a) Lagrange's form Pp + Qq = R (b) Claivant's form z=px+qy+f(p,q) v) Equations reducible to above standard types linear Homogeneous P.D.E. of nth order with constant co-efficients.

SECTION-B

Unit IV Numerical Methods :-

(a) i) Solution of Algebraic and transcendal Equations by

Newton Raphson method and by method of False Position.

ii) Solution of system of linear equations by Grout's method, Gauss Seidal method and Relaxation Method.

(b) Numerical solution of differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method and Rungekutta forth order method.

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mapping, Elementary conformal mapping w=z+c, w=cz, w+ Bilinear transformation.

Unit VI Statistics :

Probability : Axioms, conditional probability, Baye's theorem, Mathematical Expectation and probability distributions (Binomial, Poisson and Normal) Curve fitting by method of least square only for line and parabola, Corelation regression.

Books Recommended :

1) Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
2) Advance Mathematics for Engineers by Chandrika Prasad.
3) Method of Applied mathematics by F.B.Hildebran.
4) Introductory methods of Numerical Analysis by S.S.Sasby.
5) Computer Oriented Numerical Method by Raja Raman.

3CE02 STRENGTH OF MATERIALS

SECTION-A

Unit-I
1. Mechanical properties : Concept of direct, bearing and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel and concrete, Generlized Hook's law, factor of safety.
2. Uniaxial stresses and strains : Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit-II
1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear force, bending moment and loading intensity.

Unit-III
1. Stresses in beams (Bending, Shear),
   i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.
   ii) Shear : Distribution of shear stresses on beam cross sections,
   iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

SECTION - B

Unit-IV
1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.
2. Thin cylinders subjected to internal pressures.

Unit -V :
1. Principal stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.
2. Combined direct & bending stresses : Combined direct and bending stresses, applications to short columns with eccentric loads, retaining walls with horizontal lateral force.

Unit-VI
1. Slope & deflection of beams : Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by a) Macauley's method b) Moment Area method c) Conjugate Beam method.
2. Theory of long columns, Euler, Rankine formula.

BOOKS RECOMMENDED:

1. E.P.Popov, Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young, Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, Strength of Materials, Harper and Row, New York
4. Shames, I. H., Introduction to solid mechanics, Prentice Hall of India, New Delhi
5. Natarajan, Mahadeoappa, Strength of materials
6. Junnarkar, S. B., Mechanics of materials
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pte. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.

3CE03 TRANSPORTATION ENGINEERING -I

SECTION-A

Unit-I
Highway : Development And Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material And Testing.
Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.

Unit-II
Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEVTheory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, superelevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.

Unit-III
Pavement Design : Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement,
Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil.

SECTION-B

Unit-IV Traffic Engineering : Traffic Characteristics, Traffic studies, road parking system, accident study, traffic control devices, marking, signs, signals, island its type, At grade intersections – clover leaf, diamond, rotary intersections & design elements, 3 E's of traffic, regulation for driving motor vehicle, motor vehicle Act & Rule.

Unit-V Bridge Engineering – Component, classification and identification, data collection, site selection, economic span, different structural form – culverts, causeways, major and minor bridges, types of foundation, abutments, piers and wing wall, bearing their types and choices, Erection of bridge superstructure.

Unit-VI Bridge Hydrology - Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board. Load, Forces, Stresses – Loads, forces, stresses acting on bridges.IRC Specification and code practices, critical combination. Rating And Maintenance – Methods and techniques of rating of existing bridges, repairs, maintenance, corrosion – causes and prevention, Strengthning of bridge superstructure.

BOOKS RECOMMENDED :-

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transporatation & Highway Engg.
3) Dr.Kadiyali L.R. : Traffic Engg. & Transport Planning.
4) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
5) Bindra S.P. : Principles & Practice of Bridge Engg.
6) Bindra S.P. : A Course in Highway Engg.
7) Duggal A.K. & Puri V.P. : Laboratory Mannual in Highway Engg.

3CE04 BUILDING CONSTRUCTION & MATERIALS

SECTION - A

Unit- I Introduction : Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages, load bearing walls and partition walls, HDPE Wall panel.

Foundation :- Definition and necessity, loads of foundation, Bearing Capacity soil, SBC values based on IS code, field methods of improving bearing capacity.

Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls &

columns, Raft foundations, Foundations in black cotton soils, under-reamed pile foundation, precautions to be taken. Causes of failure of foundations. Setting out for foundation, excavation for foundation.

Unit-II Stone Masonry – Technical terms, General principles to be observed during construction, random rubble masonry, coursed and un- coursed rubble masonry, Selection of stone for masonry.

Brick Masonry – Classification of bricks, manufacturing of clay bricks, tests on bricks, properties of burnt bricks, new trends in brick manufacturing such as use of fly ash, stabilized mud blocks.

Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Earthquake force, various features for making load bearing structure earthquake resistant.

Unit-III Floors – Types of Floors – Basement floor, ground floor and upper floors, Types of upper floors – R.C.C. slab floor, R.C.C. slab & beam floor, R.C.C. ribbed floor, R.C.C. Grid floor, R.C.C. flat slab floor, Floor finishes – Types of flooring material, Sahabad, Kotta, Granite, Ceramic tiles, plain tiles, mosaic tiles, glazed tiles, different types of floor finishes, their suitability, method of construction, criteria for selection.

Roofs – Flat & pitched roof, steel roof trusses – types and suitability, fixing details at supports, types of roof covering, AC & GI sheets, acrylic sheets, fixing details of roof covering.

Formwork – Different types, their relative merits & demerits, period for removal of formwork for different members.

SECTION - B

Unit-IV Doors & Windows – Different forms of commercial woods-plywood, particle-board, batten-board, block-board, novapan, sunmica, veneer sheets.

Doors : Purpose, criteria for location, size of door, door frames & its types, methods of fixing, T Types of door shutters and their suitability, HDPE door shutter.

Windows – Purpose, criteria for location, no. sizes & shapes of Windows, types of windows & their suitability.

Ventilators – Types and their suitability. Fixtures & fastening for doors & windows.

Glass – Types of glass & their suitability.

Arches & lintels – Types & their suitability, details of R.C.C.

lintels & chajja, precast lintels & arches.

Unit-V Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design.
Lifts, ramps & escalators – suitability.
Plastering & pointing- Necessity, types, processes of different types of plastering, defects in plastered work.
Painting & Colouring – Necessity, types, processes of painting & colouring to wall surfaces, wooden surface, iron & steel surfaces, types of paints and their uses.
Scaffolding – Purpose, types, suitability.

Unit-VI Special Aspects of Construction –
Damp proofing – causes of dampness, its effects, various methods of damp proofing, material used for damp proofing, details of cavity wall construction.
Fire proof construction – Points to be observed during planning & construction. Fire protection requirements for a multistoried building.
Sound proof Construction – Sound absorbants and their characteristic, factors affecting the acoustical design of an auditorium.
Joints – Expansion & construction joints necessity, details of expansion joint at foundation level & roof level of load bearing structure and framed structure. Provision of construction joints in slabs, beams & columns.

BOOKS RECOMMENDED :

1) Mackay W.B. : Building Construction, Vol. I, II, III, Longmans.
2) Sushilkumar : Building Construction, Standard Publishers Distributors.
3) Deshpande R.S. and Vartak C.V. : A Treatise on Building Construction.
4) Sharma S.K. Kaul B.K. : A. T.B. of Building Construction, S. Chand & Co.
5) Gurucharan Sing : Building Construction Engg., Standard Book House, Delhi-6
6) Sane L.S. : Construction Engg., Manak Talas, Mumbai.
7) Chudley R. : Construction Technology, Vol. I, II, III & IV, Longmans Group Ltd.
8) ISE National Building Code of India, 1970.
9) Punmia B.C. : Building Construction.
10) A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

3CE05 ENGINEERING GEOLOGY

Unit-I : Introdution - Different branches of Geology and importance of Geology in Civil Engineering.
Mineralogy - Study of common rock forming and ore minerals with reference to its physical properties.
Petrology - rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Unit II : Structural Geology - outcrop, dip strike, elementary ideas about folds, faults, joints and unconformity, effect of these structures in foundation.
Earthquake Engineering - earthquake waves, causes and effects, magnitude and intensity, earthquake zones of India, seismic coefficient.
Geological investigation - surface and sub-surface investigation, direct and indirect.

Unit-III : Rock as a material of construction. Study of engineering properties of rocks and soils. Geological studies related to site selection for dams and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields etc. Case histories of some major projects of tunnels, dams and reservoirs.

BOOKS RECOMMENDED :-

1) Singh Parbin : General & Engineering Geology.
2) Mukharjee : A Text Book of Geology.
3) Tuyrell G.W. : The Principle of Petrology.
4) Wadia D.N. : Geology of India.
5) Krishan M.S. : Geology of India.
6) Date S.Y. & Mukharjee D.M. : Geological Maps.
7) Deshmukh D.N. & Mukharjee D.M. : Engineering Geological Maps.
8) Gupte R.B. : Geology of Engineering.
9) Reddy Venkata : Engnieering Geology.

3CE06 STRENGTH OF MATERIALS -LAB

PRACTICALS:

Minimum seven out of following:

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.

7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3CE07 TRANSPORTATION ENGINEERING-I-LAB

PRACTICALS

Based on above syllabus, following practical are required to be performed and a laboratory report be submitted by every student. Practical examination will be viva based on above system.

List of Experiments (Any Eight)

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of perforation value of Bitumen
7. Determination of Viscosity of Bituminous material
8. Determination of softening point of bituminous material.
9. Determination of ductility of bitumen.
10. Determination of flash point and fire point of Bituminous material
11. Determination of marshal stability value

3CE08 BUILDING CONSTRUCTION & MATERIALS - LAB

PRACTICALS –

1. Drawing of following building elements on A-2 size sheet.
   a) Panelled door, flush door, glazed window.
   b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Fields visits to building under construction and its report writing including material of construction, construction processes, Human

recourses required, construction details.

6. Sketch book containing Free hand sketches of following
   i) Different types of foundations.
   ii) Bonds in brick masonry
   iii) Types of floors. [sections]
   iv) Types of stairs. [plans and side view]
   v) Line sketches of different types of steel roof trusses.
   vi) Details of expansion joints.
   vii) Details of damp proofing for basement.
   viii) Fixtures & fastenings of doors & windows.

3CE09 ENGINEERING GEOLOGY - LAB

LABORATORY WORK :-

1) Megascopic study of common rock forming and ore minerals.
2) Megascopic study of the common igneous, sedementary and metamorpic rocks.
3) Geological map reading and construction of sections from simple geological maps with engineering problems (about 8 maps)

A report/journal on above practical conducted shall be submitted by each student. Practical examination shall be based on practical and viva-voce conducted on the above syllabus.

*****

SEMESTER : FOURTH

4CE01 GEOTECHNICAL ENGINEERING – I

SECTION – A

Unit- I History of development of soil mechanics , formation of soil, its significance to the field problems.

Soil properties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Density of Soil, relative density, in-situ density, specific gravity of soil solids, soil solids index and simple soil properties, void ratio, porosity, degree of saturation and functional relationship. Grain size analysis, Mechanical and Sedimentation analysis, consistency limits and their determination, liquidity idea, activity, sensitivity etc. Criteria of classification of fine grained and coarse grained soil IS soil classification

Unit-II Concept of clay mineral, major soil minerals, Kaolonite, IIIite, Montmorillonite, its structural formation and properties. Mechanics of compaction, factors affecting compaction, standard and modificfed Proctor test, OMC, their field determination, zero air-void line, concept of wet of optimum and dry of optimum, different structures of soil, field method

of compactions and quality control. Mechanical stabilization and CBR test & its application.

Unit-III Absorbed water, surface tension, capillarity and its effect on soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection permeability, determination of oefficient of permeability laboratory and field methods. IS procedure for determination of coefficient of permeability for stratified deposits.

Drainage and dewatering of soil, various methods, deciding different drainage system.

SECTION – B

Unit-IV Laplace equation, its derivation in Cartesian co-ordainate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design of graded filter, Terzagghi's criteria, protection filter, requirement of ideal filter material, concept of piping and criteria of stability against piping.

Unit-V State of stress at a point, Mohrs stress circle, stress distribution in soil mass, Boussinesqs theory and its applications, point load, uniformly loaded rectangular and circular area New-marks chart, its preparation and use, equivalent point load to deleted.

Compression of laterally confined soil, e-p virgin compression curve, compression index, swelling index, coefficient compressibility, concept of consolidation spring analogy Terzaghi's theory of one imensional consolidation. Mathematical treatment). Consoledo meter-test, coefficient consolidation, time factor curve fitting methods, consolidation. Cassagrandes method for determination of pre-consolidation pressure.

Unit-VI A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criterial, Mohr-Coulambs theory and development of failure envelopes, Laboratory measurement of shear strength for different drainage, coditions by direct shear test, Unconfined compression test,Triaxial and vane sheartest, concept of pore pressure coefficients and their significance on strength of soil, overconsolidation ratio, shear characteristics of sand, NC

and OC clays and partially saturated soil: Influence of soil structure and strain rate on shear strength, Merits and demerits of various shear strength tests.

BOOKS RECOMMENDED :

1) Craig R.F. : Soil Mechanics, ELBS, 1983.
2) Lambe T.W. & Whiteman R.V. : Soil Mechanics, John Wiley and Sons, 1969.
3) Terzaghi K. & Peck R.B. : Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
4) Gulhati S.K. : Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
5) Singh A. : Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
6) Venkategramiah C. : Soil Mechanics and Foundation Engg.

4CE02 FLUID MECHANICS – I

SECTION - A

Unit I : Introduction: Definition of Fluid, physical properties of fluid mass density, unit weight, specific Gravity, dynamic viscosity, Kinematic Viscosity, Newton's law of viscosity, Rheological classification of fluids. Adhesion, Cohesion, surface tension, capillarity, pressure inside droplet & jet of liquid.

Fluid Statics I : Pressure at a point, Pascal's law, Equation of fluid static's & its integration, Measurement of pressure, absolute & gauge, types of manometers.

Unit II: Fluid Statics II : Forces on immersed areas – plane and curved, Buoyancy, equilibrium of floating bodies, metacenter, metacentric height, its determination by analytical method only. Kinematics : types of Flow – Eulerian approach of describing fluid motion, streamline, stream tube, streak line, Path line, substantive, local, convective acceleration, velocity potential, stream function, continuity equation of ID & 3D flow in Cartesian coordinates.

Unit III : Fluid Dynamics : Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, HGL, EGL, velocity distribution, Average velocity, Kinetic – Energy correction factor, momentum correction factor (Definition only) Momentum equation (Statement Only) Forces on pipe bends.

SECTION - B

Unit IV: Fluid Measurement –I : Venturimeter, Orificemeter, Pitot tube, Prandtl Pitot tube, circular orifices & mouthpieces, time of

emptying rectangular tanks by orifices at bottom & sides.

Fluid Measurement – II: Notches & weirs, Definition, Types rectangular, triangular, trapezoidal, cipolletti weir, end contractions, velocity of approach, Francis equation.

Unit V: Laminar flow through circular pipes, velocity distribution, Hayegen Puiseuille equation with Proof. Reynold's number, Boundary layer, definition, development along a flat plate, Nominal thickness, energy thickness, Momentum thickness, displacement thickness.

Unit VI : Flow around immersed bodies, drag, lift, different forms of drag, calculations of drag & lift on cylindrical bodies only. Pipe flow Darcy – Weisbach equation $h_f = flv^2/2gd$ (no proof) major & minor losses, pipes in series, pipes in parallel, equivalent pipe, pipe Network (Hardy – Cross method only)

Books Recommended :

1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition.
2) Dr. Jain A.K. : Fluid Mechanics.
3) Subramanya K. : Fluid Mechanics.
4) Streeter : Fluid Mechanics.
5) Garde & Mirajgaonkar : Fluid Mechanics.

4CE03 THEORY OF STRUCTURES – I

SECTION – A

Unit-I
1. Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.
2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II
1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.
2. Deflection in determinate trusses.

Unit-III
1. Influence line diagrams for reactions, bending moment and shear force for determinate beams.
2.. Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION B

Unit-IV
1. Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.
2. Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit-V Slope deflection method:
1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

Unit-VI Moment Distribution method:
1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Snalysis.

4CE04 SURVEYING – I

SECTION-A

Unit-I
1. Introduction Surveying – Necessity & purpose, Geodetic & plane surveying, classification of survey, principles of surveying.
2. Instruments for measurement of distance, linear measurements, corrections to field measurements, ranging out, direct and indirect ranging. Use of distomat.
3. Chain surveying: basic definition, principle, selection of survey stations, offsets for locating details, limiting length of offsets, degree of accuracy of offsets, use of cross staff, optical square, prism square, obstacles in chaining, plotting of chain survey work, cross staff survey.

UnitII
1. Instruments for measurement of angles: Prismatic compass, surveyor's compass, their use and adjustments. Vernier and microscopic theodolite, their temporary adjustment. Permanent adjustment of vernier theodolite. Introduction and uses of Total Station.
2. Traversing with chain and compass, Reference meridians, bearing and azimuths. Local attraction, magnetic declination and its variation. Open & closed traverses. Adjustment of closed traverse - Bowditch's Graphical method.

Unit-III
1. Instruments for measurement of elevation : Dumpy levels tilting and automatic levels. Details of their construction.
2. Temporary and permanent adjustments of Dumpy and tilting levels.

SECTION - B

Unit-IV: 1. Measurement. of Horizontal and Vertical angles with theodolite by different methods. Other uses of theodolite.
2. Theodolite traverse, latitude and departure, Gale's traverse table.

Unit-V 1. Leveling: Definition of terms, Principle, leveling methods, leveling staves, Booking and reduction of field notes, curvature and refraction.
2. Contouring: Definition, Characteristics and uses of contour maps, methods of contouring. Refraction, reciprocal leveling plotting of profiles. Errors in leveling.

Unit-VI: 1. Plane tabling : equipments, methods, two point and three point problems, Advantages & disadvantages of plane tabling, Lehman's rules.
2. Construction and use of minor instruments such as Abney level, Box sextant, Plan i meter, Tangent clinometer, Ghat Tracer.

BOOKS RECOMMENDED :

1. D.Clark : Plane and Geodetic Surveying, Vol. I & II Aisa Publication House.
2. P.B.Sahani : T.B. of Surveying, Vol. I & II, Oxford B.H.B.H.
3. T.P.Kanetkar & Kulkarni : Surveying and Leveling, Part I & II, Pune Vidharthi Griha Prakashan, Pune.
4. B.C.Punmia : Surveying I & II, Standard Book House Delhi.
5. R.C.Brinker and P.R.Wolf, Harper and Row : Elementary Surveying

4CE05 REINFORCED CEMENT CONCRETE – I

SECTION – A

Unit-I Cement: Physical properties of Portland cement, laboratory tests, special types of cements.
Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density, laboratory tests.
Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete

Unit II Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage and durability, laboratory tests on concrete.

Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions.

Unit-III Special concrete: Light weight concrete, fibre reinforced concrete, Roller compacted concrete, self compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete.
Special concreting techniques: Guniting, grouting and shotcreting concrete, introduction & application of Ferrocement.

SECTION-B

Unit-IV Introduction of mix design, factors governing mix design, IS code method of mix design (IS: 10262 – 1982) and Indian Road Congress (IRC) – 44 methods.

Unit-V Basic elastic theory and concept of reinforced concrete, types of reinforcement.
Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, and chajjas.

Unit-VI Analysis and design of doubly reinforced rectangular beam by working stress method section for simply supported span.
Shear and Bond: Shear stress in reinforced concrete beam section, shear reinforcement, bent up bars and stirrups, bond stress, local and average bond stress, and development length.

Students must be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold (Publishers) ltd.
2. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks : Concrete Technology, ELBS
4. Gambhir, M. L. : Concrete Technology, Dhanpat Rai and Sons
5. Orchard D. F. : Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S. : Concrete Technology, S. Chand
7. Varshney, R. S. : Concrete Technology, Oxford Pub. house.
8. IS: 456 – 2000,
9. IS: 10262 – 1982,
10. Krishna Raju : Design of Concrete Mixes, Mc – Graw Hill.

11. Shah and Kale : Reinforced Cement Concrete Design,
12. Sushil Kumar : Treasure of Reinforced Cement Concrete

4CE06 GEOTECHNICAL ENGINEERING – I-LAB

PRACTICALS :-

Based on above syllabus, following ten practical are required to be formed and a laboratory report be submitted by vevery student. Practical-examination will be viva based on above syllabus.

EXPERIMENTS :-

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying method.
3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination f Atterbergs limits (LL, PL and SL)
6. Determinatin of Compaction properties (Standard Proctor Test)
7. Determination of permeability of falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial of UU type
11. C.B.R. test.
12. Consolidation test

4CE07 FLUID MECHANICS – I - LAB

PRACTICALS :-

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva-voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoullis theorem.
2. Reynolds experiment to determine type of flow.
3. Determination of coefficient of discharge for Venturimeter
4. Determination of coefficient of discharge for Orificemeter
5. Determination of hydraulic coefficients of orifice.
6. Determination of metacentric height.
7. Determination of friction factor for GI pipe
8. Determination of coefficient of discharge for rectangular notch .
9. Determination of coefficient of discharge for triangular notch.
10. Determination of coefficient of discharge for trapezoidal notch.
11. Determination of coefficient of discharge for mouthpiece.
12. Determination of Viscocity of fluid at different temperatures.

4CE08 SURVEYING – I-LAB

PRACTICALS –

Any 7 practicals mentioned below shall be performed by each student, Observations, calculations and relevant work to be submitted in the form of field book and 4 drawing in A-1 size sheet as a sessional work.

1. Measurement of length – use Distomat.
2. Chain and Compass surveying.
3. L Section & C/section of road.
4. Plane table survey.
5. Theodolite traverse.
6. Study and use of minor instruments.
7. Measurement of area of a irregular figure by digital planimeter.
8. To find corrected bearing using prismatic compass (local attraction).
9. To find R.L. of given point (differential levelling)

Practical examination shall consists of field exercise and vivavoce based on the above syllabus and practical work.

4CE09 REINFORCED CEMENT CONCRETE – I -LAB

PRACTICALS:

- Compulsory site visit and submission of site visit report.
- Minimum seven out of following list:

1. Fineness of cement:
2. Soundness of cement
3. Consistency and setting time of the cement
4. Compressive strength of cement
5. Sieve analysis of aggregate.
6. Bulking of sand (fine aggregate).
7. Silting of sand.
8. Workability by slump cone test.
9. Workability by compaction factor test.
10. Workability by flow table method.
11. Compressive strength of concrete.
12. Mix Design (Compulsory) by IS method.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3ME01 MATHEMATICS-III

Section-A

UNIT-I : **Ordinary differential equations:-** Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (10 Hrs)

UNIT-II **Laplace transforms :** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function. Solution of Linear differential equations. (10 Hrs.)

UNIT-III a) Partial differential equation of first order of following form- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii)f (x,p)=g(y,q); (iv) Pp+Qq=R (Lagranges form); (v) z=px+qy+f (p,q) (Clairaut form)

b) Statistics : Curve fitting by method of least squares (Straight and parabola only), Correlation, Regression.

c) Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (10 Hrs.)

Section-B

UNIT-IV **Complex Analysis :-** Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation), singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

UNIT-V **Numerical Analysis :** Solution of algebric and transcendental equations by Newton-Raphson method & method of false position. Solution of system of linear equations by Gauss-Seidal method, Relaxation method. Solution of first order ordinary differential equations by Picard's, modified Euler's, Runge-Kutta and Taylor's method. (10 Hrs.)

UNIT-VI **Vector Calculus :-** Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function,

Directional derivatives, Divergence and curl of a vector point function and their physical meaning, line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

Books Recommended:-

Text Books:

1. Text book on Applied Engineering Mathematics, Vol. II, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics, B.S Grewal, Himalaya Publishing House.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Book :

1. Advanced Engineering Mathematics, Erwin Kreyzig, John Wiley.

3ME02/ 3PE02 MECHANICS OF MATERIALS / STRENGTH OF MATERIALS

SECTION-A

Unit-I 1. Mechanical properties: Concept of direct, bending and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, and other metals, factor of safety,

2. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit-II 1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shear force, bending moment and loading intensity.

2. Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section, leaf springs.

Unit-III 1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.

2. Shear stress distribution on beam rectangular and circular cross sections.

SECTION – B

Unit-IV Thin and thick cylinders and thin spherical shells subjected to internal pressures.

Unit –V 1. Strain energy under uniaxial tension and compression impact loads and instantaneous stresses.

2. Principal Stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses.

Unit-VI Deflection of beams

Deflection in statically determinate (simply supported) beams subjected to point loads, uniformly distributed loads, moments by Macauley's method.

Books Recommended:

Text Books :

1. F. L. Singer : Strength of Materials, Harper and Row Publication, New York .
2. Ramamruthm : Strength of Materials, Danpat Rai and Sons, New Delhi .

Reference Books :

1. E.P.Popov : Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young : Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Shames, I. H. : Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 1990.
4. Beer and Johston : Mechanics of Materials, McGraw Hill.
5. D. S. Prakash Rao : Strength of Material : A Practical Approach, I ed, University Press, Hydrabad.

3ME03 FLUID POWER-I

Section - A

UNIT-I : - 1) Introduction to the study of fluid motion. Mechanical properties of fluids and their influence on flow characteristics.

2) Fluid Statics:- Fluid pressure, pressure variation in fluids, manometers, forces on plane and curved surface buoyancy. (12 Hrs)

UNIT-II:- Buoyancy, stability of floating bodies. Kinematics and dynamics of fluid flow:- Types of flows, Stream lines, potential lines, flow net, continuity equation. One and two dimensional motion, one dimensional method of flow analysis. Bernoulli's

equation. Venturimeter, Momentum equation for steady flow. Vortex motion. (8 Hrs)

UNIT-III:- Dimensional analysis: Dimensional homogeneity and dimension less ratios. Dimensionless parameters. Similitude and model studies. (6 Hrs)

Section - B

UNIT-IV:- Motion of viscous fluids:-Introduction to laminar and Turbulent flows. Boundary layer concept. Separation. Drag lift on immersed bodies. Reynolds number and its significance. (7 Hrs)

UNIT V:- Darcy weisbach equation i.e. Equation of pipe flow, friction charts and its use, Minor losses in pipes and fittings, losses due to sudden enlargement and contraction, Hydraulic and energy gradient lines, pipes in series and parallel. Elementary concept of water hammer. (8 Hrs)

UNIT VI:- 1. Principles of fluid machinery: Dynamic action of fluid force exerted by fluid jet on plane, curved, stationary and moving vanes. Velocity diagrams, Work done by impact, pressure due to deviated flow.

2. General Theory of Hydrodynamic Machines:- Eulers equation, Degree of reaction, classification of machines according to degree of reaction. Efficiencies: Volumetric efficiency, Hydraulic efficiency, mechanical efficiency and overall efficiency. (7 Hrs)

Books Recommended :-

Text Books:-

1. CSP Ojha, R. Berndtsson, Fluid Mechanics and Machinery; Oxford university.
2. Bansal R.K., Fluid Mechanics and Fluid Machines; Laxmi publications.

Reference Books:-

1. R.K.Rajput; Engineering Fluid Mechanics; S. Chand publications.
2. Dr. Mody & Seth; Hydraulics and Fluid Mechanics; Standard book house
3. S. Ramamrutham, Hydraulic, Fluid Mechanics & Fluid Machines, Dhanpatrai publishing company.
4. Strecter, Fluid Mechanics, Tata McGraw Hill.

3ME04 ENGINEERING THERMODYNAMICS

Section-A

Unit-I Introduction to basic concepts of thermodynamics,

Macroscopic and microscopic approaches, properties of system, state and equilibrium, processes and cycle. Temperatures and Zeroth law of thermodynamics, Quasi-static process, Forms of energy and its conversion.

Gas Laws and Ideal gas equation of states, difference between gases and vapours, equation of state, gas constant and universal gas constant. (08 hrs)

Unit-II Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams.

First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law applied to closed system under going a cycle, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Change in internal energy and Heat transfer during various non-flow processes. (10 hrs)

Unit-III First Law applied to flow processes: Steady state, steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes. (9Hrs)

SECTION - B

Unit-IV Second Law of thermodynamics: Limitations of Ist law, Thermal energy reservoir, heat engines refrigerator and heat pumps. Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, two propositions regarding the efficiency of Carnot cycles. The thermodynamic temperature scale. Reverse carnot cycle. COP of heat pump and refrigeration. Inequality of Clausius. (7 Hrs)

Unit-V Entropy: Entropy-a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, lost work. Principle of increase of entropy.

Availability and irreversibility:- Available energy referred to cycle, decrease in available energy with heat transfer through a finite temperature differences. The Helmhltz and Gibbs functions, Availability, Irreversibility and effectiveness. (8 Hrs)

UnitVI a) Air Standard Cycles: Ottto, diesel, semidiesel, sterling and joule cycles etc., their efficiencies and mean effective pressure.

b) Vapour Cycles:- Rankine and Modified Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram. (No numerical on this unit) (8 Hrs)

Books Recommended

Text Books

1. Engineering Thermodynamic - by P.K.Nag.
2. Thermodynamics Volume: I & II; R. Yadav;

Reference Books

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G.J.Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson

3ME05 MANUFACTURING PROCESSES-I

Section - A

Unit-I :- Introduction to manufacturing processes & classification; Introduction to pattern making- Pattern materials, pattern making tools, allowances, Types of patterns, functions of patterns, General properties of moulding sands, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making, core prints, core boxes. Sand casting Processes - Basic principle and Terminology of sand casting, gating system, types of gate, risers, etc. (9Hrs)

Unit-II:- Technology of melting and casting - Melting furnaces, crucibles, pit, open hearth, gas fired cupola, cupola operation and electric hearth furnaces, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace.

Defects in castings and its types, Causes and remedies of casting defects. Origin and classification of defects, shaping faults, Inclusion and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Inspection and testing of castings:- Radiography, ultrasonic, Eddy current testing, fluorescent penetrant test. (7 Hrs)

Unit III:- Casting processes and their principle of operation and applications permanent mold casting, slush casting, shell

molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipment and processes for Gravity, pressure and vacuum casting methods, cleaning of castings, Modernisation & Mechanisation of Foundries. (8 Hrs)

Section - B

Unit IV :- Mechanical working of metals: Principle of hot and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Shearing operations, tube drawing, wire drawing, spinning, embossing and coining, squeezing and bending operations, rotary swaging, Rolling, types of rolling mills, forging operations, upset forging. (8 Hrs)

Unit V:- Joining processes:- Mechanical joining processes, Mechanical fastening, riveting, soldering, brazing Welding, Types of welding processes-Arc welding: principle and working, Gas welding- principle and working Types and purpose of Electrodes, Electrode coatings(flux). TIG & MIG processes – Working principles and its applications, shielding gases, MIG-Spray transfer and dip transfer processes. (6 Hrs.)

Unit VI:- Submerged arc welding & resistance welding :- Heat generation in resistance welding, operational characteristics of resistance welding processes such as spot welding, projection welding, butt welding.

Principle of operation of friction welding, forge welding, plasma arc, thermit welding. Welding defects, Testing and Inspection of welds, Ultrasonic, Electroslag, Electron Beam, laser welding, weldability.

Surface Treatment-Electroplating, electroforming, and iodising, metal spraying, shot peening, polishing, mechanical cleaning. (9 Hrs)

Books Recommended

Text Books:-

1. Workshop Technology Vol. I by Bawa, Tata McGraw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

References:-

1. Workshop Technology Vol I by Raghuwanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A.Lindberg, PHI Pub 2001.

4. Foundry Technology by Goel Sinha.

3ME06 / 3PE06 MECHANICS OF MATERIAL-LAB. / STRENGTH OF MATERIALS-LAB.

Practicals:

Minimum Six to Eight out of following:

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Deflection of springs.

Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3ME07 FLUID POWER-I-LAB.

Practical Term Work:-

At least six practical's (study/Trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students.

1. Study of Manometers.
2. Measurement of fluid pressure by manometer.
3. Determination of metacentric height.
4. Verification of Bernoulli's equation.
5. Flow measurement by venturimeter.
6. Study of venturimeter.
7. Determination of Reynolds number.
8. Velocity distribution in Boundary layer & thickness of B.L.
9. Determination of co-efficient of friction for pipes.
10. Determination of head loss due to sudden enlargement.
11. Determination of head loss due to sudden contraction.
12. Determination of losses in bends.
13. Determination of losses in elbows.
14. Study of flow through pipes in series & parallel.
15. Verification of momentum equation.

Note :- Practical examination shall consist of oral or Experimentation based on above term work.

3ME08 MANUFACTURING PROCESSES-I –LAB.

Practice:-

1. Study of safety precautions in workshop practices.
2. Foundary:- Any two of the following jobs Sand preparation and practice in moulding of various types of patterns:- Pattern making 1 job, Moulding 1 job Casting 1 job.
3. Joining Processes:- 2 composite jobs involving electric welding, gas welding and resistance welding process.

A journal should be prepared and submitted on above term work.

The practical examination shall consist of a job preparation and college assessment should be based upon the jobs, termwork and viva examination.

SEMESTER : FOURTH

4ME01 /4PE01 BASIC ELECTRICAL DRIVES & CONTROL

Section-A

Unit I : Concept of general electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Introduction to mechatronics, Theory and principle of Power Transistor, SCR

Unit II : Basic characteristics of D.C. motor, Torque equation, Modified speed – Torque characteristics. Starting and braking of Electrical D.C. motors, comparison of mechanical and electrical braking methods. Introduction, Principle, construction and working of Servo motors, stepper motors, Brushless D.C. motors.

Unit III : Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phase Induction motors, applications. Starting and braking of 3 phase induction motors. Classification of single phase induction motors. construction, principle and working and applications. Principle and working of universal motor.

Section-B

Unit IV : Conventional methods of speed control of A.C. and D.C. motors. Thyristorized stator voltage control of 3 phase induction motor, (v/f) control method, slip-power recovery scheme. Thyristorized armature voltage control of D.C. motors using phase control & Thyristorized chopper.

Unit V : Basic principle, construction & applications of sensors and transducers, contact - non- contact type, optical proximity

sensors. Switches, contact type, magnet type, electromagnetic type, sound, light, pressure, vibration transducers, Hall effect-sensors A.C./D.C. Tachogenerators.

Unit VI: Industrial applications - classes of duty selection of an electric drive for particular applications such as steel mill, paper mill, cement mill, textile mill, sugar mill, electric traction, coal mining, etc. Induction heating, surface hardening & Dielectric heating.

Books Recommended

Text Books:-

1. A First Course on Electrical Drives - S.K. Pillai.
2. Basic Electrical Technology (Vol. 11) - B.L. Theraja

Reference Books :

1. Drives and Control - N. Dutta
2. Mechatronics - W.Bolton, Addison Wesley, Longman Ltd., 1997.
3. A Course in Electrical, Electronics Measurement and Instrumentation, By A.K.Sawhney, Dhanpat Rai & Sons, 2006

4ME02 ENGINEERING METALLURGY

Section - A

Unit I : - Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, lever rule for phase mixtures. Solidification of pure metals, nucleation and growth, ingot structure, dendritic solidification (8)

Unit II : Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Microstructure of slowly cooled steel, Estimation of carbon from microstructure, structure property relation, Introduction to composite materials, advantages and applications. (8)

Section-B

Unit IV : Cast irons **:** Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabalizing, Constitution and properties of white, gray, Nodular and Malleable cast irons, their applications, Alloy cast irons.

Non Ferrous Metals and Alloys : Types, Properties and uses of Brasses and Bronzes. Important alloys of

Aluminium, Lead, Tin and Zinc, their applications. Bearing materials, Season cracking, precipitation hardening. (8)

Unit V : Principles of Heat Treatment: - Annealing, Normalizing, Tempering Iso-thermal transformation diagrams(S-curve), super imposition of continuous cooling curves on 's' Curve, pearlite, bainite and martenste transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability. (8)

Unit VI : Methods of surface hardening: Carburizing, Nitriding, Cyaniding, Flame and Induction Hardening.

Mechanical working of Metals: - Hot and cold working, Relative advantages and disadvantages, study of stress strain curve, Luder's bands, Work hardening, strain Ageing; Recovery, Recrystallization and grain growth.

Metallurgical factors affecting various Mechanical working processes, preferred orientation, Deformation mechanisms-Slip& twining, critical resolved shear stress.

Powder Metallurgy: Concept, Methods of Manufacture of metal powders, compaction Process- Single die and double die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T. Advantages, limitations and applications of powder metallurgy. (8)

Book Recommended:-

Text Books:-

1. Introduction to physical metallurgy ;Sidney H Avner, TATA Mc-Graw hill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication

Reference Books:

1. Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Physical metallurgy for engineers, Clarke and Varney, second Edn.,1987.
3. Power metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallugrgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Meallurgy- C Daniel Yesudian, Scitech Publication

4ME03 ENERGY CONVERSION-I

Section - A

Unit I Properties of Steam: Triple point and critical point, Sensible heat, latent heat, superheat and total heat of steam. Wet steam, dryness fraction, Internal energy of steam, External work of evaporation, Specific volume, enthalpy, internal energy and entropy of steam. T-S diagram Mollier chart, Steam tables and their use. Work done and heat transfer during various thermodynamics processes with steam as working fluid. Throttling of steam, determination of dryness fraction using various calorimeters. (8 Hrs)

Unit II Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump. Boilers: Introduction to water tube boilers used in thermal power plants, packaged Boilers (fire tube), High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings and accessories—devices for improving Boiler efficiency. Principle of fluidized bed combustion. Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximum discharge, efficiency of chimney, reasons for draught loss. (7 Hrs)

Unit III FUEL & ASH HANDLING : Elementary treatment on coal, coal transportation from mine to site and site to boiler house. Fuel bed firing and suspension firing, Equipments of Mechanical grate firing, pulverised coal firing including crushers & pulverisers and burners. Oil handling system,and burner equipment,Elementary treatment on ash handling. Type of dust collectors and disposal of dust. Boiler performance:- Boiler rating, boiler power, equivalent evaporation, efficiency. Effect of accessories on boiler efficiancy and heat balance. (8 Hrs)

Section - B

Unit IV Steam power plant: General features, representation of Ranking cycle on phasediagrams. layout,site selection, concept of co-generation. CONDENSERS : Need,Types of condensers, quantity of cooling water required. Dalton's law of partial pressure, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance. Condensate pump and air extraction pumps, air enjectors Cooling water system: cooling ponds, spray tanks, cooling towers: Natural and mechanical wet type cooling tower. (7 Hrs)

UNIT V Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no

nunmerical on concept of super saturated flow & wilson line Steam Turbines:- Principle of working, Types of steam turbines such as impulse, reaction, axial & radial flow, back pressure & condensing turbines. Compounding. Reheat, regenerative cycles, bleeding. Analysis limited to two stages only. (7 Hrs)

UNIT VI Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blading. Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Height of turbine blades. LOSSES IN STEAM TURBINES:- Nozzle losses:- blade friction, partial admission, disc friction, gland leakage losses and velocity losses. Governing of steam turbines. (10 Hrs)

Recommended Books:

Text books

1. Thermal engineering; Mahesh M Rathore; Tata McGraw-Hill
2. Thermal Engineering R.Yadav; Central publication

Reference books:

1. Steam Turbine; Kearton; Oscar *Publications*
2. Thermal Power Engineering; Mathur Mehta; Tata McGraw-Hill
3. Power Plant Engineeirng; R.K.Rajput; Laxmi Publications
4. Thermal Engineering, P.L.Ballaney; Laxmi *Publications*

4ME04 MANUFACTURING PROCESSES -II

Section - A

UNIT I :- Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Cutting forces and power consumption, Machinability, Cutting fluids, Machine Tool classification. (8 Hrs)

UNIT II:- Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism, introduction to Automatic screwmachines & Single spindle and multi-spindle automat. (10 Hrs)

UNIT III:- a) Drilling M/cs general purpose, Mass production and special purpose drilling M/cs.

b) Boring M/c :- Horizontal, Vertical and jig Boring M/c.

c) Introduction to Broaching and its types, reaming operation. (8 Hrs)

Section - B

UNIT IV:- a) Milling M/c :- Types, Types of Milling Cutters, Dividing head, Compound and differential indexing.

b) Gear producing M/cs.

c) Study of various parts and operations of power hack saw. (6 Hrs)

UNIT V :- a) Grinding Machines: Bench grinders, surface grinders, centreles grinders, types of bonds & Abrasive modification of grinding wheels.

b) Study of various part & Operation of Shaper, Planer, Sloter. (6 Hrs)

UNIT VI:- Unconventional Machining Processes:-

a) Mechanical Processes:- Ultrasonic Machining - principle and applications. process parameters; Abrasive and water parameters involved.

b) Thermal processes:- Election Beam Machining – Generation of beam, principle and applications : Laser Beam machining applications : Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications.

c) Electro Chemical Machining- Classification, fundamentals: Electro mechanical milling.

d) Electric discharge Machining - Types dis-sie-onking, wire EDM, Mechanism of material removal, process parameters, advantages and applications. (8 Hrs)

Books Recomonded:

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.
2. Workshop Technology - By Hajra Choudhaury Vol II.

References:-

1. Pandya & Shah, Modern Machining process, Tata McGraw Hill 1998.
2. Workshop Technology, O.P. Khanna, Dhanpatrai & Sons.
3. Workshop Technology - By Raghuwanshi. Vol II.

4ME05 MACHINE DESIGN & DRAWING-I

Section - A

Unit I- a) Sectional Views

Conversion of pictorial view in to sectional orthographic projections, Sectional views with different types of projections, Missing views (12 Hrs)

Unit II- a) Development of surfaces

Development of surfaces of cubes, prisms, cylinders, pyramids, cones & their cut sections

b) Intersection of solids-prism and prism, cylinder and cylinder, cylinder and prism, cone and cylin-der, cone and prism. (12 Hrs)

Section B

Unit III- a) Meaning of Design, Phases of Design, Design considerations

b) Simple stresses, Thermal stresses, Torsional Stress, stresses in straight & curved beams and its application- hooks, c-clamps

c) Design & drawing of riveted joints- Caulking & fullering, failures, strength & efficiency of riveted joints.

d) Welded joints- Symbolic representation, Strength of transverse & parallel fillet welded section

e) Design & drawing of Knuckle Joints (12 hrs)

Unit IV-a) Design of Helical springs- Types of springs, stresses in helical springs, Wahl's stress factor, Buckling & surge, tension spring

b) spiral & leaf springs

c) Design of power screw-Torque required to raise loads, efficiency & helix angle, overhauling & self locking of screw, acme threads, stresses in power screw. (12 hrs)

Books Recommended

Text Books :

1) Machine Drawing by N. D. Bhatt, Charator Publication
2) Machine Design by R. S. Khurmi & J. K. Gupta , S. Chand Publication

Reference Books :

1) Machine Design by Dr. P. C. Sharma & Dr. D. K. Agrawal, Katsons Books publication
2) Design of Machine elements by C. S. Sharma, Kamlesh Purohit, PHI publication
3) Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publication
4) Machine Design, Jindal, Pearson publications
5) Design Data Book by- P.S.G. Koimbatore
6) Design Data Book by Mahadevan,

(Use of any data book from the above will be permitted during the examination).

4ME06 / 4PE06 BASIC ELECTRICAL DRIVES & CONTROL-LAB.

List of Experiments

Any eight practicals from the following list:

1. To study the Specification of Various Electrical Machines.
2. To study the D.C. Motor Starters.
3. To study the Running and Reversing of D.C. Motor.
4. Speed Measurements using Magnetic Pick-up.
5. To study the Speed reversal of counter Current Breaking of 3-phase Induction Motor.
6. To control the speed of D.C. Motor by a) Armature Control b) Field Control.
7. To perform Load Test on Induction Motor.
8. To study Dynamic/Rheostatic Breaking of D.C. Motor.
9. To study Characteristics of Thyristor.
10. To study the speed -Torque Characteristic of Servo Motor.

4ME07 ENGINEERING METALLURGY-LAB.

List of Practicals: - (At least eight practicals out of the following list.)

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.
3. Moulding of specimen for micro-examination.
4. Study of micro structures of Annealed and normalized plain carbon steels.
5. Study of micro structures of alloy steels and H.S.S.
6. Study of micro structures of various cast irons.
7. Study of micro structures of non ferrous metals.(brasses, bronzes)
8. Study of micro structures of hardened and tempered steels.
9. Study of Iron carbon Equilibrium diagram & Allotropic forms of iron.
10. Study different Heat Treatment Process for steel.
11. Study of different surface Hardening processes for steels.
12. Study of effect of alloying elements on the properties of steels.
13. Measurement of hardenability by Jominy end quench test apparatus.
14. Study of hardness tester and conversion of Hardness number
15. Industrial visit to study heat treatment plant.
16. Measurement of particle size, grain size, nodularity, coating thickness etc. by using some software like Metzer Microcam 4.0

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

4ME08 ENERGY CONVERSION–I-LAB.

Practical Term Work:-

At least six practicals (Study/trials) based on above syllabus, as given below shall be included in the report by the students.

1. Study of a water tube boiler (Babcock Wilcox boiler)
2. Study of a locomotive boiler.
3. Study of a high pressure boiler.
4. Study of boiler accessories.
5. Trial on a boiler and heat balance sheet.
6. Study of boiler mountings.
7. Study and trial on a steam turbine.
8. Study of condensers.
9. Study of condensate and air extraction pumps.
10. Study of steam power plant.

Practical Examination:- Shall consist of based on above term work and syllabus.

4ME09 MANUFACTURING PROCESSES–II-LAB.

Practicals:-

1. Demonstration of operations related to lathe, shaper, slotter, drilling & grinding m/cs.
2. One job on lathe covering taper turning and threading.
3. One job on shaping covering plane and inclined surfaces.
4. One job on milling machine.

The above jobs should include drilling, grinding, tapping etc.

Term work should be submitted in the form of journal.

N.B. :- The practical examination shall consists of preparation of practical jobs and assessment by external and internal examiner.

4ME10 MACHINE DESIGN & DRAWING-I-LAB.

List of Practical's

Any Six of the following

1) Sectional views & missing views of objects
2) Development of surfaces
3) Intersection of Solids
4) Conventions for various components like bearing, gears, springs, key & key ways, threads, tap holes and materials, Surface roughness etc
5) Design & Drawing of cotter joint
6) Design & drawing of screw jack
7) Design & drawing of flywheel
8) Design & drawing of helical spring

Any one practical from the above list should be done using software.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL ENGINEERING
(ELECTRONICS & POWER) /
ELECTRICAL & ELECTRONICS ENGINEERING /
ELECTRICAL ENGINEERING
(ELECTRICAL & POWER) /
ELECTRICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER

SEMESTER : THIRD

BRANCH ABBRIVIATIONS **:-**
EP : Electrical Engg. (Electronics & Power)
EX : Electrical & Electronics Engg.
EL : Electrical Engg. (Electrical & Power)
EE : Electrical Engg.

3 EP01/3EX01/3EL01/3EE 01 MATHEMATICS-III

SECTION-A

UNIT-I : Ordinary differential equations:- Completer solution, Operator D,Rules for finding complementary function, the inverse oprator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. Simultaneous linear differential equations with constant co-efficient, Applications to electrical circuits.

UNIT-II : Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function.

UNIT-III : a) Application of L.T. to linear differential equations with constant coefficients & Simultaneous linear differential equations.

b) Fourier transforms- Definition, standard forms, inverse Fourier transform, Properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

SECTION-B

UNIT-IV : a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients.

b) Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

UNIT-V : Vector calculus: Scalar and vector point functions, Differentiation of vectors, Curves in space,Gradient of a scalar point function, and their physical meaning, expansion formulae (without proof).

UNIT-VI : Line,surface,volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof).

BOOKS RECOMMENDED:-

1) Advanced Engineering Mathematics, 3 edi – Potter, Oxford University Press, 2008
2) Mathematical Techniques – Jordan and Smith 4/e – Oxford University Press, 2008
3) A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
4) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
5) Advancing Engg. Mathematics by E.K.Kreyzig.

3 EP02/3EX02/3EL02/3EE 02 NETWORK ANALYSIS

SECTION-A

Unit I : a] **Terminal Element Relationships:** V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] **Basic Nodal and mesh Analysis:** Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : **Network Theorems :** Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliman's theorem, Substitution

theorem, Compensation theorem, Tellegen's theorems

Unit III : **Time Domain Analysis of Circuits:** Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] **Review of Laplace Transforms:** Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. ***(Review to be done by students. No class hour will be spent for this review.)***

b] **Transformation of a Circuit into s-domain:** Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] **Sinusoidal Steady State analysis: Intro**duction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] **Fourier Series:** Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : **Two Port Networks:** two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero

plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis 6/e By Hayt & Kemmerly TataMcgraw Hill 2004
2) Network Analysis, By M.E. Van Valkenberg PHI 2005
3) Electrical Linear Circuits – David Bell Oxford University Press 2008
4) Linear Circuit Analysis 2/e – DeCarlo and Lin Oxford University Press 2009
5) Network Analysis, P.Ramesh babu, SCITECH Publications,Chennai 2009
6) Circuit and Network Analysis By Sudhakar Shyammohan Tata Mc Graw Hill 2005
7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010

3 EP03/3EX03/3EL03/3EE 03 ENERGY RESOURCES AND GENERATION

SECTION A

Unit I : **Thermal and Hydro Power plant:** Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Unit II : **Nuclear and Diesel Power plant**: Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant

Unit III : **Solar Energy and its measurement**: Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency

SECTION B

Unit IV : a] **Fuel cells:** Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system

b] **Wind Energy**: Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy

storage, application of wind energy.

Unit V : **Ocean and tidal energy:** Ocean energy resources, ocean energy routes, ocean thermal energy conversion, progressive wave, wave data collection, Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in simple single basin tidal system

Unit VI : **Other non- conventional energy resources:** Operating principle of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation, principle and operation of fuel cells, classification and types of fuel cells, performance characteristics of fuel cells.

Books Recommended :-

1) Energy Science, Principles Technologies & Impacts, John Andrews & Nick Jelley, Oxford University Press, 2009
2) Renewable Energy – Power for Sustainable Future, Godfrey Boyle, Oxford University Press, 2004
3) Conventional Energy Technology By S.B.Pandya, Tata McGrawHill, 2005
4) Non Conventional Energy Resources By G.D.Rai, Khanna Publishers, 2001
5) Energy and Atmosphere By I.M.Campbell, Wiley, New York, 2006
6) Solar Energy By S.P.Sukhatme, Tata Mc-GrawHill, 2006
7) Conventional Energy Resourses By B.H.Khan, Tata McGrawHill, 2003.

3 EP04/3EX04/3EL04/3EE 04 ELECTRONIC DEVICES AND CIRCUITS

SECTION-A

UNIT-I : P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge rectifier. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II : Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-III Study of typical transistor amplifier circuits

i) Emitter follower,
ii) Darlington emitter follower.
iii) Bootstrap emitter follower,
iv) RC coupled amplifier,

v) Transformer coupled amplifier,
vi) Cascaded amplifier,
vii) Direct coupled amplifier,
viii) Cascade stage.

SECTION-B

UNIT-IV : Class 'A' 'B' 'AB' and 'C' amplifiers, configuration of audio amplifiers, Calculations of power gain, efficiency, dissipation and distortion, oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V : Theory, construction and applications of Schottky diode,Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI : FETs (JFET & MOSFET) : Types, Characteristics and parameters (u, gm & Rds),Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

BOOKS RECOMMENDED:

1) Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011
2) Electronic Devices and Circuits 5/e – David Bell Oxford University Press
3) Microelectronic Circuits 5/3 – Sedra nad Smith Oxford University Press
4) Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3 EP05/3EX05/3EL05/3EE 05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

SECTION A

Unit I : **Measuring Instruments**: Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electro dynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type.

Unit II : **Watt meters & Energy meters**: Electro dynamic & Induction type: construction, theory of operation, torque equation, errors & demerits, Electronic energy meter.

Analysis of three phase balanced load, Blondel's Theorem, Measurement of active & reactive power & energy in single phase & three phase circuits.

Unit III : a] **Instrument Transformer**: Need of extension of range: extension using shunt & multipliers Instrument transformers:

CT & PT, Theory & construction, Phasor diagram, Ratio & Phase angle error, causes of error, applications Hall effect sensors for voltage and current measurement.

b] **Special Measuring Instruments** :- Maximum demand indicator, Trivector meter, Frequency meter, P.F. meter, Phase sequence indicator, Synchroscope, stroboscope, potentiometers.

SECTION B

Unit IV : **Measurement of circuit parameters**: Different methods of measurement of low, medium & high value of resistance, sensitivity & accuracy of different methods.

AC & DC bridges : Wheatstone, Kelvin, Maxwell, Wein, Hay, Desauty, Anderson, Schearing

Unit V : **Generalized instrumentation system** , characteristics of measurement & instrumentation system Transducers : Definition, classification, specification, selection & loading effect, Displacement, Velocity, force, & Torque transducers, Resistive, Inductive, capacitive, Strain gauge, Piezoelectric, current & voltage transducers.

Unit VI : **Transducers for pressure & temperature**: Manometer, Elastic members (Bellows, Bourdon tube, Diaphragm), RTD, Thermocouple, Thermister, Infrared & Crystal Cathode ray oscilloscope: Time, frequency & phase angle measurement using CRO. Spectrum & Wave analyzer.

Books Recommended

1) Electronic Measurement & Instrumentation by Oliver – cage, TMH 4th reprint 2010
2) Electronic Instrumentation by H.S Kalsi, TMH 3rd edition, 2nd reprint 2011
3) Instrumentation for scientists and Engineers – Turner Oxford University Press 2008
4) Electronic Instrumentation & Measurement , David Bell Oxford University Press 2nd Ed
5) A course in Electrical, Electronics measurement and Instrumentation, By A.K.Sawhney Dhanpat Rai & sons 2006
6) Electrical measurement and measuring Instruments By Golding Wheeler Publishing 2003
7) Electronic measurement and measuring Instruments By Coo.

3 EP06/3EX06/3EL06/3EE 06 NETWORK ANALYSIS LAB

Any TEN experiments based on contents of 3 EP02/3EX02/ 3EL02/3EE 02 NETWORK ANALYSIS

3 EP07/3EX07/3EL07/3EE 07 ELECTRONIC DEVICES AND CIRCUITS LAB

Any TEN experiments based on contents of 3 EP04/3EX04/ 3EL04/3EE 04 ELECTRONIC DEVICES AND CIRCUITS

3 EP08/3EX08/3EL08/3EE 08 ELECTRICAL MEASUREMENT AND INSTRUMENTATION LAB

Any TEN experiments based on contents of 3 EP05/3EX05/ 3EL05/3EE 05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

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SEMESTER : FOURTH

4EP01/4EX01/4EL01/4EE 01 ELECTRICAL MACHINES-I

SECTION A

Unit I : **D.C. Machines**

Construction, principle of operation, Emf equation, torque equation. Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation.

Unit II : **D.C. Generators.**

Types, characteristics and applications of d.c. shunt, series and compound generators.

Parallel operation of d.c. shunt, series and compound generators. Introduction for conducting and reporting the test on d.c. machines as per Indian standard.

Unit III: **D.C. Motors**

Characteristics, applications of d.c. shunt, series and compound motors, starting and speed control, losses, efficiency and testing.

SECTION-B

Unit IV: **Single phase Transformer.**

Heat run test, separation of core losses in to its component, parallel operation, equivalent circuit. Autotransformer - construction, working, merits, demerits and application.

Introduction for conducting and reporting the test on transformer as per Indian standard.

Unit V: **Three phase Transformer:**

Construction, working, types, connections, applications, testing, parallel operation, open delta, power transformer, distribution transformer construction.

Unit VI: Three phase to single phase, two phase, six phase, twelve phase conversion. Three-winding transformer and tap

changing transformer. Wave forms of no-load current and inrush current phenomenon.

Books Recommended

Electrical Machines by D.P.Kothari, I.J.nagrath TMH 4th edition, 2nd reprint 2011

ELECTRIC MACHINERY and Transformer, 3E – Bhag S Guru Oxford University Press

Advance Electrical Technology By H.Cooton. 1999

Substation Equipment By Satnam and Gupta 2003 .

4EP02/4EX02/4EL02/4EE 02 ELECTROMAGNETIC THEORY

SECTION A

Unit I : Review of Vector Analysis :cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculas. Line integral and multiple integrals. Gauss theorem.

Unit II : Electrostatics : Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III: Electrostatics fields in dielectrics : electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

SECTION-B

Unit IV: Magnetic fields : Biot-Stewart law, Ampere's law in integral and differential form. Contunuity equation, time of relaxation. Vector and Scaler magnetic potential, electric current, J vector.

Unit V : Magnetic fields in materials : magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI: Maxwell equations and wave equations : Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration poynting vector.

Books Recommended

1) Engineering Electromagnetics by W.H.Hayt, J.A.Buck, TMH 7th edition 2010

2) Foundation of Electromagnetic Theory, John Reitz, F.J.Milford, R.W.Christy, Pearson education, 4th edition 2010

3) Elements of Engineering Electromagnetics, Nannapaneni Narayana Rao, Pearson education, 2006

4) Principles of Electromagnetics 4/e Mathew Sadiku Oxford University Press

5) Field Theory, D. Ganesh rao, C.K.Narayanapa PEARSON education ,2010

4EP03/4EL03/4EE 03 ANALOG AND DIGITAL CIRCUITS

SECTION-A

Unit I : Introduction to IC's : Characteristics of IC components, Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amo, Measurement of op-amp parameter.

Unit II : Linear and Non-linear Application of Op-amp:- Inverting and noninverting amplifiers, voltage follower, integrator, differentiator differential amplifier, Sinusoidal RC-phaseshift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps. Astable, bistable and monostable multi vibrator using op-amps.

Unit III : Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78 **, 79 ** and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, astable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

SECTION-B

Unit IV : Basic Logic Circuits : Logic gate characteristics, NMOS invertor, propagation delay, NMOS logic gate, CMOS invertor, CMOS logic gates, BJT invertor, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V : Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder, ROM, Two dimensional addressing of ROM,ROM applications, PROM,EPROM,PAL AND PLAS.

Unit VI : Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters, Dynamic MOS shift registers, RAM, Bipolar RAM Cells.

BOOKS:-

1. Millman, Microelectronics, 2nd Ed., McGraw Hill.
2. Gayakwad, Op-Amp & LLG, 2nd Ed.
3. Malvino & Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.

4. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EP04/4EL04/4EE 04 MATHEMATICS-IV

SECTION-A

Unit I : a) Complex variables : analytic functions, Cauchy-Riemann conditions. Harmonic function, Harmonic conjugate functions, Milne's method.

b) Confirmed mapping : mapping by elementary functions of the type $W=z+c$, $W=cz$, $W=1/z$, $W=z^2$, $W=e^2$, $W=z+1/z$ and bilinear transformation. (10 Hrs.)

Unit II : Complex Integral : singular points, Taylor's series, Laurent's series, Cauchy's integral theorem and Cauchy's integral formula.

Residue : Cauchy's residue theorem. Contour integrals. Integration forms : f(x) dx, f (sinx, cos x) dx (10 Hrs.)

Unit III: Patial differential equations : first order and first degree p.d. equation type.

(i) f (p, q) = 0, (ii) f (p, q, z) = 0, (iii) f (p, q, x, y) = 0 (iv) f (p, q, x, y, z) = 0 etc.

Lagrange's form Pp + Qq = R. Clarinet's form Z = px + qv + f (p, q).

Equation reducible to standard form. Homogeneous P.D.E. of nth order. (10 Hrs.)

SECTION-B

Unit IV: Special functions : solution of Legendre's and Bessel's equations by Frobensious method, Bessel's function Ist kind generating function, recurrence relating values of $J_{1/2\,(x)}$, $J_{-1/2(x)}$, $J_{3/2\,(x)}$ etc.Legendre's function of Ist kind : generating function, Rodrigues function, recurrence relation, Legendre's polynomials and orthogonal properties. (10 Hrs.)

Unit V : Statistics & Probability : Axioms, conditional probability, Bay'e theorem, mathematical expectations, probability distributions : Binomial, Possion and Normal. (10 Hrs.)

Unit VI: a) Curve fittings by method of Least Squares. Correlation and regression.

b) Matrix differential equation : solution and integrated solution, Sylvester's theorem, solution of differential equations by matrix method and Peano Baker method. (10 Hrs.)

BOOKS RECOMMENDED :

1) Pipes : Mathematics for Engineers and Physicist.
2) P.N. Wartikar and J.N.Wartikar : A Text Book of Applied Mathematics.
3) B.S.Grewal : Advance Engineering Mathematics.

4) S.G.Gupta : Statistical Methods.
5) Speigal : Statistics (Schaum's series)
6) Speigal : Complexva (Schaum's series)

4EP05/4EX05/4EL05/4EE 05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION A

Unit I : Solution of Algebraic & Transcendental equations : Floating point number representation, errors, accuracy, stability of algorithms. Bracketing methods : bisection method and False Position method.

Open methods : Newton-Raphson method, Secant method and Successive Approximation method.

Comparison of different iterative methods. Implementation of these methods in C.

Unit II : Solution of Simultaneous Algebraic equations : Iterative methods : Jacobi's method and Gauss-Seidel method. Direct methods : Gaussian elimination method & Matrix Inverse method. Finding Eigen values of a matirx, determination of largest Eigen value. Implementation of these methods in C.

Unit III : Interpolation : Evenly spaced points : formation of forward & backward difference table, Newton's forward & backward difference interpolation formulae. Unevenly spaced points : divided difference table and Newton's divided difference interpolation formula, Lagrange's method. Interpolation with Cubic splines. Implementation of these methods in C.

SECTION-B

Unit IV : Numerical Differentiation and Integration : Numerical differentiation : Taylor's series method, Richardson extrapolation method, numerical differentiation using interpolation polynomial (first & second derivative near the begining & end of the table). Numerical Integration : Trapezoidal Rule, Simpson's Rules, Romberg method, Gaussian quadrature method. Implementation of these methods in C.

Unit V : Solution of ordinary differential equations : Initial value problem : Taylor's series method, Runge-Kutta methods - second & fourth order, Euler's method, Euler's modified method. Solution of simultaneous & higher order differential equations using Runge-Kutta fourth order method. Stiff differential equations and their solutions. Boundary value problem : Finite difference method and Cubic spline method. Implementation of these methods in C.

Unit VI : Principles of Object Oriented Programming : OOP paradigm, basic concepts of OOP, benefits of OOP, basic data types, users defined data types, derived data types, operators and control statements.

Books Recommended

1) Numerical Methods with Programms in C by T.Veerarajan, T.Ramachandran TMH 2nd edition, 6th reprint 2011
2) Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford University Press , 2008
3) Numerical Methods for Engineers and Scientists – Guha Oxfor University Press 2008
4) Computer Fundamentals and Programming in C – Dey and Ghosh Oxford University Press 2008
5) Chapra S.S. & Canale R.P. : Numerical Methods for Engineers, 4th edition, McGraw Hill.
6) Balguruswami E. : Object Oriented Programming with C++, Tata McGraw Hill, New Delhi.
7) Nakamura S. : Applied Numerical Methods in C, Prentice Hall.
8) Faires & Burden : Numerical Methods, 7th edition, Thomson Learning.

4EP06/4EX06/4EL06/4EE 06 ELECTRICAL MACHINES I LAB

Any TEN experiments based on contents of 4EP01/4EX01/ 4EL01/4EE 01 ELECTRICAL MACHINES-I

4EP07/4EL07/4EE 07 ANALOG AND DIGITAL CIRCUITS LAB

Any TEN experiments based on contents of 4EP03/4EL03/ 4EE 03 ANALOG AND DIGITAL CIRCUITS

4EP08/4EX08/4EL08/4EE 08 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Any TEN experiments based on contents of 4EP05/4EX05/ 4EL05/4EE 05

NUMERICAL METHODS AND COMPUTER PROGRAMMING

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. to i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)

SEMESTER : FOURTH

BRANCH ABBRIVIATION :-
EX : Electrical & Electronics Engg.

4EX03 LINEAR INTEGRATED CIRCUITS

SECTION A

Unit I : **Op-amp Fundamentals:** Differential amplifiers, ac and dc analysis of differential amplifiers, review of operation amplifier- block diagram representation, basic configurations, ideal op-amp, negative feedback, non – ideal closed loop characteristics.

Unit II : **Basic op-amp Circuits:** voltage follower, sign changer, adder, subtractor etc, I to V and V to I converters, current amplifiers, difference amplifiers, instrumentation amplifiers and their applications, transducer bridge amplifier.

Uniy III : **Op-amp Parameters:** Input bias and offset current, input offset voltage, input offset error compensation, slew rate, common mode rejection ratio etc, frequency response, input and output impedance, operation limits, compensated and uncompensated op-amps, compensation techniques.

SECTION B

Unit IV : **Non-linear Circuit Applications:** Voltage comparator and its applications, Schmitt trigger and its application, precision rectifiers, limiters, analog switches, peak detectors, sample and hold circuits, integrator and differentiator, log/antilog amplifiers, practical log/antilog circuits, analog multipliers, opamp as phase detector, op-amp electronic thermometers.

Unit V : **Active Filters:** Classification, transfer function, butter worth filters. low pass, high pass, band pass, band stop, notch and all pass.

Unit VI : a] Timer: IC 555, functional diagram, monostable and astable multivibrator.

b] **Voltage regulators:** Series op-amp regulators, IC voltage regulators, switching regulators etc, IC 723.

Text Books

1) Op-amps and Linear Integrated Circuits Technology, R.A.Gaikwad,

PHI publication, 1999

2) Design of Operational Amplifier and Analog Integrated Circuits, S.Franco TMH Publication, 2002

References

1) Linear Integrated Circuits, D.Roy Chaudhari ,New Age International Publisher, 2005

2) Operational Amplifiers & Linear ICs by David A.Bell , Oxford University Press,2011

4EX04 SIGNALS AND SYSTEMS

SECTION A

Unit I : **Introduction to Signals and Systems:** Signals and Systems, Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Time Domain and Frequency Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit II : **Fourier series and Its Properties** Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III : **Analysis of LTI Discrete-Time Systems:** Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

SECTION B

Unit IV : **Sampling:** Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit V : **The Z Transform:** The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI : **Discrete Fourier Transform and Fast Fourier Transform**

Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Books Recommended

1) Principles of Linear Systems and Signals, 2e (international version) – Lathi B. P. Oxford University Press

2) Signals & Syatems, Smarajit Ghosh, PEARSON education, 2006

3) Signals & Syatems,D Ganesh rao, satish Tunga, PEARSON education 2010

4) Principles of Signal Processing & Linear Systems (international version) Lathi B P. Oxford University Press

5) Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999

6) Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005

7) Signals and systems, Oppenheim and Schafer Prentice Hall India Of India 2nd Edition 1997

4EX07 LINEAR INTEGRATED CIRCUITS LAB.

Any TEN experiments based on contents of 4EX03 LINEAR INTEGRATED CIRCUITS

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

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SYLLABUS
PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
ELECTRONICS & TELECOMMUNICATION /
ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: THIRD

3 XT 01 / 3 XN 01 MATHEMATICS-III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D,Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's an Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform,initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity,shifting,multiplication by k,change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms,inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Prtial differential equation of first order of following form-

(i) f(p,q)=0; (ii)f(p,q,z)=0; (iii) f(x,p)=g (y,q); (iv)Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Comples Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation,magnification,inversion and bilinear transformation),singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT -VI Vector calculas:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals,irrotational and solenoidal vetor fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A text book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika Prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral Transforms by Goyal & Gupta.

3XT02 /3XN02 COMPUTER PROGRAMMING AND APPLICATIONS

SECTION-A

Unit I : Principles of object oriented Programming: OOP'S paradigm, basic concept of OOP'S Benefits of OOP'S, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++: Functions, Function over loading, Friend Functions, types of classes and its use, concept of object and its implementation, constructor and destructors.

Unit III: Operator's overloading:

Operator and their definition,overloading unary and binary opeator, Rules for overloading operators, overloading binary operators using friends and string manupalation.

SECTION-B

Unit IV : Inheritance and Polymorphism:

Defining derived classes, single and multiple inheritance,

multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual function.

Unit V : Solution of Nonlinear and Polynomial Equations:

False position, modified false position, secant, Newton Raphson Method.

Solution of Linear Systems of Equations: Gauss elimination method, L.U. factorization method, Gauss seidel iterative method.

Unit VI: Solution of differential equation: Euler's method, Runge Kutta method, Predictor Corrector method.

Numerical Integration: Trapezoidal rule, Sympson's 1/3 and 3/8 th rules.

Finite differences: Newton forward and backward interpolation formula.

Textbooks:

1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata - Graw Hill publishing Co.Ltd., New Delhi,1995.

2) Introduction to method of Numerical Analysis- S. S. Shastry, Second Edition, PHI Pvt. Ltd., New Delhi.

Reference Books:

1) Object Oriented Programming in Turbo C++ Rober Lofore Galgotia Publications Pvt.Ltd., New Delhi,1995

2) The C++ Programming Language (Third Edition) Bjarne Stroustrup Pub.Co.,New York,1995 (AddisonWesley)

3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesely Pub. Company,1995

4) Computer Oriented Numerical Methods:-V. Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.

5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI publication.

3XT03 /3XN03 ELECTROMAGNETIC FIELDS

SECTION-A

Unit I: Review of Vector Analysis:

Cartesian, cylindrical and spherical co-ordinate systems, vector products, Projection of Vectors, Gradient, Divergence & Curl, Stokes & divergence theorem. (08)

Unit II: Electrostatics:

Coulomb's law, Electric field intensity, Evaluation of electric field intensity due to line charge, surface charge & volume charge distribution, Electric flux density, Gauss Law,

Electrostatics potential, Potential gradient, Electric dipole & Polarization . (08)

Unit III: Magneto statics: Amper's law of forces, Biot-Savart's law, Ampere's law in integral and differential form., Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux & flux density, Magnetic dipole moment, Magnetization. (08)

SECTION-B

Unit IV: Boundary conditions & Maxwell's equations:

Boundary condition of dielectric-dielctric interface, dielectric-conductor interface, boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equation for steady & time varying fields. (08)

Unit V: Electromagnetic wave propagation:

Electromagnetic wave equation for free space, lossy dielectrics, perfect conductors, propagation constant, attenuation constant, phase shift constant, Skin depth, Concept of power flow, Poynting Theorem, , Reflection of a plain wave in a normal incidence at dielectric-dielectric interface, dielectric-conductor interface. (10)

Unit V: Radiation:

Magnetic scalar and vector potential, retarded potential, Electric & Magnetic fields Power radiated & radiation resistance, due to oscillating dipole, quarter wave monopole & half wave dipole. (08)

Text Books:

1) Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill

2) Jordan E.C. and Balamin K.C.: "Electromagnetic Waves and Radiating System " Prentice Hall of India Private Limited (Second Edition)

Reference Books:

1) Mathew N.O.Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press

2) Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)

3) Ramo S. and Whinnery R.: " Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.

3XT04/3XN04 ELECTRIC DRIVES & MEASUREMENTS

SECTION- 'A'

Unit-I : Measurement of resistance: Kelvin Double Bridge, Loss of charge method and megger. Measurement of Inductance and Capacitance: Maxwell's bridge, Hay's bridge, Anderson's bridge, Schering bridge,D Sautys Bridge and Carey Foster

bridge. Measurement of Q factor and tan ¢.

Unit-II : Measurement of active and reactive power in 3-phase balanced and unbalanced load. Electrodynamometer type power factor meter, frequency meter. Watt meter, Digital Energy Meter

Unit-III : D.C.Motors: Electrical and mechanical characteristics of motor,Speed control methods for constant torque and constant horse power. Application of D.C.motors. Braking-resistance, plugging and regenerative braking

SECTION- 'B'

Unit-IV : Inducation Motors: Characteristics, Speed control methods: Armature voltage, V/f control, rotor control, slip power recovery scheme and applications, plugging, Resistance braking, Regenarative Braking.

Eddy current coupling and its application.

Unit-V : Transformers: 3 phase ?transformers, rectifier transformers, pulse transformers. Open delta connection, Scott connection, Ferrite core transformer.

Unit-VI : Construction, principle of operation, characteristics and applications of : Tachogenerator, (DC & AC), Stepper motor, A.C.Servo motor 1 Phase ?induction motors and Universal motor.

TEXT BOOKS:

i) M.V.Deshpande:- Elements of Electrical Machines.

ii) A.K.Sawhney:- Electrical and Electronic Measurement and Instrumentation.

REFERENCE BOOKS:

i) E.W.Golding:- Electrical measurement and measuring Instrument, ELBS Pub.

ii) First Course on Electrical Drives-S.K.Pillai

iii) B.L.Theraja VOL II :- Electrical Engineering.

3XT05/3XN05 ELECTRONICS DEVICES AND COMPONENTS

SECTION A

Unit I : Construction, selection and failures of

- Resistors: Fixed type, Variable Type , Network and Chip type
- Capacitors: fixed and variable Type

Unit II

- Switches & Relays: Types, Construction and Testing
- Fuses, Cables and Connectors: Types, Construction, Specification and Application
- Introduction to Heat sink, Choke and Transformer

Unit III : Basics of Electronic Component layout, PCB material, Properties and specifications, Basic manufacturing process of PCB , Soldering and De-soldering Techniques.

SECTION B

Unit IV : P-N Junction diode theory- V-I Characteristics, Temperature dependency, Diode Resistance, Zener diode : characteristics, Avalanche & Zener breakdown, Testing of diode using Ohmmeter and CRO

Unit V: Theory, Construction, Characteristics and application of Tunnel, Varactor, Shottkey diode Opto-Devices: LED, Photo Diode, LCD

Unit VI : Theory of PNP and NPN Transistor, Transistor Configurations, Their Characteristics and current Components. Transistor as an amplifier, Testing of Transistor using Ohmmeter and CRO

Text Books:

1. Maduri Joshi, " Electronic Component and Material" 3rd Edition, Shroff Publication
2. Millman H Halkies, " Integrated Electronics" TMH Co. New Delhi

References:

1. Bosshart, " Printed Circuit Board" TMH
2. David Bell' " Electronic Devices and Circuits" Oxford University Press, 2010
3. Boylestad R, "Electronic Devices and Circuits" Prentice Hall of India Pvt. Ltd. New Delhi.

3XT06/3XN06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Minimum Eight experiments based on the 3XT2/3XN2 out of which at least four experiments should based on the last two Units.

3XT07/3XN07 ELECTRIC DRIVES & MEASUREMENTS-LAB.

Minimum Eight experiments based on **3XT4/3XN4**.

3XT08/3XN08 ELECTRONICS DEVICES AND COMPONENTS-LAB.

Minimum eight Practicals Should be conducted based on the **3XT5/3XN5**. (atleast one on PCB)

SEMESTER : FOURTH

4XT01/4XN01 COMMUNICATION ENGINEERING-I

SECTION-A

Unit I Signal and Noise : Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic, Frequency response, bandwidth, bandwidth requirement for different types of signals such as telephone speech, music and video. External and Internal noise, signal to noise ratio, noise figure, noise factor measurement, equivalent noise Temperature, Friiss formula. (6)

Unit II Signal Analysis : Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density, Correlation: Auto-correlation, Cross-correlation. (9)

Unit III Probability and Random Signal Theory : Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions, Ergodicity, Gaussian Process, White Gaussian Noise. (8)

SECTION-B

Unit IV Wave Propagation : Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading, single hop and multi hop propagation, duct propagation. (7)

Unit V RF Transmission Lines : Parallel and coaxial transmission line, equivalent circuit of transmission line, standing wave, characteristic(shunt) impedance, quarter wave and half wave length transform, Smith chart, Single stub (shunt) matching using smith chart, balun. (8)

Unit VI Antenna Basics & Types of Antenna : Principle of radiation, antenna power gain, beam width, polarization, bandwidth and radiation resistance, Isotropic radiator, Resonant antenna: Half wave, Folded dipole antenna, Non resonant antenna, antenna arrays, parasitic reflector, parasitic director, design of yagi-uda antenna (up to 5 elements) Long, wire, helical, rhombic, discone, log periodic, loop antenna, low, medium and high frequency antenna. (10)

Text books:-

(1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(2) Simon Haykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

Reference books

(1) Collins Dennis,Collins John "Electronic Communications" (PHI)

(2) B. P. Lathi : " Modern Digital and Analog Communication systems" 3rd Edition, Oxford Uni. Press, New Delhi.

(3) Taub and Schilling D.L. : Principles of Communication Systems, Mc-Hill Co, Tokeyo, 1994 (II Ed.)

(4) Hari Bhat: "Analog communication, 2nd Edition Pearson India, 2010"

4 XT 02/4XN02 ELECTRONIC DEVICES AND CIRCUITS-I

SECTION-A

Unit I : Rectifiers : Half wave, full wave and bridge rectifiers and their analysis. Filters : Analysis of capacitor filter, Theory of L, LC & CLC (p) filter, Zener diode as a Voltage regulator.

Unit II : DC load line and operating point (Q point); Methods of biasing & stability factor; ac equivalent circuit and hybrid model analysis of CE configuration.

Unit III : Feed back Amplifier and Oscillator : Classification of amplifier: Voltage current, trans-conductance, Trans-resistance amplifier, feedback concept, effect of negative feedback in amplifier, Methodology of feedback in amplifier and analysis. Oscillators : Barkhausen's criterion for sustained oscillations; study of Harley, Collpit, RC oscillators and crystal oscillator.

SECTION-B

Unit IV : Study of multistage transistor amplifier circuit

i) RC coupled amplifier,
ii) Transformer coupled amplifier,
iii) Direct coupled amplifier,
iv) Emitter follower; Darlington emitter follower, Bootstrapping principle,
v) Cascade stage.

Unit V : Power Amplifier : Transformer coupled Class A amplifier, Transformer coupled Class B amplifier & transformer coupled Class AB amplifier, capacitor coupled and direct coupled output stages, modifications to improve power amplifier performance, Class C amplifier and analysis.

Unit VI : JEET : Theory, Construction and Characteristics; parameters (m, g_m & rds); Biasing of JEET amplifiers, MOSFET : Theory, Construction and Characteristics of enhancement & depletion type MOSFET

UJT: Theory, Construction and Characteristics; UJT as relaxation oscillator.

Text Books :

1) David Bell : Electronic Devices and Circuits, Oxford University Press, 2010.
2) Milliman H. and Halkies : Integrated Electronics, Tata McGraw Hill, New Delhi.

Reference Books :

1) Mottershead Allen : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, 1986
2) Boylestad R. : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, V Edi. 1993
3) Ramanan K.V. : Functional Electronics, Tata McGraw Hill, New Delhi, 1989
4) Milliman S., Taub H and Halkies : Electronics Devices and Circuits, McGraw Hill Int. Co., Auckland, 1982

4 XT 03 / 4 XN 03 NETWORK ANALYSIS

SECTION-A

Unit I : a] Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems.

Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by

differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
3) Electrical Circuits – David Bell, Oxford University Press, 2008
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009

5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009

6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005

7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4XT04/4XN04 INDUSTRIAL MANAGEMENT & QUALITY CONTROL

SECTION-A

UNIT- I **Principles and Techniques of Management** : Meaning of and differences among business, management, administration and organisation, Principles of management, functions of management, planning, organisation structure and relationships, direction, co-ordination, control, motivation, delegation and decentralisation, communication, leadership and decision making. (7)

UNIT- II Market and Materials Management :

A) Marketing strategy, market research, consumer behaviour, advertising and sales promotion, channels of distribution, pricing of products.

B) Classes of material, scope of material control, scope of purchasing department, purchasing procedures, order procedures, inventory control, introduction to production, planning and control. (9)

UNIT- III **Personnel Management :** Meaning and functions of personnel management, recruitment, selection, promotion, wages and salary administation, training and development, functions and scope of trade unions in Indian industries. Welfare of labour, Problems of labour turn over & retention.

Merit Rating: Job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. (9)

SECTION-B

UNIT- IV Project and Financial Management :

A) Case studies of project report, preparation of profit and loss statement and balance sheet, ratio analysis.

B) Principles of costing , cost sheet preparation, variance analysis, meaning and application of various budgets, types of budgets and their importance. (9)

UNIT- V **Quality Control :** Concept of quality and quality control, elements of quality, factors controlling quality of design and conformance, process control, inspection planning and scheduling, 7QC (Seven Quality Control) techniques, vendor

inspection, sampling inspection, sampling plans, Quality audit system. (8)

UNIT- VI **Quality Management :** Concepts and applications of Kaizen, quality circle, ISO 9000 series, just-in-time, quality planning and total quality management, elements of TQM, Quality Circles. (8)

TEXT BOOKS:

1. INDUSTRIAL ENGINEERING AND MANAGEMENT ,O P Khanna ,2011 ,JAIN BOOK DEPOT,Post Box No. 51, New Delhi - 110001 (INDIA),81-899-2835-3.
2. INDUSTRIAL & BUSINESS MANAGEMENT ,Telsang Mertand.T, S.Chand & Company Limited, NEW DELHI. ,81-219-2056-6.
3. MANAGEMENT : PRINCIPLES, PROCESSES, AND PRACTICES, Anil Bhat, Arya Kumar , 2008 , Oxford University Press, NEW DELHI., 978-01-956-9445-1.
4. TOTAL QUALITY ,BHARAT WAKHLU ,2/e, 2007 ,S.Chand & Company Limited, NEW DELHI. ,81-219-2866-4.
5. TOTAL QUALITY CONTROL, 4TH ED. ,Armand V. Feigenbaum, 2005 ,Tata McGraw-Hill Education, New Delhi. ,978-00-702-2003-4.

REFERENCE BOOKS:

1. PRINCIPLES OF BUSINESS MANAGEMENT ,Dr. Virendra Sharad Sherlekar ,Prof.S.A.Sherlekar ,3/e, 2009 ,Himalaya Publishing House Pvt. Ltd, MUMBAI. ,978-81-8488-082-3 .
2. FUNDAMENTALS OF FINANCIAL MANAGEMENT ,BOSE, D. CHANDRA ,2/e ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-4074-9.
3. PRINCIPLES OF MANAGEMENT AND ADMINISTRATION • ,Chandra Bose , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-1929-5.
4. PROJECT MANAGEMENT ,Prof. Abdul Matheen ,2/e, 2009 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0694-4.
5. TOTAL QUALITY MANAGEMENT • ,Suganthi & Samuel , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2655-2.
6. TOTAL QUALITY MANAGEMENT ,Dr. S. Kumar ,1/e, 2006 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0568-8.
7. QUALITY MANAGEMENT, Kaniska Bedi ,2006 ,Oxford University Press, NEW DELHI . ,978-01-956-7795-9.
8. TQM : PLANNING, DESIGN & IMPLEMENTATION, Khanna, V.K., 1/e, 2009, New Age International (P) Ltd., Publishers, NEW DELHI., 978-81-224-2233-7.

9. Fundamentals of Quality Control and Improvement, Mitra Amitava, 2/e, 2009 ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2377-3.

4XT05/4XN05 INSTRUMENTATION

SECTION-A

Unit I : Transducer & Instrumentation systems (1)Transducer classification: Active/Passive. Primary/Secondary. Analog/ Digital and transduction Principles. Basic Signal conditioning Circuits. Resistive/Capacitive/Inductive reactance bridge. Current/Voltage Sensitive Wheatstons bridges & Generalized instrumentation system with particular examples (9 Hrs)

Unit II : Static characteristics, errors & statistical parameters: (1) Static characteristics: Accuracy, Precision, Sensitivity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean Average deviation Standard deviation. Probable error, Histogram, Normal & Gaussian curve of errors. (7 Hrs)

Unit III : Electronics Instrumentation: (1,2,3):Analog & Digital data acquisition system, Analog electronic multimeter, Introduction to digital voltmeter & universal counter. Stripchart & X-Y recorders. Optical Encoders. Siesmic mass vibration transducer. (3)Introduction to microphones & loud speaker. (9 Hrs.)

SECTION-B

Unit IV : Measurement of Temperature & Strain (1,3) Temperature Sensors: LM335, RTD. THERMISTORS,

Thermocouples, Thermocouples laws & its compensation methods. Pyrometers: Total/Partial radiation & optical pyrometers. Strain Gauges, Gauge factor. Strain measurement & temperature compensation methods.

Unit V : Measurement of Displacement. Pressure & Level. Displacement Measurement: (1) using resistive, capacitive, inductive (LVDT & RVDT) & Eddy current. Pressure Measurement: (1) Elastic, Inductive, Peizoelectric & capacitive transducers, Low pressure measurement using ionization gauge, pirani gauge, thermocouple vacuum gauge. Level Measurement: (1, 3) Using ultrasonic, capacitive, inductive, resistive with float, gamma rays & eddy currents techniques. (8 Hrs.)

Unit VI : Measurement of Flow, Humidity, Velocity (1) Flow Measurement: using ultrasonic, electronaquatic & hotwire

Anemometer. Humidity Measurement : using resistive, Capacitive & Crystal transducers. Velocity Measurement: Using photo detectors (both linear & angular velocity). Introductory block diagram of smart sensors , Wave analyzer & spectrum analyzers.

Books Recommended:

1) Sawhney A.K.: A course in Electrical/Electronics Measurement & Instrumentation, Dhanpat Rai & Sons., Delhi.
2) Rangan C.S., Sharma G.R. , & Mani V.S.V.: Instrumentation Devices & System,Tata Mc-Graw Hill.
3) R. K. Rajput: Electrical & Electronics Measurement & Instrumentation.

Reference Books :

1) Patranbis D. : ' Sensors & Transducers', A.H.Wheeler & Company, Prayag, India.
2) H. S. Kalsi : Electronics Instrumentation, Tata McGraw Hill, 2nd Edition
3) U.A. Bakshi & A. V. Bakshi : Electronics Instrumentation, Technical Publication
4) Robert A. Witte: Electronics Test Instrumentation : Analog & Digital Measurement.

4 XT 06/4 XN 06 ELECTRONIC DEVICES AND CIRCUITS-I-LAB.

Any TEN experiments based on contents of 4 XT 02/4XN 02 ELECTRONIC DEVICES AND CIRCUITS-I

4 XT 07/4XN 07 NETWORK ANALYSIS - LAB.

Any TEN experiments based on contents of 4 XT 03 / 4 XN 03 NETWORK ANALYSIS

4 XT 08/4XN 08 INSTRUMENTATION-LAB.

Minimum Eight experiments based on 4XT 05/4XN 05 INSTRUMENTATION

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
INSTRUMENTATION ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER
THIRD SEMESTER

3IE 01 /3 XT 01 / 3 XN 01 MATHEMATICS – III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D,Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's an Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform,initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity,shifting,multiplication by k,change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms,inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Prtial differential equation of first order of following form-

(i) f(p,q)=0; (ii)f(p,q,z)=0; (iii) f(x,p)=g (y,q); (iv)Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Comples Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation,magnification,inversion and bilinear transformation),singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT -VI Vector calculas:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals,irrotational and solenoidal vetor fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A text book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika Prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral Transforms by Goyal & Gupta.

3 IE 02 ELECTRONIC DEVICES AND CIRCUITS

UNIT-I: P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II Theory and Analysis of BI Junction transistor, 'H' Parameter, Methods of biasing, their needs, 'Q' and stability factor.

UNIT-III: Study of typical transistor amplifier circuits:

i) Emitter follower,
ii) Darlington emitter follower.
iii) Bootstrap emitter follower,
iv) RC coupled amplifier,
v) Transformer coupled amplifier,
vi) Cascaded amplifier,
vii) Direct coupled amplifier,
viii) Cascade stage.

UNIT-IV: Class 'A', 'B', 'AB' and 'C' amplifiers, Configuration of audio

amplifiers, Calculations of power gain, efficiency, power dissipation and distortion, Oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V: Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI: FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm & Rds), Biasing of FET Amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

TEXT BOOK:

1) Mottershead Allen: "Electronics Devices & Circuits" Prentice Hall of India Private Limited, New Delhi, 1986.

REFERENCE BOOKS:

1) Milliman H. and Halkies: "Integrated Electronics" ,Tata Mc-Graw Hill Book Co., New Delhi.
2) Boylestad R. and "Electronics Devices & Circuits" , Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.
3) Ramanan K.V.: "Functional Electronics", Tata Mc-Hill Publication Co. Ltd.,New Delhi, 1989.
4) Milliman S., Tube H. and Halkies: "Electronics Devices & Ciruits", Mc-Ggaw Hill Int. Co., Auckland, 1982.

3 IE 03 ELECTRICAL MEASUREMENT

UNIT-I : Introduction: Digital MultiMate's , Kilowatt meter, Data types, Measurement standards for time , frequency, voltage , current. . Introduction to reliability and safety. Response of indicating instruments for step, linear and sinusoidal inputs.

General purpose, Cathode Ray Oscilloscope, front panel control , CRT Block schematic, controls on CRO panel, Measurement of phase, frequency, Time duration.

UNIT-II: DC Bridges: Wheatstone Bridge, Bridge sensitivity, analysis by Thevenin's theorem, Errors in bridge circuits, Null type, Current and Voltage sensitive bridges, Kelvin Bridge.

AC Bridges: Inductance bridge (Maxwell's), capacitance bridge (Hay's), Wein bridge, Anderson bridge, Schering bridge, Storage & dissipation factors & their measurements. (09)

UNIT-III: Potentiometers: Measurement of voltage & current calibration sensitivity, self balancing techniques, Multirange potentiometers.

Recorders: Curvilinear & rectilinear recording, strip-chart, X-Y recorders & Dual Trace Oscilloscopes, Synchronization, Z

modulation.

Unit-IV : Construction, working principle of AC tacho generator, DC tacho generator, Two dial DC potentiometer, Coils and chokes

Safety: safety in electrical Ckts. , fundamental safety rules and electrical system earthling

Unit- V : Arithmetic Operations & Floating point Arithmetic, Boolean Algebra, OR, AND, NOT, NOR, AND, EX-OR,EX-NOR Operation, Negative & Positive Logic, Laws of Boolean Algebra, Reduction of Boolean Functions. Different Codes and their Conversions (BCD, Octal, Hex,Excess Three, Gray),

Unit- VI : Wave and Spectrum Analyzer, Harmonic Distortion Analyzer, Heterodyne Frequency meter, Function Generator.

Text Books:

1. Electronic Instrumentation Techinques by Cooper & Helfrick.
2. Modern Digital Electronics by R.P. Jain

Ref. Book:

1. Electronic Instrumentation & Measurement by Sawhney

3 IE 04 SENSORS & TRANSDUCER

UNIT I : Transducer :Defination, Classification, Selection criteria. Errors, loading effects, Transducer specifications, calibration. Generalized Instrumentation diagram.

UNIT II: Displacement Measurement: Resistive methods, Inductive Methods, Capacitive Methods.

Force & Weight: Load cell (Electrical, Pneumatic, Hydraulic), LVDT, Piezoelectric, Vibrating wire.

Torque: Strain gauge, Inductive, Digital method.

UNIT III: Temperature Transducers: Temperature scales, Bimetallic strip, Semiconductor temperature detector (thermister , LM 335). Resistance thermometer, Thermocouples, Thermopile, Crystal, Infrared thermometers

UNIT IV : Flow Transducers: Basic measurement principles, Bernoulli's theorem, Differential pressure type (Orifice, Ventury , Anubar Pitot tube),Variable area type, Magnetic, Ultrasonic, Positive displacement type ,Mass flow meter, Anemometer, Total flow meter.

Level Transducers: - float type displacer, Diaphragm box level gauge, DP cell, Ultrasonic, Capacitive , resistive.

UNIT V: Pressure Transducers: Pressure scales , Manometers, Elastic(Bellows, Bourdon tube, Diaphragm)type, Electrical pressure sensors (LVDT, Strain gauge, load cell, Piezo-electric, Capacitive),Differential pressure sensors(Capacitive, Force

balance & vibrating cylinder type),vacuum pressure measurement, thermal conductivity & ionization type, Transducers for very high pressure measurement.

UNIT VI: Humidity Transducers: Psycrometer, Hygrometer (Hair, wire & Electrolysis type),Dew point meter .Piezo-electric humidity meter, Infrared conductance & Capacitive type probes for moisture measurement. Sound level measurement.

Text Books:

1. Sensor and Transducer by D. Patranbis
2. Sensor and Transducer by Dr. A.D. Shaligram

Ref. Books:

1. Electronics Instrumentation and measurement by A.K. Sawhney
2. Electrical and Electronics measurement and Instrumentation By R. K. Rajput
3. Process Control By B.G. Liptak
4. Industrial Instrumentation & Control By S.K. Sing.

3 IE 05 ANALYTICAL INSTRUMENTATION

Unit I : Introduction to Elements of analytical Instruments, Ultraviolet (UV) and Visible absorption instruments components, Beer-Lamberts law, monochromator : design and associated equipment, monochromator performance. UV and Visible instruments : colorimeters, spectrophoto-meters : single and dual beam, dual wavelength and double monochromator, Infra-Red (IR) spectrophotometers : basic components, types.

Unit II : Flame photometry : principle, constructional details, fuel gases, atomizer, burner, optical and recording systems.

Atomic absorption spectrometers: theoretical concepts, instrumentation: hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic systems.

Unit III: Nuclear magnetic resonance (NMR) spectrometry: principle, nuclear spin, nuclear energy levels, resonance condition, NMR absorption spectra, chemical shift, constructional details, spin decoupler, Fourier transform NMR spectroscopy.

Unit IV : Fluorimeters and phosphorimeters : principle, single and double beam filter fluorimeters, ratio fluorimeters, spectrofluorimeters, phosphorescence spectrometer.

Raman spectrometry : Raman effect, Raman spectrometer.

Photoacoustic and photothermal spectrometers.

Mass spectrometery : Principal &operation ,basic

components, gas chromatograph mass spectrometer (GCMS) system.

Electron and ion spectroscopy : Instrumentation for electron spectroscopy ,

Unit V : Radio chemical instrumentation: radio chemical methods, radiation detectors (ionization chamber, Geiger-Muller, proportional and Scintillation counters), pulse height analyzer.

X-ray spectrometry: spectrum, instrumentation, diffractometers and absorption meter.

Unit VI : Gas and liquid chromatography : classification, basic parts, carrier gas, sample injection system, thermal compartment, detectors (thermal conductivity, flame ionization, electron capture, Argon ionization), introduction to liquid chromatography.

Methods of gas analysis : oxygen, carbon monoxide, nitrogen analyzer, gas density analyzers.

Refractometry : principle, Abbe and dipping types.

Interferometry : principle, types-Rayleigh, Jamin and Twyman.

Text Books

1) R.S.Khandpur : Handbook of Analytical Instrumentation

2) Willard, Merrit and Dean : Instrumental Methods of Analysis

Ref. Book:

1. E.W.Ewing : Instrmental methods of Chemical Analysis

2. R.D.Braun : Introduction to Instrumental Analysis

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3 IE 06 ELECTRONIC DEVICES AND CIRCUITS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE02.

3 IE 07 ELECTRICAL MEASUREMENT-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE03.

3 IE 08 SENSORS & TRANSDUCER-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE04.

3 IE 09 ANALYTICAL INSTRUMENTATION-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE05.

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FOURTH SEMESTER

4 IE 01 ELECTRICAL MACHINES

SECTION-A

UNIT-I: **D.C Machines**

Construction details, EMF equation, Methods of excitation, Self and separately excited generators, characteristics of series, shunt and compound generators, Principle of operation of D.C. motor, back emf and torque equation, characteristics of series, shunt, and compound motors, starting of D.C motors, types of starters, and speed control of D.C shunt motors

UNIT-II: **Transformers**

Construction details, Principle of operation, EMF equation, transformation ratio, Equivalent circuit, Loses in Transformers, Open and short circuits tests, Auto Transformers, Pulse transformer, Instrument Transformer (CT and PT),Condition of parallel operation, Connection of three phase Transformer-Star/Delta ,Delta/Star, Scott connection (Phase inversion).

UNIT-III: Synchronous Machines

a) Alternator; Construction details, synchronous speed, emf equation, winding factors, regulation by synchronous method.

b) **Synchronous Motors**:

Concept of rotating magnetic field, principle of working, effect of variation of load.

Characteristics and applications.

UNIT-IV: **Induction motor**

Construction, types, principle of operation of three phase induction motor, equivalent circuit, performance characteristics, Starting and speed control, Different types of starters, and applications.

Single phase induction motor: principle of working, type applications.

UNIT-V : **Special purpose machines**

Principle, working, Characteristic and applications of stepper motor. Principle, working, Characteristic and applications Servomotors, and Principle, working, Characteristic and applications universal motors.

UNIT-VI: **Transmission and Distribution**

Structure of electric power system, Generation, transmission ,Sub-transmission and distribution systems, EHVAC and EHVDC transmission systems, Substation layout, insulators and cables.

Text books:

1. Electrical Machines-Nagrath Kothari(Tata Mc Ggraw Hill)
2. Theory of AC Machines-Langsdrof (Tata Mc Ggraw Hill)
3. Electrical Engineering –Vol I,Direct Currents-C Dewes

Ref. books:

1 Fundamentals of Electric Machines-B.K.Gupta,Vandana Singhal
2 A Text Book of Electrical Engineering-B.L.Tharaja Volume II and III.
3 Performance and Design of DC Machine-Clayton and Hancokk

4 IE 02 COMPUTER PROGRAMMING AND APPLICATIONS

Unit I : Principles of object oriented Programming-Oops paradigm, basic concept of Oop's Benefits of Oop's, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++ Functions, Function over loading, Friend and Virtual Functions, Difference between class and structures, Array of objects, object as a function argument , constructor and destructors.

Unit III: Operator's overloading Operator and their definition, overloading unary and binary operator , Rules for overloading operators, overloading binary operators using friends and string manupalation.

UNIT IV- Inheritance and Polymorphism- Defining derived classes, single and multiple inheritance, multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual base class , virtual function.

Unit V: INTRODUCTION TO SPICE/ PSPICE**:-**Description, types , circuit elements, sources, Types of analysis ,output commands, Format of files.

DC CIRCUIT ANALYSIS**:** Registors , modelling of elements, Independent & dependent sources, DC output variables, types of DC analysis.

TRANSIENT ANALYSIS **-** Capacitors & Inductors, modeling of transient sources, transient Response.

AC CIRCUIT ANALYSIS: AC output variables AC sources & analysis.

UNIT VI : SPICE COMMANDS & DEVICES SIMULATION : Advanced commands, modeling and analysis of diode, BJT & FET

TEXT BOOK :

1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata Mc-Graw Hill publishing Co.Ltd., New Delhi,1995.

REFERENCE BOOKS :

1) Object Oriented Programming in Turbo C++ Rober Lofore, Galgretia Publications Pvt.Ltd., New Delhi,1995
2) The C++ Programming Language (Third Edition) - Bjarne Stroustrup Pub.Co.,New York,1995 (Addison Wesley)
3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesely Pub. Company,1995
4) SPICE FOR CIRCUITS AND ELECTRONICS USING PSPICE Muhammad H. Rashid. (PHI).

4 IE 03/4 XT 03 / 4 XN 03 / 4 BM 03 NETWORK ANALYSIS

SECTION-A

Unit I : a] Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

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SECTION-B

Unit IV : a] Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution

Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

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Books Recommended :-

1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
3) Electrical Linear Circuits – David Bell, Oxford University Press, 2008
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009
5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009
6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005
7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4 IE 04 ADVANCE SENSORS AND TRANSMITTERS

Unit I: Intelligent sensor: Introduction, Features , desirable on chip signal processing, present status.

MEMS Sensor: Introduction, MEMS sensor-Design challenges, MEMS sensor-generation & development.

Unit II: PH & Conductivity sensors: PH scale and standard principal of pH measurement ,different types of reference & measuring electrode .Principal of conductivity measurement, conductivity cells & bridges

Unit III: Digital transducer: Digital encoder, disc type, incremental shaft, linear displacement transducer, moir, fringe techniques, digital tachometer , digital torque sensor (inductive pickup, photo electric pickup, proximities sensor)

Unit IV: Density measurement: Introduction, various scale, hydrometer type, vibrating densitometer, gas Densitometer, ultrasonic sludge densitometer, centrifugal gas density sensor.

Viscosity measurement: Definition, capillary type, cone plate, rotameter type

Unit V: Vibration: Vibration measurement , accelerometer , sismic type, jerk meter.

Biosensor Technology: Introduction, Nanosensor: Nanotechnology Introduction, nanosensor development, future of nanosensor.

Unit VI : Transmitters: Buyancy ,differential pressure, temoerature, electro hydraulics,2 wire transmitters,

Converters:Resistance to current,voltage to current,pneumatic to electrical & electrical to pneumatic

Positioners : necessity, types and effect on performance of control valve, Actuators: pneumatic, hydraulic, electrical, electro-pneumatic, electro-hydraulic.

Text Books:

1. Sensors and Transducer by Dr. A.D. Shaligram First Edition
2. Sensors and Transducer by D. Pathanbis

Ref. Book:

1. Electronics Instrumentation and Measurement by A.K. Sawhney
2. Process Control By B.G. Liptak

4 IE 05 TELEMETRY AND TELECONTROL

Unit I : Introduction to communication systems: Basic communication systems, interface & distortion, signal characterization in time domain and frequency domain .

Unit II : Modulation Techniques: Different kinds of SSB & FM Modulators & demodulators.

Unit III: Antenna- Principle of radiation, isotropic, radiator, resonant antenna, non resonant antenna, half wave dipole antenna, folded dipole, parasitic reflector, parasitic director, antenna arrays, yagi-uda antenna, antenna power gain, beam width, polarization, radiation resistance

Unit IV: Digital communication : Sampling theorem, Nyquist frequency, Sampling techniques, & signal reconstruction, pulse modulation-(PCM) principle of delta modulation ASK, FSK, PSK coding formats.

Unit V: Multiple access Schemes: TDMA, FDMA CDMA, spared spectrum communication, D.S. spread spectrum, Frequency hoping spread spectrum, comparison

Unit VI: Smart transmitters, typical telemetry & telecontrol schemes for industrial application telemetry errors caused by noise, telemetry & carrier communication systems

TEXT BOOKS:

1) Electronic Communication D Roddy and Coolen

2) Electronics Communication System G. Kennedy TMH

3) Modern Digital and Analog Communication System B.P. Lathi, Oxford University Press, New Delhi.

Ref. Books

1. Digital Communication by K. Sam Shanmugam

2. Digital Communication by J.G. Proakis, Fourth edition.

4IE06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE02.

4IE07/4 XT 07/4 XN 07/4 BM 08 NETWORK ANALYSIS-LAB.

Any TEN experiments based on contents of 4 IE 03/4 XT 03/ 4XN 03/ 4BM 03 NETWORK ANALYSIS

4IE08 TELEMETRY AND TELECONTROL-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE05.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

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SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING /
COMPUTER ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3KS01/3KE01 MATHEMATICS – III

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: **Laplace transforms**:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) **Difference equation:-** solution of difference equations of first order Solution of difference equations of higher order with constant co-efficients b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) **Fourier transforms**:- Definition, standard forms, inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) **Partial differential equation** of first order of following form:- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii) f (x,p)=g (y,q); (iv) Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form)

UNIT-V: **Complex Analysis** :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation),singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: **Vector calculus**:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A Text Book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral transforms by Goyal & Gupta.

3KS 02/3KE02 PROGRAMMING METHODOLOGY

Objectives:

- Study of the basic concepts of Java such as operators, classes, objects, inheritance, packages and exception handling.
- Study of concepts like enumerations, generics, logging, API, assertions, Applets, AWT.
- Preparing the students to learn Object Oriented Programming Methodology.

SECTION A

Unit I: **Introduction to Object Oriented Programming**: Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. **Java Programming Constructs:** Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, Flow of Control.

Unit II: **Classes and Objects:** Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: **Inheritance:** Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface, Packages, java.lang package, Enum type.

SECTION B

Unit IV: **Exception:** Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. **Input/Output:** The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: **Applets:** Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base () and get Code Base () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: **Event Handling:** Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. **Abstract Window Toolkit:** Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Book:

Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.

Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)
4. Liang: A text Book of Java Programming, (PHI)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KS 03/3KE03 ELECTRONIC DEVICES AND CIRCUITS

Objectives:

- Study of the basic electronic device Semiconductor diode and zener diode and its applications.
- Study of electronic device Bipolar Junction Transistors and its applications.
- Study of electronic device Field Effect Transistors and its applications.

· Study of Optoelectronic devices.

SECTION-A

Unit I: pn-Junction Diode, Characteristics and Parameters, Diode Approximation, DC load line analysis, Temperature effects, Diode AC models, Zener diodes, Half- Wave Rectifications, Full-Wave Rectifications, Half-Wave Rectifier Power Supply, Full-Wave Rectifier Power Supply, RC and AC Power Supply Filters.

Unit II: BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common-Collector Characteristics, Transistor testing.

Unit III: DC Load Line and Bias Point, Base Bias, Collector-to-Base Bias, Voltage-Divider Bias, Comparison of Basic Bias Circuits, Troubleshooting BJT Bias Circuits, Bias Circuit Design.

SECTION-B

Unit IV: Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Data Sheets and Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion _Enhancement MOSFET, VMOSFET, Comparision of p-Channel and p-Channel FETs.

Unit V: BJT Phase Shift Oscillators, BJT Colpitts Oscillator, BJT Hartley Oscillator, BJT Wein Bridge Oscillator, Oscillator Frequency stabilization: Frequency Stability, Piezoelectric Crystals, Crystal Equivalent Circuit, Crystals Control of Oscillators.

Unit VI: Optoelectronic Devices: Light Units, Light-Emitting Diodes, Seven-Segment Displays, Photoconductive Cells, Photodiodes and Solar Cells, Phototransistors, Optocouplers, Phtomultipler Tube, Laser Diode.

Text Book:

David A. Bell: Electronic Devices and Circuits, Fifth Edition, Oxford University Press.

Reference Books:

1. Malvino: Principles of Electronics, TMH.
2. Millman & Halkies: Electronic Devices & Circuits, McGraw Hill.
3. Millman & Halkies: Integrated Electronics, McGraw Hill.
4. Millman: Microelectronic, McGraw Hill.
5. Roberts and Sedra: SPICE, Second Edition, Oxford University Press.
6. Sedra and Smith: Microelectronic Circuits, Oxford University Press.

3KS 04/3KE04 DISCRETE STRUCTURE

Objectives:

· Learn basic terminology, formal logic, proofs, sets, relations, functions, recursion
· Use formal logic proof and logical reasoning to solve problems
· Relate the ideas of mathematical induction to recursion and recursively defined structures
· Learning graphs, trees and related algorithms
· Relate interpret and apply these concepts to various areas of Computer Science

SECTION A

UNIT I: **Mathematical Logic:** Statements & Notation, Connectives, Equivalence Formula, Duality Law, Tautological Implication, Normal forms, Parenthesized Infix notation and Polish Notations.

UNIT II: **Theory of inference:** The theory of inference for the statement calculus, Validity using truth tables, Predicate calculus, Inference theory of the Predicate Calculus.

UNIT III: **Set Theory:** Basic concepts, Venn Diagrams, Representation of Discrete Structure, Relation and ordering, Partial Ordering, Functions, Recursions, Sets and predicates.

SECTION B

UNIT IV: **Algebraic Structures:** Semi-groups and Monoids, Product & Quotients of semi-groups, Polish expression & their compilation, Groups, Product and Quotients of Groups.

UNIT V: **Lattice & Boolean Algebra:** Lattices, partially ordered sets, Boolean algebra, Functions on Boolean Algebra, Boolean Functions as Boolean Polynomials, Minimization of Boolean Functions.

UNITVI: **Graph Theory:** Basic concepts, Paths, Reachability & connectedness, Matrix representation of graphs, Trees: tree searching, Undirected trees, Minimal spanning trees.

Text Book:

J.P.Trembley,R.Manohar:"Discrete Mathematical Structures with application to Computer Science" 1988(MCG)

Reference Books:

1. C.L.Liu : "Combinational Mathematies" Mc Graw Hill, 1988
2 Stanant "Discrete Structure" Prentice Hall.
3. C.L.Liu "Element of Discrete Mathematics" Second Edition McGraw Hill, 1987
4. Norman L.Biggs "Discrete Mathematics" Second Edition,Oxford

University Press, Indian Edition.
5. N. Chandrasekaran & M. Umaparvathi, "Discrete Mathematics" PHI (EEE) 2010.
6. Purna Chandra Biswal, "Discrete Mathematics & Graph Theory" Second Edition, PHI (EEE)2009.
7. Chakraborty and Sarkar," Discrete Mathematics" Oxford University Press, Indian Edition,2011.

3KS 05 / 3KE05 COMPUTER ORGANIZATION

Objectives:

- To understand the relationship between instruction set architecture, micro architecture, and system architecture and their roles in the development of the computer.
- Be aware of the various classes of instruction: data movement, arithmetic, logical and flow control.
- Explain how interrupts are used to implement I/O control and data transfers.
- Understand how a CPU's control unit interprets a machine –level instructions.
- Identify various types of buses in Computer systems.
- Understand memory hierarchy.
- Understand various peripheral devices.

SECTION-A

Unit-I: **Basic Structure of Computer:** Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Addressing Modes, Basic I/O Operations, Stacks, Queues & Subroutines.

Unit-II: **Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing, Microinstruction Pre-fetching, Emulation.

Unit-III: **I/O Organization:** Accessing I/O Devices, Interrupts, Direct Memory Access, Bus arbitration, I/O Hardware, Processor Bus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.

SECTION-B

Unit-IV: **Memory Unit:** Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size & Cost Considerations. Cache Memories: Performance considerations. Virtual Memories, Address Translation, Memory Management Requirements.

Unit-V: **Arithmetic:** Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplication of Positive numbers, Booth's Algorithm, Integer Division, Floating-Point Numbers and related operations.

Unit-VI: **Computer Peripherals:** Input-Output Devices like Video displays, Video terminals, Graphics input devices, Printers. Online storage devices: Magnetic disks, Magnetic tape, Systems, CD-ROM systems. Communication devices: Modems.

Text-Book:

V.Carl Hamacher & S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

References:

1. Stallings. W: Computer Organization & Arcitecture, Fifth Edition, Pearson Education.
2. Tenanbaum A.S: Structured Computer Organization, Fifth Edition, Pearson Education.
3. Hayes J.P: Computer Architecture & Organization, Fourth Edition, McGraw- Hill.
4. M. Mano & Kime Logie: Computer Design Fundamentals, Second Edition, Pearson Education.

3KS 06 / 3KE06 Programming Methodology Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3KS 07 / 3KE07 Electronic Devices & Circuits Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3 KS 08 / 3 KE 08 COMPUTER LABORATORY I [WEB TECHNOLOGY]

Unit I: **HTML**: HTML Coding, Basic Web Graphics, Web Page Design & Site Building, Adding Multimedia to the Web.

Unit II: **Paint Shop Pro/Photoshop**: Photoshop components, working with Photoshop, Image Basics, File Formats, color Palette, Layers, Creating New Images, Brushes, Grids & Gides, Scaling & Positioning Images, Moving & Merging Layers, Tool Palette, Screen Capturing, Grey styling, Animation.

Unit III: **Image Handling**: Scanning Images, Adding Text to the Images, Designing Icons, Creating Background Images, Color Models, Color Calibration, Creating Gradients, Oil Paint Effect.

Unit IV: **Multimedia**: Creating Clippings, Animation with Sound Effects, Adding Audio or Video, Windows Media Player Active x control, Agent Control, Embedding VRML in a web Page, Real Player Active x Control.

Unit V: **Applications**: Flash, Working with Layers, Working with Movies, The Drawing Tools, Color Selection, Symbols, Flash Buttons, Flash Menu Smart Clip, Interactivity with Action Script, Frame Actions and the Timeline, Exporting Animation, Applications in Flash.

TEXT BOOK:

1. Meenakshi G. M., "Web Graphics", Scitech Publications (India) Pvt. Ltd.,2007.

REFERENCE BOOKS:

1. Joel Sklar, "Textbook of Web Design", Cengage Learning.
2. James L. Mohler & Jon M. Duff, "Designing Interctive Web Sites", Cengage Learning.
3. Dr. Raja Subramanian, "Creating Web Sites in Engineering", University Science Press (An Imprint of Laxmi Publication Pvt. Ltd.).
4. Uttam K. Roy, "Web Technologies", Oxford University Press.

Minimum eight experiments/programming assignments must be completed based on the above syllabus covering each of the units.

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SEMESTER : FOURTH

4KS01/ 4KE01 DATA STRUCTURES

OBJECTIVES:

- Study the representation and use of primitive data types and built in data structures.
- Study how the data structures are allocated and used in memory.
- Study common applications of each of the data structures.
- Implement the user defined data structures in a high level language

SECTION A

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. 08Hrs

Unit-II: Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi-

demensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices. 08Hrs

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists. 08Hrs

SECTION B

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. 08Hrs

Unit-V: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffnan's algorithm. General trees. 08Hrs

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. 08Hrs

Text Book:

Seymour Lipschutz: Data Structures with C, Schaum's Outline Series, Mc Graw-Hill, International Editions.

References:

1. Forouzan, Gilberg, Mahalle, Jogalekar: Data Structures and Algorithms, CENGAGE Learning.
2. Reema Thareja: Data Structures using C, Oxford University Press, 2011.
3. Arpita Gopal: Magnifying Data structures, PHI(EEE), 2010.
4. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
5. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.
6. Standish: Data Structures in Java, Pearson Education.

4KS02/ 4KE02 ANALOG & DIGITAL ICS

AIM To understand the functions of various digital and analog ICs and their applications in the design of electronic circuits.

OBJECTIVES :

- To get the knowledge about the characteristics and operation of

different analog ICs.

- To study the applications of the above ICs in the design of electronic circuits.
- To get basics knowledge about digital ICs and digital systems.
- To study the design of combinational circuits and sequential circuits.

Unit-I : **OPERATIONAL AMPLIFIERS :** Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting and non-inverting amplifiers, adder/ subtractor, integrator, differentiator, Schmitt Trigger, analog multiplier.

Unit-II : **TIMERS & PHASE LOCKED LOOP :**

Timers: Block schematic of timer IC 555, Application of timer 555 as astable, monostable, bistable multivibrator, Delayed timer, Saw tooth generators. Phase Locked Loops: Operation of phase lock loop system, transfer characteristics, lock range, capture range, study of PLL IC-LM 565 and its application as AM detector, FM detector and Frequency Translator.

Unit-III. **NUMBER SYSTEMS :**

Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r s and (r-1)s Complements, Subtraction using 1s and 2s. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes.

Unit-IV : **BOOLEAN FUNCTIONS USING GATES :**

Boolean theorems, Minterm and maxterm representation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

Unit-V : **COMBINATIONAL CIRCUITS :**

Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractor, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean Expression Implementation using these ICs.

Unit-VI : **SEQUENTIAL CIRCUITS :**

Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC Specifications.

Text Books:

1. Ramakant A.Gayakwad, „OP-AMP and Linear ICs, Prentice Hall, 1994.
2. M.Morris Mano "Digital Design" (2/e) (PHI).

Reference Books :

1. R F. Coughlin;F.F.Driscoll: Operational Amplifiers & Linear Integrated Circuits, Pearson
2. Sedra & Smith : Microelectronics Circuits, 5e, Oxford University Press
3. Jain R.P. "Modern Digital Electronics" (TMH).
4. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).

4KS03/ 4KE03 OBJECT ORIENTED PROGRAMMING

SECTION A

Unit I: **Objects & Classes in C++:** Declaring & using classes, Constructors, Objects as function arguments, Copy Constructors, Static class data, Arrays of Objects, C++ String class.

Unit II: **Operator Overloading:** Overloading Unary & Binary Operators, Data Conversion, Pitfalls of Operator Overloading, Pointers & Arrays, Pointers & Functions, New & Delete Operators, Pointers for Objects.

Unit III: **Inheritance in C++:** Derived Class & Base Class, Derived class Constructors, Function overloading, Class hierarchies, Public & Private Inheritance, Multiple Inheritance, Containership: Classes within Classes.

SECTION B

Unit IV: **Virtual Function Concepts**: Abstract Classes & Pure Virtual Functions, Virtual Base classes, Friend functions, Static Functions, Assignment & copy initialization, the this pointer, Dynamic type information.

Unit V: **Streams & Files in C++:** Stream Classes, stream errors, disk file I/O with streams, File Pointers, Error handling in file I/O, File I/O with member functions, Overloading the extractions & Insertions operator, Memory as a Stream Object, Command Line Arguments, Multifile Programs.

Unit VI: Function Template, Class template, Exception Syntax, Multiple exceptions, Exception with Arguments, Introduction to Standard Template Library, Algorithms, Sequential Containers, Iterates, Specialized iterates, associative containers, Function objects.

Text Book:

Robert Lafore: Object Oriented Programming in C++, Galgotia Publication.

Reference Books:

1. Herbert Schildt: C++: Complete Refernce,TMH.
2. Bjarne Stroustrupe: C++ Programming Language, Addision Wesley.
3. Venugopal: Mastering C++, TMH.
4. Lipmann: C++ Primer, Addision Wesley.
5. Sourav Sahay: Object Oriented Programming with C++, Oxford University Press.

4KS04/ 4KE04 ASSEMBLY LANGUAGE PROGRAMMING

SECTION-A (8 hrs/unit)

Unit I: 8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation.IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming : Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

SECTION B

Unit IV: The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. 8086 I/O programming using 8255.

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation.
8086 Interrupt-driven programming using 8259.

TEXT BOOKS:

1. W. A. Triebel & Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor (2/e) (PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
3. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall .

4KS05/ 4KE05 THEORY OF COMPUTATION

SECTION A

Unit I: Alphabet, Language, Operations, Finite State Machine, Definitions, Finite Automation Model, Acceptance of Strings and Languages. Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA. Conversion of NFA into DFA, Equivalence between two FSM's, Moore and Mealy Machines.

Unit II: Regular Sets, Regular Expressions, Identity Rules. Manipulation of Regular Expressions, Equivalence between RE and FA. Inter Conversion, Pumping Lemma, Closure Properties of Regular Sets (proofs not required), Regular Grammars, Right Linear and Left Linear Grammars, Equivalence between Regular Linear Grammar and F A inter conversion between RE and RG.

Unit III: Context Free Grammar, Derivation trees, Chomsky Normal Form, Greibach Normal Form, Push down automata, Definition, Model, Acceptance of CFL, Equivalence of CFL and PDA, Interconversion, Enumeration of properties of CFL (proofs omitted).

SECTION B

Unit IV : Turing Machine, Definition, Model, Design of TM, Computable Functions, Recursive enumerable language, Church's hypothesis, Counter machine, Types of TM's.

Unit V: Chomsky hierarchy of languages, Linear bounded automata and Context Sensitive Language, Introduction of DCFL and DPDA, Decidability of problems.

Unit VI: Undecidability: Properties of recursive & non-recursive enumerable languages, Universal Turing Machine, Post-correspondence problem, Introduction to recursive function theory.

Text books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation,
2. Peter Linz: An Introduction to Formal Languages and Automata (Chapter 1 to 12 except 6.3 & 7.4),

Reference Books:

1. Rajendra Kumar: Theory of Automata, Languages & Computation, TMH, 2010.
2. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
3. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, Mc Graw Hill,2010.
4. John C. Martin: Introduction to Languages and the Theory of Automata.
5. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation.
6. Mishra & Chandrashekharan: Theory of Computation.
7. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press,2011.

4KS06/4KE06 Data Structures Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS07/4KE07 Analog & Digital IC's Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS08/4KE08 Object Oriented Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4KS09/4KE09 Assembly Language Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 to ES-4 *i.e. at the end of this syllabus.

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SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTER
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3 IT 01/3 KS 01 / 3 KE 01 MATHEMATICS-III

SECTION-A

UNIT-I: Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: Laplace transforms:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) Difference equation:- solution of difference equations of first order Solution of difference equations of higher order with constant coefficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) Fourier transforms:- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Partial differential equation of first order of following form:- (i) f (p, q)=0; (ii)f (p, q, z)=0; (iii) f (x, p)=g (y, q); (iv) Pp + Qq = R (Lagranges Form); (v) Z = px+qy+f (p,q) (Clairaut form)

UNIT-V: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation),singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics, Vol. II by P.N.Wartikar and J.N.Wartikar
2) Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
3) Advancing Engg. Mathematics by E.K.Kreyzig.
4) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
5) Higher Engg. Mathematics by B.S.Grewal.
6) Control System by Gopal and Nagrath.
7) Integral Transforms by Goyal & Gupta.

3 IT 02 PROGRAMMING METHODOLOGY

(8 Hrs. / Unit)

Unit I: Introduction to Computer and Languages, OOPS and Software development: Software Engineering and SDLC. Java Basics: Program Components, Compilation cycle. Introduction to Applet and Application, Data types and Variables

UnitII : Operators: Arithmetic operators, relational operators, Assignment operators. Control statement: Selection statement: if, nested if, switch statement. Repetition statements: while, do-while, for, nested loops. Introduction to Math class. Arrays: Basics, One dimensional, Multidimensional, Array of Objects, Passing array to method.

Unit III: Introducing classes, class fundamentals, declaring objects, methods, class data,& instance data, constructor, this keyword, access control, Introduction to String and String Buffer classes.

Unit IV: Event handling: Event handling mechanism, Delegation Event model, Event, Event Listener: Action Listener, mouse Listener, mouse Motion Listener, window Listener , Introduction to AWT, AWT classes: Button, Text Field, Label. Working with Graphics, Working with colors. AWT controls Fundamentals: Adding and removing controls, responding to control. Using

delegation Event model: Handling mouse events

Unit V: Applet class and its methods, Adapter classes, Inheritance, Polymorphism, Abstract classes and Interface, Packages. Multithreaded Programming: The java thread model, Creating a thread, Creating multiple threads.

Unit VI: Java File I/O: File, File Dialog object, Low and High level File I/O, the Stream classes, Byte Stream: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, Print Writer, Exception handling: Exception types, uncaught Exceptions using try and catch, throw, throws, finally. GUI objects programming: Frame class, menus and other GUI objects.

TEXT BOOK:

1) Herbert Schildt : Java Complete References(McGraw Hill)

REFFERENCE BOOKS :

1) C.Thomas Wu: An Introduction to OOP with Java(McGraw Hill)
2) E. Balaguruswami : Programming with JAVA (4th edition), McGraw Hill
3) Sachin Malhotra : Programming in JAVA, Oxford Press.

3 IT 03 DISCRETE STRUCTURE

(7 Hrs. / Unit)

UNIT I : Mathematical Logic : Statements & Notation , Connectives , Normal forms , The Theory of Inference for the statement calculus , Predicate calculus , The Theory of the Predicate Calculus.

UNIT II: Set Theory : Basic concepts of Set Theory , Representation of Discrete Structure, Relation and ordering, Functions , Recursion.

UNIT III : Algebraic Structures : Algebraic Systems , Semi groups and Monoids , Grammars and Languages, Polish expression & their compilation , Groups , Semi groups.

UNIT IV : Lattice & Boolean Algebra : Lattices as Partially ordered sets, Boolean Algebra, Boolean Functions, Representation of Boolean Functions , Minimization of Boolean Functions.

UNIT V: Graph Theory : Basic concepts of Graph Theory , Paths , reachability & connectedness, Matrix representation of graphs , Storage Representation and Manipulation of Graphs.Trees :Tree Traversal , Minimal spanning trees. PERT.

UNIT VI: Compultability theory :Finite state machines , Finite state acceptors and regular grammers. Turning, machines and partial recursive functions.

TEXT BOOK :

1. J.P.Trembley, R.Manohar :"Discrete Mathematical Structures with Application to Computer Science" 1988 (Tata McGraw Hill)

REFERENCE BOOKS:-

1. S.K. Chakraborty & B.K.Sarkar ;"Discrete Mathematics" OXFORD.
2 Swapan Kumar Sarkar: "A Text Book of Discrete mathematics" (S.CHAND).
3. Bernard Kolman,Robert C.Busby, Sharon Ross: "Discrete Mathematical Structures" Third Edition PHI

3 IT 04 ELECTRONICS DEVICES AND CIRCUITS

UNIT I: Semiconductor Devices: PN Junction Diode, Zener diode BJT & FET transistor. Rectifying circuits & DC power supplies: HWR, FWR, BR, and Comparison. Inductor and capacitor Filter circuits for D.C. Power supplies.

UNIT II: Transistor biasing: The CE amplifier (Simple analysis), Operating point, Stability Factor of self (Potential divider) bias Definition of Hybrid parameters. RC Oscillator: phase shift oscillator and Wein – Bridge oscillator, Transistor as a switch.

UNIT III: Opto- Electronics Devices: fundamental of light, photoconductive sensors, photodiodes, phototransistors their principle of operation & application. Opto – couplers. Introduction to P-spice: Circuit element sources in PSPICE, Modeling analysis of diode, BJT & Op-Amp.

UNIT IV: Operational Amplifier: Block diagram of op-amp, Differential amplifier, transfer characteristics, CMMR improvement, constant current source, dc level shifting, study of IC uA741. Inverting & non-inverting amplifier,

UNIT V: Linear & non-linear application of Op-Amp: voltage follower, Integrator, Differentiator, voltage to current converter, sinusoidal RC Oscillator. Comparator, Astable Monostable, & Bistable Multivibrator. 3 pin IC Voltage regulator 78XX, 79XX.

UNIT VI: Timer: block diagram of IC 555, application of Timer IC 555 as astable, monostable multivibrator, phase lock loops: operations of phase lock loop system, transfer characteristics, lock range capture range.

Text Books

1. N.N.Bhargava, D.C.Kulshreshtha, S.C.Gupta: Basic Electronics & Linear circuits, (TTTI)

2. M.H. Rasid: SPICE for circuits & electronics Using PSPICE (PHI)
3. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)

Reference Books

1. Malvino: Principals of Electronics(TMH)
2. Millman & Halkins: Electronics Devices & Circuits (MC Graw Hill)
3. K.R.Botkar: Integrated circuits (Khanna P
4. D.Roy Choudhury & Shail Jain: Linear Integrated circuits (NAIL)

3 IT 05 ASSEMBLY LANGUAGE PROGRAMMING

Unit I: Microprocessor 8086 architecture-BIU and EU, pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation, Maximum and Minimum Modes.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions, and logical instructions. Shift and rotate instructions and their use in 8086 programming

Unit III: 8086 programming: 8086 flag register and Flag control instructions control flow and jump instructions, Loops & loop handling instructions. Stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Concept of Macros and their types. 8086 programming using these instructions

Unit IV: Memory system design: Address decoding techniques, static-RAM interfacing, Dynamic-RAM (DRAM): refreshing techniques, interfacing and DRAM controllers; direct memory access (DMA). Interfacing Chips- SRAM and EPROM with 8086, 8237 DMA: pin diagram, internal organization, modes of operation

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. Programmable Interval Timer / Counter 8253: pin diagram, internal organization, modes of operation

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts, Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation...

TEXT BOOKS:

1. Avtar Singh & Walter A. Triebel: The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware, and Applications, PHI, 2003.
2. K.M Bhurchandi, "Advanced Microprocessor and Peripherals Architecture, Programming and Interfacing", Tata Mc Graw Hill , 2006.
3. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
4. Liu Gibson: Microcomputer Systems: The 8086/8088 Family-Architecture, Programming And Design , PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall
3. D. V. Hall: Microprocessors and Interfacing, TMH.

3IT06 **Programming Methodology Lab.:** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 02 syllabus covering each of the units.

3IT07 **Electronics Devices & Circuits Lab. :** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 03 syllabus covering each of the units. At least two experiments must be conducted using PSPICE.

3IT08 **Assembly Language Programming Lab. :** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 04 syllabus covering each of the units.

3IT09 **Computer Lab-I (Linux,Unix) Lab. :** Minimum Eight experiments/programming assignments must be completed based on Linux and /or Unix.

SEMESTER : FOURTH

4IT01 DATA STRUCTURES

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Subalgorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit-II : Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices.

Unit-III : Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists.

Unit-IV : Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.

Unit-V : Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffnan's algorithm. General trees, M-way search Trees.

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

Textbook :

Seymour Lipschutz : " Theory & Problems of Data Structures" Schaum's Outline series (Mc Graw-Hill) International Editions.

REFERENCES :

1. Reema Thareja : Data Structures Using C. (Oxford)
2. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
3. Trembley, Sorenson:- An Introduction to Data Structures with Applications.
4. Aho Ullman : Analysis and Design of Algorithms.

5. Bhagat Singh, Naps : Introduction to Data Structures.

4IT02 COMMUNICATION ENGINEERING

Unit I AM Transmitters

Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter, Generation of SSB-SC by phase-shift method.

Unit II AM Receivers

TRF receiver, Superhetrodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, Communication Receiver, Selectivity filter method, Phase shift method , sensitivity, Image rejection ration of communication receiver,Noise calculation in DSB-FC,DSB-SC & SSB-SC

Unit III FM Transmitters

FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparision, Pre-emphasis and De- emphasis.

Unit IV FM Receivers

Details of FM receiver, blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, AudiQ Amp!., AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster seeley and ratio detectors, Stereo FM receiver, Noise in FM Reception, FM threshold effect.

Unit V Pulse Modulation Technique : The sampling theorem, Sampling of Band-Pass Signal, Linear and Non linear quantization, Aliasiry effect, Aperture effect, Reconstruction of filter, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Time Modulation, PCM, DM, ADM

Unit VI Signal Analysis

Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Delta Function, Fourier Transform of Periodic functions, fundamental of Power Spectral Density & Energy Spectral Density, Correlation, auto-correlation, Cross-correlation.

Text Books

(1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(2) Taub and Schilling D.L. : Principles of Communication Systems, Mc-

Hill Co, Tokeyo, 1994 (II Ed.)

Reference books:-

(1) B. P. Latbi : "Modern Digital and Analog Communication Systems" Oxford University Press, New Delhi.
(2) Hari Bhat: "Analog Communication, 2nd Edition Pearson India, 2010"
(3) S. Kundu: " Analog & Digital Communication, Pearson India, 2010"
(4) R.P.Singh, S.D. Sapre: Communication System, Anolog and Digital, Tata Mc-Graw Hill Co., New Delhi.

4IT03 OJECT ORIENTED TECHNOLOGIES

UNIT I : Introduction to Object Oriented Programming**:** Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming. Objects & classes in C++: Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects,

UNIT II : C++ string Class. Operator overloading :Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers& Arrays. Pointer & functions. New & deleter operators. Pointers For objects.

UNIT III : Inheritance in C++ :Derived class & base class, Derived class Constructors, Function overloading, class hierarchies, public and private inheritance, multiple inheritance Containership : classes within classes.

UNIT IV : Virtual functions concepts, Abstracts classes & pure virtual Functions. Virtual base classes, Friend functions, static Functions, Assignment and copy initialization the this pointer. Dynamic type information. Introduction to C++ graphics, creating basic shapes, using colors and styles .

UNITV: Streams & File in C++: Stream classes, stream errors, disk File I/O with streams File pointers, Error handling in file I/O File I/O with members functions, overloading the extractions & Insertion operators, Memory as a stream object, command Line arguments. Multifile programs.

UNIT VI : Function Tamplate, class templates, Exception syntax Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers iterators, specialized iteratrors, associative containers Function objects.

Text Book:

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia Publications)

References:

1. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 - X.
2. Herbert Schildt C++ : Complete Reference (TMH)
3. BPB Editorial Board Advanced C++(BPB Publications)
4. Lipmann C++ Primer (Addison-Welsley)

4 IT 04/ 4 BM 04 SOCIAL SCIENCES & ENGINEERING ECONOMICS

SECTION - A

Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy. (9)

Unit II : Indian Parliament : composition and powers.
President of India : Election and Powers.
Council of Ministers and Prime Minister (9)

Unit III : Impact of Science and Technology on culture and Civilization. Human Society : Community Groups, Social Control : Meaning, Types and Agencies. Marriage and Family : Functions, Types and problems.

SECTION - B

Unit IV: Nature and scope of Economics : Special significance of Economics to Engineers.
Production : Factors of production, Laws of return, Various Economic systems, Forms of Business Organisation. (9)

Unit V : Banking : Functions of Central and Commercial Banks.
Taxation : Principle of taxation, Direct and Indirect taxes.
Market : Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly. (9)

Unit VI: Economics of Development : Meaning, Characterisitcs of under development, obstacles to Economic growth and vicious circle of poverty.
Economic Planning : meaning, objective and salient features of current five years plan of India.
Planning horizons, life structuring the alternatives.
Economics of comparision of different alternative projects. (10)

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. Joshi G.N. : The Constitution of India, Macmillan India Ltd.
3. Mahajan : The Constitution of India, S.Chand, New Delhi.
4. Maclaver and Page : Principle of Sociology.
5. Davis K. : Human Society
6. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
7. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
8. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
9. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
10. Dhingra I.C. : Indian Economy
11. E.Kuper : Economics of W.R.Development, McGraw Hill Co.,
12. Jemes L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

4IT05 NUMERICAL METHODS & OPERATION RESEARCH TECHNIQUES

Unit I : Error Analysis, absolute, relative and percentage errors. A general error formula and error in series approximation, Solution of Non linear and polynomial equations: Bisection Method, False Position method, secant, Newton Raphson methods.

Unit II : Solution of Linear Systems of Equation : Gauss elimination method, Gauss Jorden Method, Gauss Seidel Iterative Method, Gaussian elimination, Matrix Inversion Method, L-U factorization method. Regression, Curve fitting: Least Square Method, Correlations.

Unit III : Integration and Differential equations : Numerical Integration-Trapezoidal, Simpsons one third and three eight rules, Romberse Method. Newtons forward and backword interpolation formula. Numerical differentiation : Maximum and minimum values. Lagrange's Interpolation Method, Euler's method, Runge Kutta methods, Predictor Corrector method, Taylor Series.

Unit IV : Operations Research Models and Dynamic Programming : Operations research models- classification of problems, phases of operation research, scope and limitation of operations research. Dynamic programming : Investment

problem Stagecoach Problem, Equipment Replacement problem, conversion of final value problem into an intial value problems.

Unit V : Linear Programming and Sequencing: Linear programming – Concept of Linear Programming, simplex method, Big-M Method, Two Phase Simplex Method, concept of duality, transportation problems, Assignment Problem, Hungarian Method. Sequencing Problem: Two-Machine, N-Jobs, and Three Machine Problem.

Unit VI : PERT and CPM : Pert Networks, ET, TE, TL, SE and Critical path, Probability of completion. Decision theory : Introduction, Minimax decision procedure, Bayes decision procedure with and without data, Regret function Vs. Loss function.

TEXT BOOKS :-

1) Computer Oriented Numerical Methods : V.Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2) Introduction to Operation Research : Billy, E.Gillett, Tata McGraw Hill Pub. Co. Ltd., New Delhi.

REFERENCE BOOKS

1) Introduction to Methods of Numerical Analysis : S.S.Shastry, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2) Optimization Theory and Applications : S.S.Rao, Second Edition, Wiley Eastern Limited, New Delhi.
3) J. N. Kapoor- Mathematical Statistics Tata McGraw Hill Pub. Co. Ltd.

4IT06 **Data Structures Lab :** Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4IT07 **Communication Engineering Lab :** Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT08 **Object Oriented Technologies Lab :** Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT09 **Computer Lab-II (HTML) :** Minimum Eight experiments/ programming assignments must be completed based on HTML.

This Lab is based on Web publishing. The topics to be covered include

1. Web Publishing
2. Web Page Design
3. Exposure to IE & NN Browsers

4. Dynamic HTML.

Each group of 2 students should build their own Website.

Text Book: M. Petrovsky : Dynamic HTML in Action (TMH)

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. ES-1 to ES-4 i.e. at the end of this syllabus.

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ENVIRONMENTAL STUDIES

Total Marks : 100

PART-A

SHORT ANSWER PATTERN **25 Marks**

1. The Multidisciplinary nature of environmental studies
- . Definition, scope and importance.
- . Need for public awareness.

(2 lecture hours)

2. Social Issues and the Environment
- . From Unsustainable to Sustainable development
- . Urban problems related to energy
- . Water conservation, rain water harvesting, watershed management
- . Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- . Envionmental ethics : Issues and possible solutions.
- . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- . Wasteland reclamation.
- . Consumerism and waste products.
- . Environment Protection Act.
- . Air (Prevention and Control of Pollution) Act.
- . Water (Prevention and Control of Pollution) Act.
- . Wildlife Protection Act.
- . Forest Conservation Act.
- . Issues involved in enforcement of environmental lesislation.
- . Public awareness. (7 lecture hours)

3. Human Population and the Environment
- . Population growth, variation among nations.
- . Population explosion - Family Welfare Programme.
- . Environment and human health.
- . Human Rights.
- . Value Education.
- . HIV / AIDS.
- . Women and Child Welfare.
- . Role of Information Technology in Environment and human health.
- . Case Studies. (6 lecture hours)

PART-B

ESSAY TYPE WITH INBUILT CHOICE **50 Marks**

4. Natural resources :
- . **Renewable and non-renewable resources :**
  - . Natural resources and associated problems.
    - - Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
    - - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
    - - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
    - - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
    - - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
    - - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- . Role of an individual in conservation of natural resources.
- . Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems
- . Concept of an ecosystem.
- . Structure and function of an ecosystem.
- . Producers, consumers and decomposers.
- . Energy flow in the ecosystem.
- . Ecological succession.
- . Food chains, food webs and ecological pyramids.
- . Introduction, types, characteristic features, structure and function of the following ecosystem :-
  - - Forest ecosystem
  - - Grassland ecosystem
  - - Desert ecosystem
  - - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)

6. Biodiversity and its conservation
- . Introduction - Definition : genetic, species and ecosystem diversity.
- . Biogeographical classification of India.
- . Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- . Biodiversity at global, National and local levels.
- . India as a mega-diversity nation.
- . Hot-spots of biodiversity.

. Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
. Endangered and endemic species of India.
. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

. Definition
. Causes, effects and control measures of :-
- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

. Solid Waste Management : Causes, effects and control measures of
. Role of an individual in prevention of pollution.
. Pollution case studies.
. Diaster management : floods, earthquake, cyclone and landslides.

(8 lecture hours)

PART-C

ESSAY ON FIELD WORK 25 Marks

8. Field work

. Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
. Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
. Study of common plants, insects, birds.
. Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(**Notes :** i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net **(R)**
3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
4) Clark R.S., Marine Pollution, Clanderson Press Oxford **(TB)**

5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7) Down to Earth, Certre for Science and Environment **(R)**
8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.
9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai **(R)**
10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Ca mbridge Univ. Press 1140p
11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications **(TB)**
14) Miller T.G.. Jr., Environmental Science, Wadsworth Publishing Co. **(TB)**
15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
16) Rao M.N. & Datta A.K.,1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18) Survey of the Environment, The Hindu **(M)**
19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science **(TB)**
20) Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media **(R)**
21) Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications **(TB)**
22) Wagner K.D., 1998, Environmental Management, W.B.Saunders Co., Philadelphia, USA 499p.
23) डॉ. विठ्ठल घारपूरे : पर्यावरणशास्त्र- पिंपळापूरे ॲन्ड कंपनी पब्लीशर्स, नागपूर.**(R)**
24) Dr. Deshpande, A.P.Dr. Chudiwale, A.D., Dr. Joshi, P.P., Dr. Lad, A.B.: Environmental Studies, Pimpalapure & Co., Publishers, Nagpur. **(R)**
25) R.Rajagopalan : Environmental Studies, Oxford University Press, New Delhi, 2005 **(R)**

(M) Magazine
(R) Reference
(TB) Textbook

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DIRECTION

No. 31/2011 Date : 10/06/2011

Subject : Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No. 39 accepted and recommended schemes of teaching & examinations of III to VIII/X as per Credit Grade System of various branches as per Credit Grade System in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of VII & VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice-Chancellor u/s Section 14 (7) of M.U. Act, 1994 on behalf on Academic Council on 9th June, 2011,

AND

Whereas this schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as per Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Engineering & Technology are to be sent for printing.

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers confirmed upon me under sub section (8) of Section 14 of the Maharashtra Universities Act, 1994, hereby direct as under :-

1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering &Technology, Direction, 2011"
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH		Appendix No.
1)	Civil Engineering	A
2)	Mechanical Engineering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Engineering (Electrical & Power)	F
7)	Electrical Engineering	G
8)	Electronics & Telecommunication Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical) Techology	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

Sd/-
Dr. Mohan K. Khedkar
Vice-Chancellor

*****

B.E. V & VI Semester **Prospectus No. 131712**

संत गाडगे बाबा अमरावती विद्यापीठ
SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS

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Four Year Degree Course
Bachelor of Engineering / Bachelor of Technology

BRANCHES

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2) Electronics & Telecommunication Engineering
3) Electronics Engineering
4) Chemical Engineering
5) Polymer (Plastic) Technology
6) Food, Pulp & Paper, Oil & Paint and Petrochemical Technology
7) Textile Engineering
8) Computer Science and Engineering
9) Computer Engineering.

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6 of 2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011 Date : 10-06-2011

Subject :- Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology.

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No.39 accepted and recommended schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice Chancellor u/s Section 14(7) of M.U.Act, 1994 on behalf on Academic Council on 9th April, 2011,

AND

Whereas these schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as pere Credit Grade System inthe faculty of Engineering & Technology are to be implemented fromthe academic session 2011-2012.

AND

Whereas syllabi of various branches in the faculty of Enginering & Technology are to be sent for printing,

Now, therefore, I,Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994 hereby direct as under :-

1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches inthe faculty of Enginering & Technology, Direction, 2011".
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH		**Appendix No.**
1)	Civil Engineering	A
2)	Mechanical Enginering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Enginering (Electrical & Power)	F
7)	Electrical Enginering	G
8)	Electronics & Telecommunications Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	TExtile Engineering	N
15)	Chemical Engineering	O
16)	Chenmical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology)	Q
18)	Information Technolog	R
19)	Biomedical Engineering	S

sd/-
Dr.Mohan K.Khedkar
Vice Chancellor

****

DIRECTION

No. : 31 /2012 Date : 19 /07/2012

Subject :- Corrigendum to Direction No.31 of 2011

Whereas,the Direction No.31 of 2011 in respect of the Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology is in existence**,**

AND

Whereas, the schemes of teaching and examinations of III to VIII/X Semesters as per Credit Grade System for the branches Civil Engineering, Mechanical Engineering, Production Engineering,Electrical Engineering(Electronics & Power), Electrical & Electronics Engineering, Electrical Engineering (Electrical & Power), Electrical Engineering, Electronics & Telecommunication Engineering, Electronics Engineering, Instrumentation Engineering, Computer Science & Engineering, Computer Engineering, Architecture, Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology), Information Technology, Biomedical Engineering were to be implemented from the session 2011-2012 in phase wise manner by the said Direction No. 31 of 2011 as per respective Appendices i.e. AppendixA,B, C,D, E, F, G, H, I,J, K, L,M, N, O, P, Q, R and S,

AND

Whereas, the Academic Council in its meeting held on 05/05/ 2012 vide Item No. 53 (1) A-R1, C-R-1,D-R1,E-R1,H-R1 and I-R1 has recommended the revised schemes of teaching and examinations of V to VIII/X Semesters as per Credit Grade System for the branches Production Engineering, Electronics & Telecommunications Engineering, Electronics Engineering, Computer Science & Engineering, Computer Engineering,Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology),

AND

Whereas, the revised Schemes of examinations as per Credit Grade System for the above mentioned branches in the faculty of Engineering & Technology are to be implemented from the academic session 2012-2013 in phase wise manner ,

AND

Whereas, the Schcmes of teaching and examinations of above mentioned branches as per Credit System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas, the process of making the Regulation is likely to take some time,

AND

Whereas, the syllabi of above mentioned branches along with the revised schemes of examinations in the faculty of Engineering & Technology are to be made available for the students admitted during the Session 2012-2013,

Now, therefore , I, Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University,Amravati in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994, do hereby direct as under : -

1) This Direction shall be called “Corrigendum to Direction No. 31 of 2011”,
2) This Direction shall come into force from the date of its issuance.
3) Revised schemes of teaching and examinatiions of V to VIII/X Semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH		**Appendix No.**
1)	Production Engineering	A
2)	Electronics & Telecommunications Engineering	B
3)	Electronics Engineering	C
4)	Computer Science & Engineering	D
5)	Computer Engineering	E
6)	Textile Engineering	F
7)	Chemical Engineering	G
8)	Chemical Technology(Polymer)(Plastic)Technology	H
9)	Chemical Technology (Food, Pulp & Paper,Oil & Paint and Petrochemical Technology)	I

sd/-

Date :- 19 /07/2012 (Mohan K.Khedkar)

Vice Chancellor

****

FOUR YEAR DEGREE COURSE

B.E. PRODUCTION ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER : FIFTH

APPENDIX- A

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hrs.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5PE01	DESIGN OF MACHINE ELEMENTS	3	1	_	4	4	4	80	20	100	40	_	_	_	_
02	5PE02	TOOL ENGINEERING - I	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	5PE03	MATERIAL HANDLING SYSTEMS	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	5PE04	CONTROL SYSTEMS ENGINEERING	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEPE05	FREE ELECTIVE - I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5PE06	COMMUNICATION SKILLS	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5PE07	DESIGN OF MACHINE ELEMENTS - Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5PE08	TOOL ENGINEERING - I - Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5PE09	COMMUNICATION SKILLS - Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5PE10	COMPUTER APPLICATIONS IN PRODUCTION ENGINEERING - Lab.	1	_	2	3	3	_	_	_	_	_	25	25	50	25
		TOTAL	18	3	8	29	26				550				200	
														TOTAL		750

FREE ELECTIVE - I 01) INDUSTRIAL ENGINEERING ii) INDUSTTRIAL SAFETY MANAGEMENT

SEMESTER : SIXTH

THEORY																
01	6PE01	TOOL ENGINEERING - II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	6PE02	METROLOGY & QUALITY CONTROL	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	6PE03	MACHINE TOOL DESIGN	4	1	-	5	5	3	80	20	100	40	-	-	-	-
04	6PE04	WORK STUDY	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEPE05	FREE ELECTIVE - II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6PE06	TOOL ENGINEERING - II - Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6PE07	METROLOGY & QUALITY CONTROL - Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6PE08	MACHINE TOOL DESIGN - Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	6PE9	MINOR PROJECT (MACHINE SHOP PRACTICE)	_	_	3	3	3	_	_	_	_	_	25	25	50	25
		TOTAL	16	3	9	28	25				500				200	
														TOTAL		700

FREE ELECTIVE – II - 01) INDUSTRIAL AUTOMATION 02) ENGINEERING ECONOMICS & ENTREPRENEURSHIP DEVELOPMENT

Note : Students will have to opt the free electives offered from other courses of their college / Institution / University Department.

Four Year Degree Course in Bachelor of Engineering
Branch : Electronics & Telecommunication Engineering
Semester Pattern (Credit Grade System)

APPENDIX - B

Semester : Fifth

Sr. No.	Subject Code	Subject	TEACHING SCHEME HOURS / WEEK Lecture	Tutorial	P/D	Total HOURS/WE	CREDITS	EXAMINATION SCHEME THEORY DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL MAX. MARKS EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5XT1	Electronic Devices & Circuits-II	4	1		5	5	3	80	20	100	40	–	–	–	–
02	5XT2	Power Electronics	4			4	4	3	80	20	100	40	–	–	–	–
03	5XT3	Control System Engineering	4	1		5	5	3	80	20	100	40	–	–	–	–
04	5XT4	Communication Engineering-II	4			4	4	3	80	20	100	40	–	–	–	–
05	5FEXT5	Free Electrive- I	4			4	4	3	80	20	100	40	–	–	–	–
06	5XT6	Communication Skills	2			2	2	2	40	10	50	20				
		Free Elective - I : 1. Consumer Electronics 2. Fibre Optics														
PRACTICALS / DRAWING / DESIGN																
07	5XT7	Electronic Devices & Circuits-II Lab			2	2	1	–	–	–	–	–	25	25	50	25
08	5XT8	Power Electronics Lab			2	2	1	–	–	–	–	–	25	25	50	25
09	5XT9	Communication Engineering-II Lab			2	2	1	–	–	–	–	–	25	25	50	25
10	5XT10	Communication Skills Lab			2	2	1						15	10	25	12
		TOTAL	22	2	8	32	28				550				175	
														TOTAL	725	

Semester : Sixth

Sr. No.	Subject Code	Subject	TEACHING SCHEME HOURS / WEEK Lecture	Tutorial	P/D	Total HOURS/WE	CREDITS	EXAMINATION SCHEME THEORY DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESSMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL MAX. MARKS EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	6XT1	Digital Integrated Circuits	4			4	4	3	80	20	100	40	–	–	–	–
02	6XT2	Linear Integrated Circuits	4	1		5	5	3	80	20	100	40	–	–	–	–
03	6XT3	Introduction to Microprocessors	4	1		5	5	3	80	20	100	40	–	–	–	–
04	6XT4	Digital Communication	4			4	4	3	80	20	100	40	–	–	–	–
05	6FEXT5	Free Electrive -II	4			4	4	3	80	20	100	40	–	–	–	–
		Free Elective - II : 1. Introduction to Wireless Technology 2. Electronic Test Instruments - Analog and Digital.														
PRACTICALS / DRAWING / DESIGN																
06	6XT6	Integrated Circuits Lab			2	2	1	–	–	–	–	–	25	25	50	25
07	6XT7	Introduction to Microprocessors Lab			2	2	1	–	–	–	–	–	25	25	50	25
08	6XT8	Digital Communication Lab			2	2	1	–	–	–	–	–	25	25	50	25
		TOTAL	20	2	6	28	25				500				150	
														TOTAL	650	

Note : Students will have to opt the free electives offered from other courses of their college / Institution / University Department.

Four Year Degree Course in Bachelor of Engineering
Branch : Electronics Engineering - Semester Pattern (Credit Grade System)

SEMESTER - FIFTH

APPENDIX - C

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WE	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE [CONTINUOUS]	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXNERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5XN1	Electronic Devices & Circuits-II	4	1		5	5	3	80	20	100	40	_	_	_	_
02	5XN2	Power Electronics	4			4	4	3	80	20	100	40	_	_	_	_
03	5XN3	Control System Engineering	4	1		5	5	3	80	20	100	40	_	_	_	_
04	5XN4	Communication Engineering-II	4			4	4	3	80	20	100	40	_	_	_	_
05	5FEXN5	Free Electrive- I	4			4	4	3	80	20	100	40	_	_	_	_
06	5XN6	Communication Skills	2			2	2	2	40	10	50	20				
	Free Elective - I : 1. Consumer Electronics 2. Fibre Optics															
PRACTICALS / DRAWING / DESIGN																
07	5XN7	Electronic Devices & Circuits-II Lab			2	2	1	_	_	_	_	_	25	25	50	25
08	5XN8	Power Electronics Lab			2	2	1	_	_	_	_	_	25	25	50	25
09	5XN9	Communication Engineering-II Lab			2	2	1	_	_	_	_	_	25	25	50	25
10	5XN10	Communication Skills Lab			2	2	1						15	10	25	12
		TOTAL	22	2	8	32	28				550				175	
														TOTAL	725	
Semester : Sixth																
THEORY																
01	6XN1	Digital Integrated Circuits	4			4	4	3	80	20	100	40	_	_	_	_
02	6XN2	Linear Integrated Circuits	4	1		5	5	3	80	20	100	40	_	_	_	_
03	6XN3	Introduction to Microprocessors	4	1		5	5	3	80	20	100	40	_	_	_	_
04	6XN4	Radar & Television Engineering	4			4	4	3	80	20	100	40	_	_	_	_
05	6FEXN5	Free Electrive -II	4			4	4	3	80	20	100	40	_	_	_	_
		Free Elective - II : 1. Introduction to Wireless Technology 2. Electronic Test Instruments - Analog and Digital.														
PRACTICALS / DRAWING / DESIGN																
06	6XN6	Digital Integrated Circuits Lab			2	2	1	_	_	_	_	_	25	25	50	25
07	6XN7	Linear Integrated Circuits Lab			2	2	1	_	_	_	_	_	25	25	50	25
08	6XN8	Introduction to Microprocessors Lab			2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	2	6	28	25				500				150	
														TOTAL	650	

Note : Students will have to opt the free electives offered from other courses of their college / Institution / University Department.

Four Year Degree Course in Bachelor of Engineering

Branch : Computer Science & Engineering- Semester Pattern (Credit Grade System)

SEMESTER : FIFTH

APPENDIX - D

Semester :FIFTH																			
			TEACHING SCHEME					EXAMINATION SCHEME											
			HOURS / WEEK					THEORY						PRACTICAL					
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS			
													EXTERNAL	INTERNAL					
THEORY																			
01	5KS01	Data Communication	4	—	_	4	4	3	80	20	100	40	_	_	_	_			
02	5KS02	File Structures & Data Processing	4	1	_	5	5	3	80	20	100	40	_	_	_	_			
03	5KS03	System Software	4	_	_	4	4	3	80	20	100	40	_	_	_	_			
04	5KS04	Switching Theory & Logic Design	4	1	_	5	5	3	80	20	100	40	_	_	_	_			
05	5FEKS05	Free Elective I*	3	_	_	3	3	3	80	20	100	40	_	_	_	_			
06	5KS06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_			
PRACTICALS / DRAWING / DESIGN																			
07	5KS07	System Software Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25			
08	5KS08	Switching Theory & Logic Design Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25			
09	5KS09	Communication Skills Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25			
		TOTAL	21	2	6	29	26				550				150				
														TOTAL	700				

Free Elective I* (i) Data Structures & Algorithms (ii) Data Communication & Networking

Semester :SIXTH																			
THEORY																			
01	6KS01	Operating Systems	4	1	_	5	5	3	80	20	100	40	_	_	_	_			
02	6KS02	Database Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_			
03	6KS03	Computing Resources Management	4	_	_	4	4	3	80	20	100	40	_	_	_	_			
04	6KS04	Computer Architecture	3	1	_	4	4	3	80	20	100	40	_	_	_	_			
05	6FEKS05	Free Elective II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_			
06	6KS06	Professional Ethics	2	_	_	2	2	2	40	10	50	20	_	_	_	_			
PRACTICALS / DRAWING / DESIGN																			
07	6KS07	Operating Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25			
08	6KS08	Database Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25			
09	6KS09	Computer Lab-II (Hardware Lab)	1	_	2	3	2	_	_	_	_	_	25	25	50	25			
		TOTAL	21	2	6	29	26				550				150				
														TOTAL	700				

Free ElectiveII* (i) Database Management System (ii) Software Project Management

Note : Students will have to opt the free electives offered from other courses of their college / Institution / University Department.

Four Year Degree Course in Bachelor of Engineering

Branch : Computer Engineering- Semester Pattern (Credit Grade System)

SEMESTER : FIFTH

APPENDIX - E

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	5KE01	Data Communication	4	__	_	4	4	3	80	20	100	40	_	_	_	_
02	5KE02	File Structures & Data Processing	4	1	_	5	5	3	80	20	100	40	_	_	_	_
03	5KE03	System Software	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5KE04	Switching Theory & Logic Design	4	1	_	5	5	3	80	20	100	40	_	_	_	_
05	5FEKE05	Free Elective I*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5KE06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5KE07	System Software Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5KE08	Switching Theory & Logic Design Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5KE09	Communication Skills Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	21	2	6	29	26				550				150	
														TOTAL	700	

Free Elective I* (i) Web Technologies (ii) Object Oriented Programming

Semester :SIXTH

THEORY																
01	6KE01	Operating Systems	4	1	_	5	5	3	80	20	100	40	_	_	_	_
02	6KE02	Database Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6KE03	Computing Resources Management	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6KE04	Computer Architecture	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	6FEKE05	Free Elective II*	3	_	_	3	3	3	80	20	100	40				
06	6KE06	Professional Ethics	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6KE07	Operating Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6KE08	Database Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6KE09	Computer Lab-II (Hardware Lab)	1	_	2	3	2	_	_	_	_	_	25	25	50	25
		TOTAL	21	2	6	29	26				550				150	
														TOTAL	700	

Free Elective II* (i) Java Programming (ii) Expert Systems

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

Four Year Degree Course in
Bachelor Textile Engineering - Semester Pattern (Credit Grade System)

SEMESTER : FIFTH

APPENDIX - F

Sr. No.	Subject Code	Subject	TEACHING SCHEME: HOURS / WEEK: Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	EXAMINATION SCHEME: THEORY: DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL: MAX. MARKS: EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5 TX 01	Yarn Manufacturing -III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	5 TX 02	Fabric Manufacturing-III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	5 TX 03	Textile Testing-I	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	5 TX 04	Textile Costing and Economics	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	5FETX05	Free Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	5 TX 06	Minor Project-I	_	_	2	2	2	_	_	_	_	_	_	50	50	25
07	5 TX 07	Yarn Manufacturing -III- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5 TX 08	Fabric Manufacturing-III- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5 TX 09	Textile Testing-I- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	15	4	8	27	24				500				200	
														TOTAL	700	

Free Elective-I:- (i) Technical Textiles (ii) Fashion & Clothing Science

Semester : Sixth

Sr. No.	Subject Code	Subject	TEACHING SCHEME: HOURS / WEEK: Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	EXAMINATION SCHEME: THEORY: DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	PRACTICAL: MAX. MARKS: EXTERNAL	INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	6 TX 01	Fabric Structure	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	6 TX 02	Advanced Yarn Manufacturing Technology	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	6 TX 03	Textile Testing-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	6 TX 04	Apparel Merchandising	3	_	_	3	3	3	80	20	100	40	_	_	_	_
05	6FETX05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	6 TX 06	Communication Skill	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	6 TX 07	Minor Project-II	_	_	2	2	4	_	_	_	_	_	25	25	50	25
08	6 TX 08	Fabric Structure- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6 TX 09	Advanced Yarn Manufacturing Technology- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	6 TX 10	Textile Testing-II- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
11	6 TX 11	Communication Skill-Lab.	--	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	17	2	10	29	27				550				250	
														TOTAL	800	

Free Elective-II:- (i) Computer Aided Textile & Fashion designing (ii) Fashion Technology

* Notes : 1) Student has to undergo inplant training for 15 days in any textile manufacturing unit
2) Students will have to opt the free electives offered from other courses of their College / Institution / University Department

Four Year Degree Course in Bachelor of Engineering
Branch : Chemical Engineering - Semester Pattern (Credit Grade System)

SEMESTER - FIFTH

APPENDIX - G

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	5CH01	Heat Transfer	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5CH02	Chemical Engineering Process-I (Inorganic Chemical Technology)	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5CH03	Economics & Management	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	5CH04	Material Science & Engineering	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	5FECH05	Free Elective-I	3	_	_	3	3	3	80	20	100	40				
06	5CH06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5CH07	Heat Transfer-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5CH08	Material Science & Engineering-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5CH09	Communication Skills- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	20	1	6	27	24				550				150	
														TOTAL		700
		Free Elective-I 1) Air Pollution Control 2) Risk & Safety Management in Industries.														
Semester : Sixth																
THEORY																
01	6CH01	Chemical Engineering Operation - II (Mass Transfer - I)	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	6CH02	Chemical Engineering Process-II (Organic Chemical Technology)	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	6CH03	Computer Programming & Applications	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	6CH04	Process Equipment Design & Drawing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	6FECH05	Free Elective II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	6CH06	Chemical Engineering Operation - II (Mass Transfer - I)-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	6CH07	Computer Programming & Applications-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6CH08	Minor Project	_	_	2	2	4	_	_	_	_	_	25	25	50	25
		TOTAL	17	2	6	25	25				500				150	
														TOTAL	650	

Free Elective-I 1) Renewable Energy Sources 2) Water Technology

Note : Students will have to opt the free electives offered from other courses of their college / Institution / University Department.

Four Year Degree Course in Bachelor Technology
Branch : Polymer (Plastic) Technology Semester Pattern (Credit Grade System)

APPENDIX - H

Semester : FIFTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	PID	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	5PP01	Heat Transfer	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	5PP02	Polymer Materials	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	5PP03	Engineering Plastics & Speciality Polymers	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	5PP04	Instrumentation & Control	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	5FEPP05	Free Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5PP06	Communication Skill	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5PP07	Heat Transfer-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5PP08	Polymer Materials-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5PP09	Instrumentation & Control-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5PP10	Communication Skill-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	19	2	8	29	25				550				200	
														TOTAL		750

Free Elective-I 1) Polymer Science and Technology 2) Rubber Technology

Semester : Sixth

THEORY																
01	6PP01	Chemical Engineering Operation-II (Mass Transfer)	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	6PP02	Elastomer Technology	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	6PP03	Computer Programming & Applications	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	6PP04	Polymer Engineering Thermodynamics	3	_	_	3	3	3	80	20	100	40	_	_	_	_
05	6FEPP05	Free Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	6PP06	Chemical Engineering Operation-II (Mass Transfer)-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	6PP07	Elastomer Technology-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6PP08	Computer Programming & Applications-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6PP09	Minor Project	_	_	2	2	4	_	_	_	_	_	25	25	50	25
		TOTAL	15	3	8	26	25				500				200	
														TOTAL		700

Free Elective-II 1) Polymeric Materials 2) Paint and Surface Technology

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

Four Year Degree Course in Bachelor of Technology

Branch : Food, Pulp & Paper, Oil & Paint and Petrochemical Technology - Semester Pattern (Credit Grade System)

Semester : FIFTH **APPENDIX - I**

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY		Semester : Fifth														
01	5 CT 01	Heat Transfer	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	5 CT 02	Mechanical Operations	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	5 CT 03	Chemical Engineering Thermodynamics	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	5 FT 04	Food Technology - II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
	5 PT 04	Pulp & Paper Technology -II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
	5 OT 04	Oil & Paint Technoloogy -II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
	5 PC 04	Petrochemical Technology - II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	5 FECT 05	Free Elective - I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
06	5 CT 06	Communication Skills	2	_	_	2	2	2	40	10	50	20	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
07	5 CT 07	Heat Transfer -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	5 CT 08	Mechanical Operation-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	5 CT 09	Chemical Engineering Thermodynamics-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
10	5 FT 10	Food Technology - II-Lab	_	_	4	4	2	_	_	_	_	_	25	25	50	25
	5 PT 10	Pulp & Paper Technology -II-Lab	_	_	4	4	2	_	_	_	_	_	25	25	50	25
	5 OT 10	Oil & Paint Technoloogy -II-Lab	_	_	4	4	2	_	_	_	_	_	25	25	50	25
	5 PC 10	Petrochemical Technology - II-Lab	_	_	4	4	2	_	_	_	_	_	25	25	50	25
11	5 CT 11	Communication Skills-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	17	1	12	30	25				550				200	
														TOTAL	750	
Free Elective - I : 1) Environmental Impact : Risk Assessment and Management 2) Economics and Management																
THEORY		**Semester - Sixth**														
01	6 CT 01	Process Equipment - Design & Drawing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	6 CT 02	Computer Programming & Applications	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	6 CT 03	Instrumentation & Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	6 FT 04	Food Technology -III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
	6 PT 04	Pulp & Paper Technology -III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
	6 OT 04	Oil & Paint Technoloogy -III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
	6 PC 04	Petrochemical Technology -III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	6 FECT 05	Free Elective - II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	6 CT 06	Process Equipment Design & Drawing-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	6 CT 07	Instrumentation & Control-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	6 CT 08	Computer Programming & Application-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	6 CT 09	Minor Project	_	_	2	2	2	_	_	_	_	_	25	25	50	25
		TOTAL	17	3	8	28	25				500				200	
														TOTAL	700	

Free Elective - II : 1) Introduction to Membrane Technology 2) Renewable Energy Sources 3) Chemical Technology

Note : Students will have to opt the free electives offered from other courses of their College / Institution / University Department

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
PRODUCTION ENGINEERING EXAM.
SEMESTER PATTERN (C. G. S.)
FIFTH SEMESTER

5PE01 DESIGN OF MACHINE ELEMENTS

Lecture : 04 Hrs/ w
Tutorial : 01 Hrs/ w
Credits : 05
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 04

Course Objectives:

- To study the different types load considerations and design aspects of various machine members.
- Develop and evaluate alternatives for mechanical systems.
- To synergize forces, moments, torques, stress and strength information.
- To develop ability to analyze, design and/or select machine elements - with attention to safety, reliability, and societal and fiscal aspects.
- Design shafting and specify appropriate keys and couplings.
- Design springs, common welded and bolted connections.

SECTION-A

UNIT-I : Introduction to M/c design, Design procedure, factors affecting M/c design, types of stresses in machine members compound stresses, theories of material failure. Factor of safety, properties and selections of material, designation of material as per I.S.I.; elementary ideas of inertia and thermal stresses. Design of levers and threaded fastness. (12)

UNIT- II: Design of Joints: Pin, Cotter, Knuckle, etc., Riveted and Welded joints. (12)

SECTION-B

UNIT III: 1. Design procedure for parts subjected to alternating, shock and impact loads. Stress concentration, Endurance limit.
2. Design of Helical, leaf and spiral spring.
3. Design of Keys and Splines. (12)

UNIT-IV: 1. Design of pressure vessels and pipes.
2. Design of shafts, spindle and coupling.
3. Design of columns and frames with direct and eccentric loading. (12)

TEXT BOOKS :

1. Design of Machine Elements, V. B. Bhandari, 3 Ed. (Tata McGraw-Hill Publishing Company Ltd.)
ISBN: 9780070681798
2. Mechanical Engineering design, J. E. Shigley, Mitchell, 3 Ed(McGraw- Hill Publishing Co. Ltd)
ISBN:9780071441633

3. Elements of Machine Design, N. C. Pandya and C. S. Shaha, 15 Ed., (Charotar Publishing House)
ISBN:81-85-594-42-2
4. A Text Book of Machine Design, R. S. Khurmi, (S. Chand) ISBN: 8121925371
5. Machine Design, R. K. Jain, (Khanna Publishers.)

REFERENCE BOOKS

1. Machine Tool Design, N. K. Mehta, (Tata McGraw-Hill Publishing Company Ltd.)
2. Design Data Books : a) Shivalkar, Kulkarni b) K.Mahadevan c) N.R.Chakrabarti
3. Design of Machine Elements, Dbrovalsky (MIR Publisher)
4. Design of Machine Elements by M. F. Spoots, T.E.Shoup 4 Ed. (PHI) ISBN: 0-87-692-177-2
5. Computer Aided Analysis and Design of Machine Elements by Dukki Patti, Rao, Bhat , (New Age, Delhi)
6. CMTI Machine Tool Design Handbook (TMH)
7. Machine Design by Black and Adams (McGraw-Hill Publishing Company Ltd)

5PE02 TOOL ENGINEERING – I

Lecture : 03 Hrs/ w
Tutorial : 01 Hrs/ w
Credits : 04
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- To meet the requirements of industry in the fields of tool design and manufacturing
- To train students in designing different tools like Single point Tool, Circular and Flat form tool, drill, reamer and broach.
- Student should have the basic knowledge of metal cutting process (machining). Economics of Machining.

SECTION-A

UNIT-I : Mechanics of metal cutting : Common features of machining processes. Basic wedge action of cutting tools, mechanism of chip formation; type of chips. Concept of cutting speed, feed, depth of cut, shear angle, velocity relation, shear strain. Merchant theory of metal cutting, cutting forces and power, metal removal rate, energy consideration in metal cutting. (8)

UNIT-II : Single point cutting tool : Classification, systems of nomenclature, design of single point tool, cutting speeds, feeds and tool angles, chip breakers, form tools, classification, design

of flat & circular from tool, clamping arrangement of form tools.

(7)

UNIT- III: i) Drills: Types, geometry of twist drill, cutting variables, and chip formation, forces and torque in drilling.

ii) Milling cutters : Conventional & climb milling, types of cutters, geometry of plain milling cutter, face milling cutter, machining process and cutting variables, force acting on plain milling cutter. Design considerations in milling cutter.

iii) Reamers: Types, tool geometry, tolerance, design considerations. (7)

SECTION-B

UNIT-IV: Broaches : i) Cutting process in broaching, geometric elements of broach teeth, cutting variables in broaching classification of broach design of broaches, cutting forces in broaching.

ii) Gear Cutting Tools: (Different types) gear shaper cutter, gear hob and their geometry.

iii) Thread cutting tools: Geometry of tapes & dies.

iv) Tools for NC/CNC machines. (7)

UNIT-V: Tool Wear, Tool Life, Machinability and Coolants: Wear mechanism, type of tool wear and chipping of different tool material, tool failure criteria, direct and indirect. Tool life equation, effect of process parameters on tool life, tool life tests-machinability, criteria for machinability, distribution of heat generated in metal cutting, functions of cutting fluids, types and selection of cutting fluid. (8)

UNIT-VI: Tool Materials and Economics of Machines: Properties and applications of various tool materials HSS, cast cobalt alloys, Carbides, ceramics, diamonds, UCON, CBN, Recent tool materials. Classification of carbides. Component of machining costs, optimisation criteria, high efficiency zone, tool life for minimum cost of production and for maximum production rate.

Surface Finish : effect of machining parameters, surface finish expression, cost of surface finish. (8)

TEXT BOOKS :

1) Metal Cutting Theory and Cutting Tool Design : MIR Pub. by Arshinov.
2) Fundamentals of Metal Cutting and Machine Tools by WFL, Juneja.

REFERENCE BOOKS :

1) Production Technology, By HMT
2) Metal Cutting Theory and Practice : Central Book Pub. by A. Bhattacharya.
3) Production Technology : PHI Astme.

5PE03 MATERIAL HANDLING SYSTEMS

Lecture : 03 Hrs/ w
Tutorial : _____
Credits : 03
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- This course will cover the different classifications of material handling equipment. Within each of these classifications, we will discuss the alternate types of equipment available and what situations are appropriate for applying the different variations.
- A special emphasis will be on the application of material handling equipment in a warehouse environment.
  Distribution activities are becoming a focus for many industrial engineers and the ability to apply and evaluate material handling equipment is an essential part of evaluating and managing a storage facility.

SECTION-A

UNIT-I : Introduction, definition of material handling, its relationship with plant layout. Types of industries, related material handling equipment. Design of plant layout. Site selection for plant. (6)

UNIT-II: Principles of mechanical handling, types of material handling equipments and their field of applications, selection and specification of equipments. Screw conveyor. Introduction, calculation of HP of motor used, characteristics and field of application of screw conveyers, determination of application of screw conveyers of salient dimensions and power requirements. (8)

UNIT- III: Belt conveyers : Introduction, types of drives used for belt conveyers, methods of maintaining belt tensions. Optimization of cross sectional area of belt conveyers supported on (a) two roller system (b) three roller system, determination of salient dimensions and power requirements. (8)

SECTION-B

UNIT-IV: Types of cranes and their application : Electric Over head Travelling (E.O.T.) cranes, types of EOT cranes and their applications, design of mechanical system used for :

a) Cross travel of the crane,

b) Longitudinal travel of the crane and
c) Hoisting and lowering motion of the crane load.
Design of breaking, system of various types of EOT cranes, functions of limit switches used EOT cranes. (8)

UNIT-V: Introduction, working principles, and field of applications of the following mechanical handling equipments (No mathematical treatment is contemplated)
i) Pneumatic conveyers
ii) Hydraulic conveyers
iii) Escalators
iv Robots in material handling. (8)

UNIT-VI: A) Introduction, working principles and field of applications of following mechanical material handling equipments. (No mathematical treatment is contemplated)
i) Ladle Crane
ii) Electric Lifts
iii) Skip Hoists
iv) Fork Lift Trucks
v) Winches
B) Repairs and maintenances of material handling equipments and hazards with M.H.E. (7)

TEXT BOOKS :

1) Material Handling System Design : James Apple
2) Material Handling Equipments : Alexandrov
3) Introduction to Material Handling : Siddhartha Ray Publish by New Age Int. Pub. ISBN: 81-224-2099-0

REFERENCE BOOKS :

1) Material Handling Hand Book Published By JOHN WILLEY & Sons.
2) Plant Layout and Material Handling : James Apple 3RD Ed ISBN: 047107171-4 (JOHN WILLEY & Sons)
3) Plant Layout and Material Handling : National Productivity Council
4) Handbook of Material Handling, By R Robinson, Chichester, ISBN: 0-470-20098-7

5PE04 CONTROL SYSTEMS ENGINEERING

Lecture : 03 Hrs/ w
Tutorial : 01 Hrs/ w
Credits : 04
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- To develop the student's skills in applying Laplace transform to obtain transfer functions.
- To develop student's skills associated with modeling dynamic systems through block diagrams and signal flow graphs.
- To develop student with knowledge of state variable models of feedback control systems.
- To provide the student with skills in analyzing characteristics of dynamics systems and measures of performances.
- To provide the student with analysis skills associated with the assessment of system stability.
- To provide the student with the ability to perform root locus analysis.

SECTION-A

UNIT-I : Introduction, system concept, open and closed loop systems, mathematical models, transfer functions, formulation of mathematical model of mechanical, hydraulic, thermal and simple electrical systems. Concept of block diagram, block diagram algebra, signal flow graphs. (7)

UNIT-II : Basic control actions: proportional, integral and PID controllers, principle of working and characteristics performance of control system and components for the following types :- position, velocity, temperature, pressure, force, torque, flow level etc. (for mechanical, hydraulic, pneumatic and electrical systems).
Study of important automatic speed systems in various prime movers. (8)

UNIT-III: Transient Response Analysis: - method of analysis transient and steady state response of first, second and higher order systems, impulse and step input responses. Transient response specification, Steady state errors and error constant. (7)

SECTION-B

UNIT-IV : Concept stability, necessary condition for stability, Rauths stability criterion, root locus concept, construction of root loci, systems with transportation log. (8)

UNIT-V : Logarithmic and polar plots, Nyquist stability criterion; stability analysis, determination of system parameter from experimental results. (8)

UNIT-VI: Design and compensation techniques : introduction, preliminary design considerations; lead and log compensations. (7)

TEXT BOOKS:

1) Modern Control Engineering : Katsuhiko, Ogata Prentice Hall.
2) Automatic Control Engineering : Francis H. Raven, McGraw Hill
3) Feedback Control Systems By U A Bakshi, Pearson

REFERENCE BOOKS:

1) Control System Engineering : I.J.Nagrath & M.Gopal, Wesley Eastern.

2) Automatic Control System : Kuo B.C.
3) Automatic Control Introduction : Webb C.R.
4) Control System Engineering : Dorf R.C.

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5FEPE05 FREE ELECTIVE - I
(1) INDUSTRIAL ENGINEERING

Lecture : 03 Hrs/ w
Tutorial : _____
Credits : 03

Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- This course studies the definition of industrial engineering and the evolution of its approach in solving problem as well as discussing the manufacturing system which use as an object of the study. The course objective is to introduce the discipline and profession of industrial engineering.

SECTION - A

Unit I: The Purpose, Fundamentals and Evolution of Industrial Engineering. The Role and Career of the Industrial Engineer in the Modern Organization. The Industrial Engineer as Manager. Industrial Engineering in Government, Service Industry Applications. **(7)**

Unit II: The Concept and Importance of Productivity, Productivity Improvement through Business Process Reengineering, Total Productivity Management, Performance Management; A Key Role for Supervisors and Team Leaders, Managing Change through Teams, Involvement, Empowerment, and Motivation. **(7)**

Unit III: Methods Engineering and Workplace Design, Continuous Improvement, Work Design and Flow Processes for Support Staff, Setup Time Reduction, Measurement of Work, Purpose and Justification of Engineered Labor Standards, Standard Data Concepts and Development, Developing Engineered Labor Standards, Allowances, Computerized Labor Standards, Implementation and Maintenance of Engineered Labor Standards. **(8)**

SECTION - B

Unit IV: Ergonomics, Resources, Designing, Implementing, and Justifying an Ergonomics Program, Ergonomic Consumer Product Design, Manufacturing Ergonomics, Ergonomics in the Office Environment, the Interface between Production System Design and Individual Mechanical Exposure. Occupational Safety Management and Engineering. **(7)**

Unit V: Quantitative Approach to the Site Selection Process, Facilities Layout and Design, A Participatory Approach to Computer-Aided Workplace Design, Planning a Manufacturing Cell, Scheduling and Inventory Control of Manufacturing Systems, An Introduction to Supply Chain Management, Production Scheduling. **(8)**

Unit VI: Industrial Engineering Support for Materials Management, Materials Handling, Warehouse Management, Distribution Systems, Inventory Management and Control. Product Design and Quality Management, Product Development, Design for Manufacture and Assembly, Value Management. World-Class Manufacturing: An Industrial Engineering View. **(8)**

TEXT BOOKS:

1. Dr.B.Kumar, Industrial Engineering; Khanna Publishers.
2. Martand Telsang, Industrial Engineering and Production Management; S.Chand.ISBN:81-219- 1773-5

REFERENCES BOOKS:

1. Turner, W.C., et. Al, 1993, “Introduction to Industrial and System Engineering”, Prentice Hall.
2. Hicks, P.E., 1994, “Industrial Engineering and Management: a New Perspective”, McGraw-Hill, Inc.
3. Eide, et. Al., 2002, “Engineering Fundamental and Problem Solving”, John Wiley & Sons.

5FEPE05 FREE ELECTIVE - I
(2) INDUSTRIAL SAFETY MANAGEMENT

Lecture : 03 Hrs/ w
Tutorial : _____
Credits : 03

Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

The course will allow you to realize the following objectives-

- Develop range of competencies necessary in the field of safety management
- Knowledge and understanding on the subject and skills needed for different situations
- Risk assessment, health and safety regulations
- Develop skills in communication, management and critical thinking

- Plan of conduct during and after investigations depending on sensitivity of subject matter
- Identify and analyze broadly defined problems, evaluate strategies

SECTION - A

UNIT - I : Concepts : History of Safety movement – general concepts of management – planning for safety for optimization of productivity -productivity, quality and safety-line and staff functions for safety-budgeting for safety-safety policy. (7)

UNIT- II : Techniques-Incident Recall Technique (IRT) – disaster control – damage control-job safety analysis – safety survey – safety inspection – safety sampling – motivating techniques – evaluation of performance of supervisors on safety-safety posters – safety displays – safety pledge – safety Lab. (8)

UNIT III : Components of safety audit – review of inspection, remarks by government agencies, consultants, experts – perusal of accident and safety records, formats – implementation of audit indication - liaison with departments to ensure co-ordination – check list – identification of unsafe acts of workers and unsafe conditions in the shop floor. (8)

SECTION – B

UNIT-IV : Concept of an accident – Cost of accident- reportable and non reportable accidents – reporting to statutory authorities – principles of accident prevention – accident investigation and analysis – records for accidents – departmental accident reports – documentation of accidents – unsafe act and condition – domino sequence – supervisory role – role of safety committee –cost of accident – factories act – safety health. (8)

UNIT V : Safety Performance Monitoring : Calculation of accident indices – frequency rate – severity rate – frequency severity incidence – incident rate – accident rate – safety "t" score – problems. (7)

UNIT VI: Safety Education And Training: Importance of training-identification of training needs-training methods - programmes-seminars – conferences – competitions – motivation – communication - role of government agencies and private consulting agencies in safety training – awards – celebrations. (7)

TEXT BOOKS:

1. Heinrich H.W. "Industrial Accident Prevention" McGraw-Hill Company, New York.

2. Krishnan N.V. "Safety Management in Industry" Jaico Publishing House, Bombay.

REFERENCE BOOKS:

1. Dan Petersen, "Techniques of Safety Management", McGraw-Hill Company, Tokyo.
2. Blake R.B., "Industrial Safety" Prentice Hall, Inc., New Jersey.
3. "Safety and Good House Keeping", N.P.C., New Delhi.
4. "Accident Prevention Manual for Industrial Operations", N.S.C.Chicago.
5. Lees, F.P., "Loss Prevention in Process Industries" Butterworth publications, London, 2nd edition.
6. John Ridley, "Safety at Work", Butterworth & Co., London.

5PE06 COMMUNICATION SKILLS

Lecture : 02 Hrs/ w **Internal Assessments:** 10

Tutorial : _____ **University Exam:** 40

Credits : 02 **Theory Paper (Hrs.) :** 02

UNIT-I: Comprehension over an unseen passage.
Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage.
Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.
Active and passive forms, negative and interrogative, punctuation and capitalization. (8)

UNIT-II : Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectively and subject content. Non-verbal communication, types of graphics and pictoral devices. (8)

UNIT- III: Specific formats for written communication like - business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-

to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop. (8)

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Cbrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Raman Sharma "Technical Communication", Oxford University Press.
4) F. Frank Candlin ; General English for Technical Students, University of London Press Ltd.

5PE07 DESIGN OF MACHINE ELEMENTS – Lab.

Practical : 02 Hrs/ w **Practical Term Work:** 25
Tutorial : ____ **Practical / Oral Exam:** 25
Credits : 01

Course Objectives:

- Apply the study of the different types load considerations and design aspects of various machine members.
- Apply the ability to analyze, design and/or select machine elements - with attention to safety, reliability, and societal and fiscal aspects.
- Design shafting and specify appropriate keys and couplings.
- Design springs, common welded and bolted connections.

TERM WORK

Any eight of the following design. (Standard components shall be selected from relevant I.S. codes and Design Data Handbooks for the exercises given below.)

1. Design of cotter joint.
2. Study of Engineering Materials, their applications and selection as per different standards used in practice.
3. Design of Knuckle joint.
4. Design of circumferential/longitudinal riveted joint of boiler.
5. Design of springs.
6. Design of rigid flange coupling.
7. Design of flexible coupling (Bush pin type)
8. Design of lever of a safety valve.

9. Design of eccentrically loaded bracket.
10. Design of pipe and pipe joints subjected to internal pressure.
11. Design of shaft carrying one pulley and supported in two bearing.
12. Design of Coupling and Detailed Working drawings with assembly.
13. Design of bolted, riveted and welded joints for transverse and eccentric loading.
14. Design of Gear Drive involving Gears, Shafts, and Keys with working drawings.
15. One assignment using CAD package on any one of the exercises.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

5PE08 TOOL ENGINEERING – I – Lab.

Pra
Practical : 02 Hrs/ w **Practical Term Work:** 25
Tutorial : ____ **Practical / Oral Exam:** 25
Credits : 01

Course Objective:

- Student should have the basic knowledge of how to design various tools used for machining (metal cutting), Student should be able to design Single point tool, Circular and flat form tools, drill, broach. Student should also have the knowledge of selecting proper tool which will give the desired quality in the most economical way.

PRACTICALS :

At least six experiments based on above syllabus as given below:

1) Measurement of forces on lathe tool dynamometer.
2) Drawing and design of single point tool.
3) Drawing and design of circular form tool for two jobs.
4) Drawing and design of flat form tools.
5) Design of broach.
6) Study of geometry of drill and reamer and measurement of axial thrust and torque by drill tool dynamometer.
7) Study of geometry of taps and dies.
8) Study of geometry of gear cutting tools.

A Journal / Report on experiments conducted shall be submitted by each student. Practical examination shall be vivavoce based on above practical and the syllabus of the course.

5PE09 COMMUNICATION SKILLS – Lab.

Practical : 02 Hrs/ w
Tutorial : ____
Credits : 01

Practical Term Work: 25
Practical / Oral Exam: 25

Course Objective:

- On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and communication for technical English language, actively participate in group discussions and interviews and bit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and action. The sample list of experiments is given below. This list can be used as guideline for problem statements but f scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.
  1. Assignments and tests for vocabulary building
  2. Technical report writing
  3. Group discussions
  4. Interview techniques
  5. Projects and tasks such as class news letter
  6. Writing daily diaries and letters
  7. Interactive language laboratory experiments.

TEXT BOOKS :

1) Norman Lewis : Word Power Made Easy
2) Ghosh: "Technical Communication", Oxford University ress.
http://www.teachingenglish.org.uk

5PE10 COMPUTER APPLICATIONS IN PRODUCTION ENGINEERING – Lab.

Practical : 02 Hrs/ w
Lecture : 01 Hrs/ w
Credits : 03

Practical Term Work: 25
Practical / Oral Exam: 25

Course Objective: Student will

- Understand and practical knowledge of 2D and 3D modeling of various part models.
- Have a good understanding of the various kinds of databases and the support they provide to different levels of management.
- Be able to use SQL with confidence to implement a relational database, and to maintain and access data in relational databases
- Be able to use Word, Excel and Presentation documentations.
- Have a good understanding of various Numerical, Statistical Analysis and its plots.

UNIT – I: MODELING SOFTWARE:

1) Sketching, selection of sketch plane, creating feature on work plane, extrude, dimensioning sketches, constraining sketches.
2) Create Rectangle, Circle, and Polygons. Extrude these to make box, cylinder & prism and dimension the above part, change size by editing dimensions & using constraints.
3) Create various drawing views of the 3-D parts.
4) Extrudes to face/plane, intersect, face draft, 3D rounds, 3D fillets & 3D chamfers, setting & modifying feature dimensions, history based part modification.
5) Use extrudes commands to make holes through the above objects. Also face drafts a part on another part.
6) Create 3-D rounds and fillets on box corners and Use history to modify above feature and their dimensions.

UNIT II : DBMS SOFTWARE:

1) Design and draw an ER diagram using standard notations for given problem definition
2) Convert given ER diagram into Database Tables.
3) Create Database Tables and Indices in back end Database like / MS ACCESS / ORACLE / SQL Server / My SQL using SQL DDL statements and applying all required constraints on Tables and/or Tuples. *(Create at least 03 tables using all types of possible constraints, and relationship (foreign key) between them.)*
4) Use SQL DML statements such as INSERT, UPDATE, DELETE to insert the data into tables and to update/delete the data inserted into/from tables if required.
5) Write and execute SQL queries to extract information from the tables.
6) Study on any two of the following:
   a) Inter-organizational and global information systems
   b) Functional and enterprise system
   c) Intelligent systems in Business.
   d) Electronic Commerce (E-Commerce).

UNIT III: NUMERICAL & STATISTIC AL ANALYSIS SOFTWARE (MATLAB / PYTHON):

1) Matrices and array manipulation;
2) Solution of linear algebra and nonlinear systems;
3) Input/output and simple plotting (2D and 3D plot)

4) Data analysis and Statistics;
5) Initial value and boundary value problems;
6) Interpolation (global, piecewise, regression);
7) Numerical integration algorithms;

UNIT IV: OFFICE (Microsoft / OpenOffice):

1) Word processing: MS-Word, word basics, formatting text and documents, working with header and footer, footnotes, endnotes, tables and sorting, graphics, mail merge and macros.
2) Spreadsheets and their uses in business, Excel basics, rearranging worksheets, excel formatting techniques, using functions, chart features and working with graphics in excel.
3) Power Point: Basics, working with texts and graphics in Power Point.

TERM WORK:

1) Minimum Two practicals from each on Unit I, II and III
2) Prepare a mail merge application using Word and Excel.
3) Prepare a Presentation on any one Topic from V semester syllabus A Journal / Report on experiments conducted shall be submitted by each student. Using. and presented by using .
   Practical examination shall be viva-voce based on above units, taken jointly by internal & external examiner.

TEXT BOOKS:

1) "MASTERING CAD CAM" By Ibrahim Zeid, 2005, TMH, ISBN 0-07-059411-2
2) "DATABSE MANAGEMENT AND ORACLE PROGRAMMING", By S S KHANDARE, 2004, S CHAND & Co. NEW DELHI , ISBN 81-219-2283-6
3) "Getting Started with MATLAB, By Rudra Pratap, 2010, Oxford University Press, NEW DELHI, ISBN 978-0-19-806919-5

REFERENCE BOOKS:

1) "INTRODUCTION TO DATABASE MANAGEMENT", By Dr Madhulika Jain, 2002, BPB PUBLICATION, NEW DELHI, ISBN 81-7656-638-1
2) "Pro/Engineering Wildfire for Engineers and Designers" By Prof. Sham Tickoo, 2003, Wiley Dreamtech India Pvt. Ltd. New Delhi, ISBN 81-7722-413-1

SIXTH SEMESTER

6PE01 TOOL ENGINEERING - II

Lecture : 04 Hrs/ w
Tutorial : 01 Hrs/ w
Credits : 05

Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objective:

- Student should have the basic knowledge of how to design various tools used for machining (metal cutting), Student should be able to design jigs, fixtures, press tools and dies. Student should also have the knowledge of selecting proper jigs, fixtures and forming process / tools, which will give the desired quality in the most economical way

SECTION-A

UNIT-I & II : Jigs & Fixtures : Design economics, principles of locations, types of location, preparation of jamming problem of chips & dust in location, use of dowels, redundant location, principles of clamping, types of clamps, power clamping drill bushes, types of drill jigs and their design, milling fixtures, turning fixtures, grinding & broaching fixtures, indexing devices in jigs of fixtures. (14)

UNIT-III : Rolling : Principle, classification of rolling mill, construction of rolling mill, layout of rolling mills, maximum permissible reduction in one pass, no. passes, roll pass design, box pass and oval pass, defects in rolling, sectional rolling passes, rolling torque of power.
Extrusion : process fundamental; forward, backward, impact, hydrostatic extrusion, pressure required in extrusion. (10)

SECTION-B

UNIT-IV & V : Press Tools : Classification of presses, shear action in die cutting operation, clearance, cutting forces, shear on punch and die, centre of pressure, classifications of cutting operation, operating of metals, drawing fundamental, types of die construction, function of nomenclature of die components, planning for cupping operation.
Miscellaneous dies : Horn die, cam action die, rubber & bulging, sub-pressing die. (14)

UNIT-VI: Forging : process fundamental, classification & schedule of forging equipment, classification of forging process, type of forging product, perform stages & design of product for close die forging, shape of perform stages for class III forgings, strength of forged component, trim ting, mounting of dies, non classified forgings upset forging. (10)

TEXT BOOKS:

1) PRODUCTION ENGINEERING By P C Sharma
2) Tool Design - Donaldson, T.M.H.

REFERENCE BOOKS:

1) An Introduction Jig & Tool Design - EKBs, T.M.H.A., Kempster.

2) Jigs & Fixtures - P.H.Joshi, T.M.H.
3) Rolling Practice - Burtsev, MIR.
4) Techniques Press Working Sheet Metal - Eary, P.H. Inc.
5) Fundamentals of Tool Design - P.H.Astme.
6) Manufacturing Technology - P.N.Rao, T.M.H.

6PE02 METROLOGY AND QUALITY CONTROL

Lecture : 03 Hrs/ w
Tutorial : 01 Hrs/ w
Credits : 04
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- Future manufacturing processes will require smaller tolerances than currently obtained to achieve the desired quality and reliability. Designers of components and machines will need a better understanding of the potential error sources and the way they will influence the final component. This course will build the foundations for dimensional metrology and error analysis to give the student the ability to predict the potential precision - that is, the accuracy and repeatability - of a new machine design. The course will:
  - Describe the foundations of mechanical metrology
  - Discuss the instruments currently used for precision measurement, their operating principles, advantages and limitations
  - To study how to set up the measurements and how to use the results to evaluate the performance of the machine
  - Develop an understanding of techniques for error analysis and performance prediction

SECTION - A

UNIT-I: i) Standards of measurements: principles of measurements, line and end standards, slip gauges, end bars, wave-length standards, classification of standards.

ii) Interchangeability. Universal and local interchangeability, selective assembly, concept of limits, tolerance and allowances, types of fits and gauges. B.S. system and Indian standard specification for limits and fits, design of plain limit gauges and their manufacture.

ii) Screw thread limit, fits, design of screw thread limit gauges. (8)

UNIT-II: i) Measuring instruments: 1. Linear measurements - length measuring instruments based on Vernier principle, Micrometers, Dial gauges.

ii) Comparators: various comparators such as mechanical, electrical, and electronic optical and pneumatic comparators, their principle of operation and application.

iii) Angular measurements: Vernier and Universal Bevel protractor, Sine bar, levels, clinometers, optical dividing head. Angular slip gauges, taper gauges, autocollimeter.

iv) Optical instruments: Projector, tool makers' microscope, interferometers. (8)

UNIT-III: Measurements :

i) Screw thread measurement: measurement of elements of screw threads, major & minor pitch and effective diameters, errors in screw thread elements and their effects, external and internal screw threads.

ii) Gear measurements: inspection of gears for tooth thickness, measurement of tooth profile, pitch measurement, alignment error, master gear, Parkinson gear tester.

iii) Surface roughness: surface texture measurements and gauging, surface roughness in various manufacturing process.

iv) Geometrical features: flatness, squreness, roundness, cylindricity.

v) Automated inspection: in process gauging and principle of co-ordinate measuring machine. (7)

SECTION – B

UNIT-IV: i) Basic concepts of quality and quality control: fitness, for use, quality characteristics, parameters of fitness for use quality function, quality control, quality assurance.

ii) Quality policies and objectives: the need for quality policies, formulation of quality policies, quality objectives for break through and control.

iii) Quality costs: phases in quality cost program, discovering the optimum quality cost.

iv) Process acceptance is product acceptance, advisory Vs. mandatory process, quality mindedness, quality control circles, vendor inspection, vendor rating, process capability study. (8)

UNIT-V: Statistical quality control : importance of statistical methods in quality control, basic philosophy and principles of sub grouping, meaning of statistical control, variables and attributes, measurements and inspection, different types of control charts (X-R, MP, P and C charts) (7)

UNIT-VI: Acceptances sampling : sampling inspection, viz hundred percent inspection, basic concepts of sampling inspection, operating characteristics curve, conflicting interests of consumer and producer's producers and consumer's risk, AQL, LTPO, AOQL, Single and double sampling plans, acceptance/ rejections, acceptance rectification plans. (7)

TEXT BOOKS:

1) Engineering Metrology : R.K.Jain
2) Engineering Metrology: I.C.Gupta
3) Statistical Quality Control : Gupta R.C.

REFERENCE BOOKS:

1) Quality Control Hand Book : J.M.Juran
2) Statistical Quality Control : Grant
3) Metrology and Measuring Instruments : M.R.Taher.
4) Engineering Metrology : K.W.B.Sharp,
5) Statistical Quality Control : Grant E.L., R.S.Leavenwogth.

6PE03 MACHINE TOOL DESIGN

Lecture : 04 Hrs/ w
Tutorial : 01 Hrs/ w
Credits : 05
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- The main objective of this course is to offer the student the basics of Machine Tool Design.
- To make the students understand the concepts & broad principles of contents of the course.
- Sensitizes the students of the importance of course in real life environment.
- Study of procedure to design various machine tool members under different loading.

SECTION-A

UNIT-I: Design of spur, helical, bevel and worm gear drives, design of belt and chain drives. (8)

UNIT-II: Design of clutches and brakes, journal bearing and lubrication, selection of ball and roller bearings. (8)

UNIT-III: General classification, general requirements of m/c tools, aim of speed and feed rate regulation, classification of speed and feed boxes, step less regulation of speed and feed rates. (8)

SECTION-B

UNIT-IV : Design of speed and feed boxes :- stepped regulation of speed, break up of speed step, selection of best possible structure diagram, speed chart, design of feed box, determining the numbers of teeth of gears. (8)

UNIT-V: Design of m/c tool structure :- Functions, and their requirements design criteria, materials used, profiles used, basic design procedure, guide ways, slide ways and antifriction ways, shapes and material used, method of adjusting clearance in slide ways, protecting devices for slide ways. Design of spindles. (10)

UNIT-VI: Regulation of speed in electrical control circuits, electrical circuits diagram for starting and stopping the motor of a m/c tool, electrical brakes, electromagnetic clutch, ferromagnetic power clutch, thermal relay in m/c tools, electrical automation in m/c tools. Acceptance test of lathe and drilling. (6)

TEXT BOOKS :

1. MACHINE TOOL DESIGN, N. K. Mehta, Tata McGraw Hill, ISBN 0-07-451775-9.
2. DESIGN OF MACHINE TOOL, D. K Pal, S. K. Basu, 4th Edition. Oxford IBH 2005, ISBN 81-204-0968

REFERENCE BOOKS:

1. PRINCIPLES OF MACHINE TOOL, Bhattacharya and S. G. Sen., New central book agency Calcutta, ISBN 81- 7381-1555.
2. MACHINE TOOL, N. S. Acherkan, Vol. I, II, III and IV, MIR publications.
3. DESIGN PRINCIPLES OF METAL CUTTING MACHINE TOOLS, F. Koenigsberger, The Macmillan Company New York 1964.
4. MACHINE TOOL DESIGN HANDBOOK, C.M.T.I. Bangalore, (TMH)
5. DESIGN DATA HANDBOOK, K. Mahadevan and K. Balveera Reddy, C.B.S. Publishers & Distributors
6. Product Design and Manufacturing, (3/e), A. K. Chitale and R. C. Gupta, Prentice- Hall of India Pvt. Ltd.

6PE04 WORK STUDY

Lecture : 04 Hrs/ w
Tutorial : _____
Credits : 04
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- The Work-Study Program encourages community service work and

work related to each student's course of study. It develops scientific methods for doing work.

- Establishes goals for productivity and systems of reward for meeting goals. Also trains the personnel in how to use the methods and thereby meet the goals.

SECTION-A

UNIT-I : Work Study: Definition, objectives and scope of work study, Contribution of Taylor and Gilbreth, Work study and Productivity. Problems in increasing productivity through work study. The human factor in the application of work study. Classification of work study. (8)

UNIT-II: Method study: Definition, objectives and basic procedure of method study, symbols in charting, different recording techniques, analysis and critical examinations of operation and development of improved method. Principals of motion Economy, Introduction to memomotion and micromotion study. (8)

UNIT-III: Charts and Diagrams: Study of Operation process chart, Flow process chart, Multiple activity charts, Two handed charts. SIMO chart, Flow and string diagram cycle graph, crono cycle graph, (8)

SECTION-B

UNIT-IV: Work Measurement: Definition of Time study, basic procedure and equipments of time study. Breaking of an operation into elements. Allowances and their applications, Calculation of standard time. (8)

UNIT-V: Work sampling :- Concept, steps, advantages, applications and limitations of work sampling, sampling errors and confidence level, Introduction to standard data and synthetic time study devices. Introduction to Job Evaluation system and its necessity; Job Analysis, Description and Evaluation. Evaluation Systems like Factor Comparison, Point System, Merit rating. (8)

UNIT-VI: Application of Work Study: Introduction of work study into organization, its application in manufacturing and service sector, training of personnel in work study, Wage incentives plans, Case studies and analysis. (8)

TEXT BOOKS :

1. ILO, "INTRODUCTION TO WORK-STUDY", Universal Publishing Company. ISBN 81-8502700-4.
2. "WORK STUDY" , By O. P. Khanna, Dhanpat Rai Publications, New Delhi.
3. Work Study And Ergonomics by S.K. Sharma, Savita Sharma, 1 st Ed. , S.K. Kataria & Sons , 4760-61/23, Ansari Road, Daryaganj, New Delhi-110002 (India) ISBN 9788188458349

REFERENCE BOOKS:

1. Yoga M., JOB EVALUATION, National Productivity Council; New Delhi, India; 1971; First Edition
2. Zandin Kjell.B, "MOST WORK MEASUREMENT SYSTEMS". Publisher: M. Dekker ISBN-10: 0-8247- 6899-X, ISBN-13: 9780824768997
3. Maynard H. B., "INDUSTRIAL ENGINEERING HANDBOOK", 3rd edition, McGraw Hill Book Company. ISBN 0-07-041084-4
4. Text Book of Work Study And Ergonomics, By Suresh Dalela and Saurabh Dalela

6FEPE05 FREE ELECTIVE - II
(01) INDUSTRIAL AUTOMATION

Lecture : 03 Hrs/ w
Tutorial : _____
Credits : 03
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- To understand &implementation of Basic & Application sensor for simple factory Automation
- The course is aimed to study the concepts and implementation techniques of Industrial Electronics and Industrial Automation.
- It provides the understanding of PLC hardware and programming techniques.
- Furthermore, it provides the basic understanding of Hydraulic and Pneumatic systems
- To understand basic skills useful in automated machines and equipment and describe the terms and phrases associated with industrial automation.

SECTION – A

UNIT- I: Automation of assembly lines : Concept of automation, mechanization and automation, Concept of automation in industry, mechanization and automation, classification, balancing of assembly line using available algorithms. Transfer line-monitoring system (TLMS) using Line Status, Line efficiency. Buffer stock Simulation in assembly line. (7)

UNIT- II: Automation using hydraulic systems: Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis. Servo valves, electro hydraulic valves, proportional valves and their applications. (7)

UNIT- III: Automation using pneumatic systems : Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods – step counter method - compound circuit design - combination circuit design. Pneumatic equipments - selection of components – design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits. (8)

SECTION – B

UNIT- IV : Automation using electronic systems : Introduction, various sensors, transducers, signal processing, servo systems, programming of microprocessors using 8085 instruction, programmable logic controllers. (7)

UNIT- V: Automated work piece handling: Working principles and techniques, job orienting and feeding devices. Transfer mechanisms automated feed cut of components, performance analysis. Uses of various types of handling systems including AGV and its various guiding technologies. (8)

UNIT- VI: Introduction to robot technology: Robot physical configuration and basic robot motions, Types of manipulators- constructional features, servo and non servo manipulators. Feedback systems and sensorsencoders and other feedback systems, vision, ranging systems, tactile sensors. Programming languages description of VAL and other languages. Artificial intelligence-legged locomotion and expert systems. (8)

TEXT BOOKS:

1. Groover, M.P., CAD/CAM- Prentice Hall
2. Yoram Koren, Robotics for Engineers- McGraw Hill 1992
3. Paul, R.P., Robot Manipulators- MIT Press 1993

REFERENCE BOOKS:

1. Andrew Parr, " Hydraulic and Pneumatic ", (HB), Jaico Publishing House,
2. Bolton. W. " Pneumatic and Hydraulic Systems ", Butterworth - Heineman,

6FEPE05 FREE ELECTIVE - II
(02) ENTREPRENEURSHIP DEVELOPMENT AND ENGINEERING ECONOMICS

Lecture : 03 Hrs/ w
Tutorial : _____
Credits : 03
Internal Assessments: 20
University Exam: 80
Theory Paper (Hrs.) : 03

Course Objectives:

- Engineering Economics gives the students an overview of the economics methods employed in effective engineering decisions as related to the designing, planning and implementation of successful projects. It emphasizes the practical benefits of the applications of such tools as Time Value of Money calculations, Depreciation, Replacement Analysis, Benefit to Cost Ratios, Break-even Analysis, and Life Cycle Cost.
- Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise.

SECTION – A

UNIT I : Industrial Economics : Basic Concepts, Demand Analysis, Types of Demand, Determinants of Demand, Methods of Demand Forecasting, Supply, Law of Diminishing Marginal Utility, Elasticity of Demand. (7)

UNIT II : Factors Of Production, Production Function, firm and Industry, Laws of Return, Cost Concepts, Fixed Variable, Average, Marginal And Total cost, Break Even Analysis, Depreciation Cost, Taxation System, Types of Taxes. (8)

UNIT III: Optimum size of Unit, Optimum Firm, Industrial Combinations, Causes for the Growth of combinations. Forms of combination In India, Various Competitive Situations, Perfect, Monopoly, Monopolistic, Oligopoly. Price Determination Under These Situations. Impact of Globalization on Indian Economy. (7)

SECTION – B

UNIT IV: Concept of Entrepreneurship, Definition, competencies Of Entrepreneurs, Entrepreneurial Functions, Achievement, Motivation, Types of Enterprises. Policies Governing Small Scale Industries, Procedure to Set Up Small Scale Industrial Unit, Advantages and Limitations Of SSI. (8)

UNIT V: Market Survey And Factors Governing Product Selection. Project Report Preparation, Technical, Financial and Marketing Analysis of the Project. Factors Governing the Selection of Site, Plant And Machinery. Financial and Ratio Analysis. (7)

UNIT VI: Role Of Consultancy organizations, Role of District Industries Center, State Ind. Develo0pment Corporations, Banks And Financial Institutions, Latest SSI Intensive Schemes (To be confirmed From DIC Time to Time) Determination Of Working Capital Requirement, Industrial Overheads, Determination Of product Sales Cost. (8)

TEXT BOOKS :

1. D.Salvatore , "Managerial Economics in a global economy" Tata McGraw Hill
2. Reckie and Crooke., " Managerial Economics" Prentice Hall; 4 edition.
3. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi

REFERENCES BOOKS ::

1. Khan M.Y., Jain P.K , "Management Accounting", Tata Mc Graw Hill, 1995.
2. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
3. Entrepreneurship: New Venture Creation - David H. Holt
4. Handbook of Small Scale Industry by PM Bhandari

6PE06 TOOL ENGINEERING – II – Lab.

Practical : 02 Hrs/ w **Practical Term Work:** 25
Tutorial : _____ **Practical / Oral Exam:** 25
Credits : 01

Objectives:

- To meet the requirements of industry in the fields of jigs, fixtures and dies.

- To train students in designing different tools drill jigs, turning fixture, milling fixture and forming dies.
- Student should have the knowledge of metal forming process.

TERM WORK:

At least eight designs based on above syllabus as given below:

1) Design and drawing of drilling / reaming jigs. - **3 sheets**
2) Design and drawing of milling fixtures. - **3 sheets**
3) Design of drawing of press tools - **3 sheets**
   *(For all above 3 designs at least **one printout of each design** is showing manufacturing drawing with tolerances, material specification and heat treatment using well known commercial available drafting package.)*
4) Design of drawing of forging dies - **1 sheet**
5) Problem on roll pass design - **1 sheet**
6) Design and drawing of one progressive die. - **1 sheet**
7) Design and drawing of one drawing die. - **1 sheet**
   (Out of above 4 designs take printout of any one design using well known commercial available drafting package.)
8) 3D model of various elements of jigs and fixtures using well known commercial available drafting package.

   Above mentioned design work should be done by a batch of not more than ten students for each component.

   A Journal / Report on experiments conducted shall be submitted by each student. Practical examination shall be vivavoce based on above practical and the syllabus of the course, taken jointly by internal & external examiner.

6PE07 METROLOGY AND QUALITY CONTROL - Lab.

Practical : 02 Hrs/ w **Practical Term Work:** 25
Tutorial : _____ **Practical / Oral Exam:** 25
Credits : 01

Objectives:

- To develop hands-on-skills on tools and techniques of measurements for industrial Metrology and Quality Control.
- Making the students well acquainted with basic concept to quality and it's corelational criteria's to implement the concept of quality.
- Students should be able to apply the principles of Metrology and Quality Control system.
- To provide the students with a sound basic background in a vast field of Metrology and Quality Control and understand its practical applications.
- Develop an understanding of techniques for error analysis and performance prediction

TERM WORK:

Term work shall consist of eight experiments based on the following:-

1) Design and drawing of at least two types of limit gauges.
2) Problem solving and sketching figures for Selection of slip gauges
3) Problem solving and sketching figures for angle gauges
4) Study of comparators
5) Study of angular measurement
6) Study of screw thread measurement
7) Measurement of Gear tooth thickness using Gear tooth Vernier caliper and Span Micrometer
8) Study of flatness and squareness measurement
9) Measurement of angle by Sine bar / Sine center.
10) Study and Experiment on Profile Projector.
11) Measurement of Screw thread parameters using Floating Carriage Micrometer.
12) Calibration of instrument using Calibration setup.

6PE08 MACHINE TOOL DESIGN – Lab.

Practical : 02 Hrs/ w
Tutorial : _____
Credits : 01

Practical Term Work: 25
Practical / Oral Exam: 25

Objectives:

- To have develop hands on skills in the subject
- Develop the practical aspects of the theory knowledge
- Application of the theory with Understanding of fundamentals of the subject and be in a position to explain the procedure of the experiments.

TERM WORK:

Practical Minimum 8 out of following:

1. Design and working drawing of Speed Gear Box
2. Design and working drawing of Feed Gear Box
3. Design of clutches or breaks drive.
4. Design of belt or chain drive.
5. Design of electrical circuits.
6. Inspection and acceptance test.
7. Study of Step-less Drives
8. Design of Base
9. Design of Bed
10. Design of Column
11. Design of Slide ways
12. Design of Spindle
13. Power Screw Design (Sliding & Rolling friction)
14. Design of Guide ways

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

6PE09 MINOR PROJECT (MACHINE SHOP PRACTICE)

Practical : 03 Hrs/ w
Tutorial : _____
Credits : 03

Practical Term Work: 25
Practical / Oral Exam: 25

Objectives:

- Applying tools and methodologies of a field of practice in a Machine Shop Project.
- Applying skills and academic knowledge in a workplace.
- Application of the theory with Understanding of fundamentals of the subject and be in a position to explain the procedure of the experiments.

TERM WORK:

Term work shall consist of minimum **02** composite jobs involving operations on the **Lathe, Shaping, Milling, Drilling and Slotting Machine.**

Each student shall submit details of operations, process analysis along with flow process charts for the jobs prepared and time estimation of each job in the form of journal.

PRACTICAL EXAMINATION:

Practical examination shall consist of assessment of above term work and oral based on above term work.

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRONICS & TELECOMMUNICATION ENGINEERING
SEMESTER PATTERN (C. G. S.)
FIFTH SEMESTER

5XT1/ 5XN 1 ELECTRONIC DEVICES AND CIRCUITS-II

SECTION-A

Unit I : Linear wave shaping using RC and RL circuits, analysis and calculations of RC low pass and high pass filters, analysis of clipping and clamping circuits using diodes and switching transistors.

Unit II : Switching characteristics of semiconductor devices : Diode as switch, transistor as a switch, characteristics and analysis, FET as a switch, characteristics, JFET, CMOS, switching speed of devices : Schottky diode and transistor, Logic gates.

Unit III : Collector coupled bistable, monostable and astable multivibrators, Time base generators & Sweep Generators. Boolean Algebra, Number systems, Gray codes, Arithmetic operations using Two's compliments.

SECTION-B

Unit IV : Study and analysis of Digital Logic Families : RTL, DTL, HTL, TTL, ECL, IIL, CMOS, and their characteristics, tri-state logic,5400/7400 TTL series.

Unit V : Flip-flops : R-S, J-K, Master slave J-K, D-type, T-type; registers and counters, adders and subtractors using logic gates, D/A converters and types: Weighted resister, R-2R ladder. A/D converters and Types: Ramp, Dual slope, Successive approximation.

Unit VI : Types of semiconductor memories, sequential memories, 2 and 4 phase ratioless shift registers, static shift registers, implementation of ROM (ROM, PROM, EPROM, EEPROM) BJT RAM cell, MOS-RAM, CCD memories.

BOOKS RECOMMENDED :

1) Jacob Millman & Herbert Taub : "Pulse Digital & Switching waveforms", McGraw Hill International Book Co.
2) Taub H. and Schillings D.L., London, : "Digital Integrated Electronics", McGraw Hill Company.
3) R. P. Jain : "Modern Digital Electronics", Tata McGraw Hill, New Delhi 1998.

4) Malvino A.P. & Leach D.P. : "Digital Principles &Applications", TMH Publishing Co., New Delhi (3rd Edition).

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5XT2 / 5XN2 POWER ELECTRONICS

SECTION-A

Unit I : SCR, Triac, LASCR, Diac-construction, characteristics, two transistor analogy for turning ON of a SCR, turn ON mechanism, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuits. Introduction to GTO, power transistor, power MOSFET, IGBT - their construction & characteristics.

Unit II: Series parallel operation of SCRs, static & dynamic equalizing ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, Protection of SCRs against di/dt, dv/dt, radio freq., interference, over voltage, over current.

Unit III: Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters. Three phase half controlled bridge and fully controlled bridge rectifier.

SECTION-B

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, output voltage and waveform control, principle of operation for three phase bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter, current source inverter, harmonics reduction techniques.

Unit V: Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper and AC chopper. Basic principle of cycloconverter, single phase to single phase cycloconverter.

Unit VI: Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, Static ckt. breaker, UPS, fan speed regulator, principle of soft start ckts, electronic ballast.

TEXT BOOKS:

1) M. Ramamoorthy, Thyristor and their application.

2) M. H. Rashid - Power Electronics Circuits, Devices and Application, Pearson Edu.
3) SCR Manual GE.

REFERENCE BOOKS :

1) Joseph Vithayathil, "Power Electronics: Principles and Applications", McGraw-Hill
2) Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics: Converters, Applications, and Design", Wiley
3) K. Hari Babu – Power Electronics, Scitech Pub..
4) Devdatta Y. Shingare, A Text book of Industrial & power electronics, Electrotech Pub. Satara.
5) J. S. Katre, Power Electronics, Tech-max Pub. Pune.

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5XT3 / 5XN3 CONTROL SYSTEM ENGINEERING

SECTION-A

Unit I : Basic definition; closed and open loop systems; transfer function, block diagrams, derivation of transfer functions of physical systems, signal flow graphs, basic control action.

Unit II : Time Response Analysis: Typical test inputs, , Impulse response function, Transient Domain specifications, Analysis of first, second & higher order systems, Steady state analysis: steady state error and error constants, Dynamic error coefficients.

Unit III:

1. Stability Analysis: stability of control system, Routh Hurwitz's stability criterion,

2. Roots Locus: Introduction to Root Locus method; Root Locus plots, Rules for constructing root loci, stability analysis of systems using Root locus, concept of dominant closed loop pole pair, Root contour plots, effect of addition of zeros & poles.

SECTION-B

Unit IV : Introduction of frequency response, Bode plots, stability margins on the Bode plot, stability analysis of systems using Bode plots, polar plots, Nyquist stability criterion, relative stability.

Unit V : State Space representation of systems, conversion of state variable models to transfer functions, conversion of transfer functions to state variable models, solution of state equations, concepts of controllability and observability.

Unit VI : Sample Data Control Systems : Representation of sampled data (Discrete) systems, review of Z-transforms, Sampler and hold ckt., Zero order hold, sampling theorem, Z-transform analysis of sampled data control systems (open & closed loop systems), Z transform of systems. Solution of difference equation by Z-transform methods. Response of discrete systems. Pulse Transform functions of open loop, closed loop systems with different sampler locations. Digital controller & its transfer functions, Stability analysis of discrete time system using bilinear transformation.

TEXT BOOK :

1. Nagrath I. J. and M. Gopal, "Control Systems Engineering", 5th Ed. New Age International.
2. K. Ogata : Modern Control Engineering, Fourth Edition(PHI)

REFERENCE BOOKS:

1) Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 11th Ed., Pearson Education.
2) M. Gopal : Digital Control Systems Principles & Design (TMH)
3) Norman S. Nise, "Control System Engineering", 5th Edition, Wiley.
4) Bhattarcharya: Control System Engineering, 2nd Edition (Pearson Education).

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5XT4 / 5XN4 COMMUNICATION ENGINEERING-II

SECTION-A

Unit I : AM Transmitters : Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter, Generation of SSB-SC by filter method, phase-shift method & third method (weavers).

Unit II : AM Receivers : TRF receiver, Super heterodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, selectivity sensitivity, fidelity Image rejection ration, communication receiver, SNR of DSB-FC, DSB-SC & SSB-SC

Unit III : FM Transmitters : FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparison, pre-emphasis and De- emphasis. Stereo FM Transmitter.

SECTION-B

Unit IV : FM Receivers : Details of FM receiver blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, Audio Amplifier, AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster Seeley and ratio detectors, Stereo FM receiver, Noise in FM Reception, FM threshold effect.

Unit V: Pulse Modulation Techniques: The sampling theorem, Sampling of Band-Pass Signal, Linear and Non linear quantization, Aliasing effect, Aperture effect, Reconstruction filter, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Time Modulation, PCM, DM, ADM

Unit VI : Telephone Switching Techniques : Introduction to Switching System, Pulse dialing, Touch tone dial telephone, Space Division Switching SPC, Centralized and Distributed SPC, Time Division Switching : Basic Time Division space switching, Time Division time switching, Time multiplexed space switching, Time Multiplexed time switching, EPABX.

Text Books:-

(1) Taub and Schilling D.L. : Principles of Communication Systems, McGraw Hill Co, Tokyo, 1994 (II Ed.)
(2) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co., New Delhi (Third Edition)
(3) T. Vishwanathan : " Telecommunication Switching systems and Networks", PHI learning Private Ltd., 2009

Reference Books :

(1) Wayne Tomasi, "Electronic Communication Systems", Pearson Education, third edition
(2) Simon Haykin : "Communication System, John Wiley and Sons Ltd., New York, (Third Edition), 1994
(3) B. P. Lathi : " Modern Digital and Analog Communication systems" 4th Edition Oxford University Press.
(4) Hari Bhat: "Analog communication", 2nd Edition Pearson India, 2010
(5) S. Kundu: " Analog and Digital communication", Pearson India 2010

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FREE ELECTIVE- I
5FEXT5 / 5FEXN5 (1) CONSUMER ELECTRONICS
SECTION-A

Unit I : Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalizers and Mixers, Electronic Music Synthesizers, Commercial Sound, Theater Sound System **(8 Lectures)**

Unit II : Video Systems and Displays: Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Remote Controls, Video Telephone and Video Conferencing **(8 Lectures)**

Unit III : Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, Computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System. **(8 Lectures)**

SECTION-B

Unit IV : Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System **(8 Lectures)**

Unit V : Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM, Dish washers **(8 Lectures)**

Unit VI : Calculators: Structure, internal organization, servicing; In-Car-Computers: electronic ignition, electronic ignition lock system, Antilock Braking System (ABS), Electronically controlled Suspension (ECS), Instrument panel displays, ultrasonic car safety belt system, Air Bag System, Vehicle proximity detection system, car navigation system **(8 Lectures)**

Text Book:1. Consumer Electronics S P Bali Pearson Ed 2005

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FREE ELECTIVE- I
5FEXT5 /5FEXN5 (2) FIBER OPTICS
SECTION-A

Unit -I : Light Ray Theory
Propagation of light in different media : propagation of light in an optical fiber, Basic structure and optical path of an optical fiber, Acceptance angle and acceptance cone, Numerical aperture(NA) (General), Modes of propagation, Meridional and skew rays, Number of modes and cut-off parameters of fibers. **8 Lectures**

Unit - II: Losses and Dispersion in Optical Fiber

Fiber Losses : Attenuation in optic fibers, Materials losses, Rayleigh scattering losses, Absorption loss, Leaky modes, Bending losses, Radiation losses.

Dispersion in optical fiber: Electrical Vs. optical bandwidth. Bandwidth-length product, Intermodal dispersion, Mixing modes, Material chromatic dispersion. **(8 Lectures)**

Unit-III: Light Sources and Detectors for Optical Fiber (8 Lectures)

Light Sources : Introduction, LED (Light Emitting Diode), Processes involved, structure material and output characteristics of LED, Fiber LED coupling, Bandwidth, Spectral emission of LEDs, LASERS : Operation types, Spatial emission pattern, Current Vs. output characteristics.

Detectors : Introduction, Characteristics of photo detectors (General), Photoemissive type, Photoconductive and photo voltaic devices, PN junction type, PIN photo diode, Avalanche photo diode (APD).

SECTION-B

Unit -IV: Fiber optic Communication systems and Modulation

Fiber Communication systems : Transmitter for fiber optic communication, High performance transmitter circuit LED – Analog transmitter, LASER transmitter, Digital laser transmitter, Analog laser transmitter with A/D conversion and digital multiplexing, Fiber optic receiver, Fiber based modems : Transceiver.

Modulation : LED analog modulation, Digital modulation, Laser modulation, Pulse code modulation (PCM), Intensity modulation (IM). **(8 Lectures)**

Unit -V: Optical Fiber Communication application

Optical fiber communication systems : Introduction, Important applications of integrated optic fiber communication technology, Long haul communication, Coherent optical fiber Commun-ication, Principle of coherent detection.

(8 Lectures)

Unit -VI : Measurements on Optical Fibers

Introduction, Measurements of numerical aperture (NA),Measurements of Fiber- attenuation, Optical time Domain Reflectometry (OTDR), Measure-ments of dispersion losses, Measurements of refractive index, Cut-off wavelength measurement, Measurements of Mode Field Diameter (MFD),

(8 Lectures)

Text Books:

1. Optical Fiber Communications : Principles and Practices- John M. Senior (PHI)
2. Optical Fiber and Optical Fiber Communication Systems S. K. Sarkar (S. Chand and Comp.

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5XT6 / 5XN 6 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage. Comprehension – A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :-Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II : Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictorial devices.

Unit III : Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED:

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.

2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.

3) Raman Sharma "Technical Communication", Oxford University Press..

4) F. Frank Candlin : General English for Technical Students, University of London Press Ltd.

5XT7: Electronic Devices & Circuits-II Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XT1(Electronic Devices & Circuits-II)

5XT8: Power Electronics Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XT2(Power Electronics)

5XT9: Communication Engineering-II Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XT4 (Communication Engineering-II)

5XT10: Communication Skills Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XT6 (Communication Skills)

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6XT1/ 6XN1 DIGITAL INTEGRATED CIRCUITS

SECTION-A

Unit I : Combinational Logic Design: Function of binary variables, Boolean Algebraic Theorems, Standard form of logic functions, K-Map up to 5 variables, Quine McCluskey Method, Don't Care Conditions and its effects, Synthesis using AND-OR Gates **(8 periods)**

Unit II: Combinational Logic Design using 74/54 MSI chip series concerning to MUX, DEMUX, Decoders, Encoders, Comparators, Code converters, Priority Encoders, Parity Generator/Checker and BCD to Seven Segment Decoders **(8 periods)**

Unit III: Combinational Logic Design using ROM array, PLA, PAL, preliminary design concepts using FPGAs, N-bit binary adder using 7480, Look-ahead carry adder construction **(8 periods)**

SECTION-B

Unit IV: Design of counters and sequential networks. Analysis of clocked sequential networks, general models of sequential machines, equivalence and minimization networks, deviation of state graphs and tables, reduction of state assignments, SM charts **(8 periods)**

Unit V: Analysis of asynchronous sequential networks, derivation and reduction of primitive flow tables, state assignments and realization of flow tables, hazards, asynchronous sequential network design **(8 periods)**

Unit VI: Fault detection and location in combinational circuits. Paths sensitizing method, equivalent – normal – Form method (ENF), two level fault detection, fault detection and location in sequential circuit using circuit test approach **(8 periods)**

Text Books:

1. Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico Publication
2. Lee S. C., "Digital Circuit and Logic Design", PHI
3. Jain R. P. "Modern Digital Electronic Circuits and Systems", TMH

Reference Books:

1. Digital IC Reference data manuals
2. Texas Instruments Inc. Design with TTL ICs
3. Morris Mano, "Digital Electronics: Circuits and Systems", PHI
4. Parag K. Lala, "Fault tolerance and fault testable hardware design, B. S. Publications, Hyderabad

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6XT2 /6XN2 LINEAR INTEGRATED CIRCUITS

SECTION-A

Unit I: Operational Amplifier, block diagram of op-amp, Differential amplifier: gain expressions using h - parameters, constant current source, level shifting, transfer- characteristics, frequency response, frequency compensation methods, study of ICuA741, measurement of parameters of op-amp and offset nulling and their importance.

Unit II: Linear Applications of Op-Amp: Inverting and non inverting amplifiers, voltage followers (AC & DC), integrator, differentiator, differential amplifier, instrumentation amplifiers, precision rectifiers, RMS to DC converter, voltage to current converter, sinusoidal RC oscillators, constant voltage sources, frequency to voltage and voltage to frequency converter.

Unit III: Non Linear Applications of Op-Amp and Filter Circuits: Clipping and clamping circuits, comparator, zero crossing detector, Schmitt trigger, peak detector, astable, monostable and bistable multivibrator, voltage sweep generator.
Active filters : Butterworth filters using op-amp. Log and Antilog amplifiers.

SECTION-B

Unit IV: Voltage Regulator: Block schematic of regulator IC 723, regulated power supply using IC 723, short circuit protection, switch mode power supply, dual tracking regulators, regulator using 78**, 79**, and LM 317.

Unit V:1. Timers : Block schematic of IC 555, application of timer 555 as astable, monostable and bistable multivibrators, frequency divider, pulse stretcher, sawtooth generator, free running ramp generator, FSK generator.

Unit V: 2.Sample & hold circuit.

Unit VI:1. PLL: Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC-LM 565 and its applications as AM detector, FM detector and frequency translator.

Unit VI: 2. Introduction to Audio Function Generator IC 8038.

Text Books :

1) Gayakwad R.A. : OP-Amps and Linear Integrated Circuits, Prentice Hall of India Pvt. Ltd., New Delhi (Second Edition), 1980.
2) Robert F. Coughlin, Frederick F. Driscoll: Operational Amplifier and Linear Integrated Circuits, Sixth Edition, PHI Pub.

Reference Books :

1) Tobey J.E. and Grame J.E. : Operational Amplifier Design and Applications, International Student Edition, 1983.
2) T.R. Ganesh Babu, B. Suseela: Linear Integrated Circuits, Third Edition, Scitech Pub.

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6XT3/6XN3 INTRODUCTION TO MICROPROCESSORS

SECTION-A

Unit I: 8085 : Architecture, Register Structure, Addressing modes, Instruction set of 8085, Timing diagrams.

Unit II : Assembly Language Programming of 8085, Introduction to assemblers, Simulators, Stack, Subroutine. Address space partitioning schemes : Memory mapped I/O and I/O mapped I/O, Address decoding techniques.

Unit III: Interrupt system of 8085, software and hardware interrupts, Data transfer schemes: Serial data transfer through SOD and SID, USART 8251 and its interfacing.

SECTION-B

Unit IV : Internal architecture, programming and interfacing of PPI 8255, Programmable interval Timer/ Counter 8254, Introduction to DMA data transfer , DMA Controller 8237 and its interfacing.

Unit V : 8086 : CPU architecture, internal operations, addressing modes, instruction formats, execution timing.

Unit VI : Instruction set of 8086, Assembly language programming (ELEMENTARY PROGRAMMING) Assembly Directives, Operators.

Text Books:

1) A. K. Ray and K. M. Bhurchandi: Advanced Microprocessors and Peripherals, Architecture Programming and Interfacing, TMH.
2) Gaonkar R.S. : Microprocessor Architecture Programming and Applications with the 8085, Penram International Pub. (Third Edition), 1997.
2) Gibson G.A., Liu Y.C. : Microcomputer system the 8086/8088 family, Prentice Hall India Pvt. Ltd.

Reference Books:

1) Hall D.V. : Microprocessor and Interfacing Programming and Hardware, McGraw Hill Co., New York, 1986.
2) Data sheet manuals by INTEL.

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6XT4 DIGITAL COMMUNICATION

SECTION-A

Unit 1:- Introduction to Digital Communication System
Functional Blocks of Digital Communication System; Source Encoder and Decoder; Channel Encoder and Decoder; Modulator and Demodulator
Line Coding:- Need for Line coding; Properties of Line Coding; Unipolar RZ and NRZ; Polar RZ and NRZ; Bipolar NRZ (AMI); Split Phase Manchester Coding; Polar Quaternary NRZ Coding; HDB3 Coding Scrambler and Unscrambler **(6)**

Unit 2:- Information Theory
Measure of Information; Entropy and Information Rate of Long Independent and Dependent Sequences; Markoff Statistical Model for Information Sources; Entropy and Information rate of Markoff Sources

Source Encoding: - Huffman Encoding; Shannon's Encoding Algorithm; Shannon-Fano Algorithm;

Discrete Communication Channel: - Noiseless Channel; Deterministic Channel; Binary Symmetric Channel; Rate of Information Transfer over Discrete Channel; Capacity of Discrete Memoryless Channel

Continuous Channel: Shannon Hartley Theorem for channel capacity; Signal to Noise Ratio –Bandwidth Tradeoff **(12)**

Unit 3:- Bandpass Modulation and Demodulation techniques

BPSK, BFSK, ASK and DPSK generation and reception; Signal space diagram, PSD and Bandwidth of BPSK and BFSK systems; QPSK and MSK Transmitter and Receiver; Signal space diagram, PSD and Bandwidth of QPSK and MSK; Probability of Error of ASK,BPSK and BFSK systems; Comparison of Digital modulation systems

Coherent Detection: - Integrate and Dump Filter (SNR and Probability of Error); Optimum Filter (Transfer function and Probability of Error); Matched Filter (Impulse response and Probability of Error) **(10)**

SECTION-B

Unit 4:- Base Band Transmission

Base Band Binary PAM systems, Inter Symbol Interference, Base Band Pulse Shaping and Nyquist Criterion; Eye Diagram Correlative Coding: Duobinary Encoder with Pre-coder; Modified Duobinary Encoder; Modified Duobinary Encoder with Pre-coder

Equalization: Need for equalization; Transversal Equalizer (Problems Expected); Preset Equalizer; Adaptive Equalizer, Clock and Carrier Synchronization. **(8)**

Unit 5:- Error Control Coding

Introduction to Error Control Coding; Types of Errors; Methods of Controlling Errors;

Linear Block Codes: Matrix Description of Linear Block codes, Hamming Distance; Hamming Weight; Minimum Hamming Distance; Hamming Codes; Encoder for Linear Block code; Syndrome Decoding; Syndrome Decoder for (n,k) Linear Block Code; Error Detection and Correction capability of Linear Block Codes (Derivation expected)

Cyclic Codes: Properties of Cyclic Codes; Systematic and Non-Systematic generator Matrix, Parity Check Matrices for Cyclic Codes; Encoders for Cyclic Codes; Syndrome Decoding for Cyclic Codes

Convolution Codes: Time Domain Approach and Transform domain approach for convolution code generation; Code Tree and Code Trellis for Convolution code **(8)**

Unit 6:- Multiple Access Schemes and Spread Spectrum Communication

Multiple Access schemes: Time Division Multiple Access, Frequency Division Multiple Access; Code Division Multiple Access; Space Division Multiple Access

Spread Spectrum Systems: Notion of Spread Spectrum; PN Sequence Generation (Problems Expected); Direct Sequence Spread Spectrum (DSSS); Jamming Margin; Processing Gain; E_b/N_o Ratio; Frequency Hopped Spread Spectrum; Slow and Fast frequency Hopping. **(6)**

TEXT BOOKS:

1. Shanmugam K.S. :"Digital & Analog Communication Systems", John Wiley & Sons, New York, 1996.
2. Lathi B. P. :"Modern Digital and Communication Systems", Holt Rinchart and Winston Inc., New York, 1993.
3. Simon Haykin : "Digital Communication" , John Wiley and Sons, Pvt. Ltd., Singapore.

REFERENCE BOOKS :

1. Proakis J. K. :"Digital Communication", Mc-Graw Hill Book Co., London (Second Edition)
2. Taub, Herbert, Schilling D.L : "Principles of Communication Systems", Mc-Graw Hill International Book Co., Tokyo.
3. W.C.Y. Lee : "Mobile Cellular Telecommunications Systems", Mc-Graw Hill International Editions, 1990
4. Glover and Grant : "Digital Communication", Prentice Hall Publication.

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FREE ELECTIVE II

6FEXT5/ 6FEXN5 (1) INTRODUCTION TO WIRELESS TECHNOLOGY

SECTION-A

Unit I : (8 Lectures)

Introduction to networking: the Internet reference model, layering and protocols, OSI and other models, Network types, network media, network topologies, connectivity devices, evolution of networking, types and range of wireless communication, wireless technologies

Unit II : **(8 Lectures)**

Wireless LAN, satellite communication, wireless application protocol (WAP), antennas, narrow-band and spread-spectrum technologies, cellular telephony, propagation, frequencies and spectrum and personal communication system

Unit III : **(8 Lectures)**

Wireless Application Protocol model, WAP architecture component, Trends: technology and culture, 3G, wireless in local proximity, Bluetooth: design and principle of operation, transmitter characteristics, spurious emissions, baseband characteristics, physical channel, channel control, Bluetooth security, inter-operability requirements for blue-tooth as a WAP bearer

SECTION-B

Unit IV : **(8 Lectures)**

Cellular telephony, history of cellular telephony, design and principle of cellular operation, cellular telephony operation, analog cellular telephones, digital cellular telephones, digital networks, personal communication systems, the third generation, recent events in cellular telephony

Unit V : **(8 Lectures)**

Wireless LAN: introduction, benefits of WLANs, design and principle of operation, WLAN configuration, micro-cells and roaming, types of WLANs, WLAN customer consideration, wireless LAN standards, IEEE 802.11, 802.11b and 802.11a, selecting the WLAN, microwave LANs

Unit VI: **(8 Lectures)**

Communicating with a satellite, LEOs, MEOs, GEOs and HEOs systems, design and principle of operation of Global Positioning System (GPS); satellite, control and user segments, Differential GPS, geometric earth models and future of GPS

Text Book:

An Introduction to Wireless Technology by Garry S. Rogers and John Edwards, Pearson Education.

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FREE ELECTIVE II

6FEXT5/ 6FEXN5 (2) ELECTRONIC TEST INSTRUMENTS: ANALOG AND DIGITAL

SECTION-A

Unit I : **(8 Lectures)**

Analog meters, digital meters, dc voltmeter, ac voltmeters, RF probes, ammeters, ac ammeters, ohm-meters, 4-wire ohm measurements, multi-meters, meter range, other multi-meter functions: continuity indicators, diode tests, frequency counters, minimum, maximum, average read-outs, capacitance and temperature measurements, specifications

Unit II : **(8 Lectures)**

Floating and grounded outputs, sine wave sources, imperfections in sine wave sources,: frequency accuracy, frequency stability, amplitude accuracy, distortion, spurious responses, close-in-sidebands , Function Generators: Arbitrary waveform generators, arbitrary waveforms, AM and FM modulation, bursts, Frequency Shift Keying, Frequency sweep, sync output, phase locking, pulse generators, RF signal generators

Unit III : **(8 Lectures)**

Oscilloscopes: the concept of oscilloscope, digital scope block diagram, sample rate, real time and repetitive sampling, triggering, acquisition/sweep control, vertical amplifier, vertical resolution, ac and dc coupling, bandwidth limit, X-Y display mode, High impedance inputs, 50 ohm inputs, digital acquisition and display techniques, specifications of oscilloscopes, mixed signal oscilloscope, oscilloscope probes, probe compensation, active probes, differential measurements, high voltage probes, current probes

SECTION-B

Unit IV : **(8 Lectures)**

Oscilloscope measurements, basic waveform measurements, voltage gain measurements, phase measurements, frequency measurements, digital signal measurements, frequency response measurements, square wave tests, linearity measurements, curve tracer measurement techniques, diode I-V and resistor I-V characteristics, amplitude modulation measurements, power measurements, FFT measurements, basic time domain reflectometry

Unit V : **(8 Lectures)**

Spectrum and network analyzers: spectrum analyzer, bank-of-filters spectrum analyzers, FFT spectrum analyzers, wave-meters, resolution bandwidth, narrow-band and broadband measurements, swept spectrum analyzers, spectrum analyzer measurements, Network Analyzers, distortion analyzers, RF power measurements, RF power meter,

Unit VI : **(8 Lectures)**

Logic Analyzers: logic probes, oscilloscope logic measurements, logic analyzers, timing analyzers, glitch detect, state analyzers, data formats, state displays, timing displays, microprocessor measurements, trigger events and sequencing, microprocessor program flow, logic analyzer probing, combined scope and logic analyzer, PC-hosted logic analyzers

Text Book:

Electronic Test Instruments: Analog and Digital by Robert A. Witte, Second Edition, Pearson Education

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6XT6: Integrated Circuits Lab

Minimum 4 experiments uniformly distributed based on the syllabus of 6XT1(Digital Integrated Circuits) and 4 experiments uniformly distributed on the syllabus of 6XT2 (Linear Integrated Circuits)

6XT7: Introduction to Microprocessors Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 6XT3 (Introduction to Microprocessors)

6XT8: Digital Communication Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 6XT4 (Digital Communication)

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
ELECTRONICS ENGINEERING
SEMESTER PATTERN (C. G. S.)
FIFTH SEMESTER

5XN1 ELECTRONIC DEVICES AND CIRCUITS-II

SECTION-A

Unit I: Linear wave shaping using RC and RL circuits, analysis and calculations of RC low pass and high pass filters, analysis of clipping and clamping circuits using diodes and switching transistors.

Unit II : Switching characteristics of semiconductor devices : Diode as switch, transistor as a switch, characteristics and analysis, FET as a switch, characteristics, JFET, CMOS, switching speed of devices : Schottky diode and transistor, Logic gates.

Unit III : Collector coupled bistable, monostable and astable multivibrators, Time base generators & Sweep Generators. Boolean Algebra, Number systems, Gray codes, Arithmetic operations using Two's compliments.

SECTION-B

Unit IV : Study and analysis of Digital Logic Families : RTL, DTL, HTL, TTL, ECL, IIL, CMOS, and their characteristics, tri-state logic,5400/7400 TTL series.

Unit V : Flip-flops : R-S, J-K, Master slave J-K, D-type, T-type; registers and counters, adders and subtractors using logic gates, D/A converters and types: Weighted resister, R-2R ladder. A/D converters and Types: Ramp, Dual slope, Successive approximation.

Unit VI : Types of semiconductor memories, sequential memories, 2 and 4 phase ratioless shift registers, static shift registers, implementation of ROM (ROM, PROM, EPROM, EEPROM) BJT RAM cell, MOS-RAM, CCD memories.

BOOKS RECOMMENDED :

1) Jacob Millman & Herbert Taub : "Pulse Digital & Switching waveforms", McGraw Hill International Book Co.
2) Taub H. and Schillings D.L., London, : "Digital Integrated Electronics", McGraw Hill Company.
3) R. P. Jain : "Modern Digital Electronics", Tata McGraw Hill, New Delhi 1998.
4) Malvino A.P. & Leach D.P. : "Digital Principles &Applications", TMH Publishing Co., New Delhi (3rd Edition).

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5XN2 POWER ELECTRONICS
SECTION-A

Unit I : SCR, Triac, LASCR, Diac-construction, characteristics, two transistor analogy for turning ON of a SCR, turn ON mechanism, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuits. Introduction to GTO, power transistor, power MOSFET, IGBT - their construction & characteristics.

Unit II: Series parallel operation of SCRs, static & dynamic equalizing ckts., equalisation of current in parallel connected SCRs, string efficiency, derating factor, Protection of SCRs against di/dt, dv/dt, radio freq., interference, over voltage, over current.

Unit III: Principle of phase control, half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of free wheeling diode, single phase dual converters. Three phase half controlled bridge and fully controlled bridge rectifier.

SECTION-B

Unit IV: Classification of ckt. for forced commutation, series inverter, improved series inverter, parallel inverter, output voltage and waveform control, principle of operation for three p h a s e bridge inverter in 120 deg. and 180 deg. mode, single phase transistorised bridge inverter, current source inverter, harmonics reduction techniques.

Unit V: Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper ckt., Jones chopper, step-up chopper and AC chopper. Basic principle of cycloconverter, single phase to single phase cycloconverter.

Unit VI: Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers, Static ckt. breaker, UPS, fan speed regulator, principle of soft start ckts, electronic ballast.

TEXT BOOKS:

1) M. Ramamoorthy, Thyristor and their application.
2) M. H. Rashid - Power Electronics Circuits, Devices and Application, Pearson Edu.
3) SCR Manual GE.

REFERENCES :

1) Joseph Vithayathil, "Power Electronics: Principles and Applications", McGraw-Hill

2) Ned Mohan, Tore M. Undeland, William P. Robbins, "Power Electronics: Converters, Applications, and Design", Wiley
3) K. Hari Babu – Power Electronics, Scitech Pub..
4) Devdatta Y. Shingare, A Text book of Industrial & power electronics, Electrotech Pub. Satara.
5) J. S. Katre, Power Electronics, Tech-max Pub. Pune.

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5XN3 CONTROL SYSTEM ENGINEERING
SECTION-A

Unit I : Basic definition; closed and open loop systems; transfer function, block diagrams, derivation of transfer functions of physical systems, signal flow graphs, basic control action.

Unit II : Time Response Analysis: Typical test inputs, , Impulse response function, Transient Domain specifications, Analysis of first, second & higher order systems, Steady state analysis: steady state error and error constants, Dynamic error coefficients.

Unit III : 1. Stability Analysis: stability of control system, Routh Hurwitz's stability criterion,

Unit III : 2. Roots Locus: Introduction to Root Locus method; Root Locus plots, Rules for constructing root loci, stability analysis of systems using Root locus, concept of dominant closed loop pole pair, Root contour plots, effect of addition of zeros & poles.

SECTION-B

Unit IV : Introduction of frequency response, Bode plots, stability margins on the Bode plot, stability analysis of systems using Bode plots, polar plots, Nyquist stability criterion, relative stability.

Unit V : State Space representation of systems, conversion of state variable models to transfer functions, conversion of transfer functions to state variable models, solution of state equations, concepts of controllability and observability.

Unit VI : Sample Data Control Systems :
Representation of sampled data (Discrete) systems, review of Z-transforms, Sampler and hold ckt., Zero order hold, sampling theorem, Z-transform analysis of sampled data control systems (open & closed loop systems), Z transform of systems. Solution of difference equation by Z-transform methods. Response of discrete systems. Pulse Transform functions of open loop, closed loop systems with different sampler locations. Digital controller

& its transfer functions, Stability analysis of discrete time system using bilinear transformation.

TEXT BOOKS :

1. Nagrath I. J. and M. Gopal, "Control Systems Engineering", 5th Ed. New Age International.
2. K. Ogata : Modern Control Engineering, Fourth Edition(PHI)

REFERENCE BOOKS:

1) Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 11th Ed., Pearson Education.
2) M. Gopal : Digital Control Systems Principles & Design (TMH)
3) Norman S. Nise, "Control System Engineering", 5th Edition, Wiley.
4) Bhattarcharya : Control System Engineering, 2nd Edition (Pearson Education).

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5XN4 COMMUNICATION ENGINEERING-II

SECTION-A

Unit I : **AM Transmitters :** Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter, Generation of SSB-SC by filter method, phase-shift method & third method (weavers).

Unit II : **AM Receivers :** TRF receiver, Superheterodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, selectivity sensitivity, fidelity Image rejection ration, communication receiver, SNR of DSB-FC, DSB-SC & SSB-SC

Unit III : **FM Transmitters :** FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparison, pre-emphasis and De- emphasis. Stereo FM Transmitter.

SECTION-B

Unit IV : **FM Receivers :** Details of FM receiver blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, Audio Amplifier, AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster Seeley and ratio detectors, Stereo FM receiver, Noise in FM Reception, FM threshold effect.

Unit V : **PULSE MODULATION TECHNIQUES**: The sampling theorem, Sampling of Band-Pass Signal, Linear and Non linear quantization, Aliasing effect, Aperture effect, Reconstruction filter, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Time Modulation, PCM, DM, ADM

Unit VI : **TELEPHONE SWITCHING TECHNIQUES:** Introduction to Switching System, Pulse dialing, Touch tone dial telephone, Space Division Switching SPC, Centralized and Distributed SPC, Time Division Switching : Basic Time Division space switching, Time Division time switching, Time multiplexed space switching, Time Multiplexed time switching, EPABX.

Text Books:-

(1) Taub and Schilling D.L. : Principles of Communication Systems, McGraw- Hill Co, Tokyo, 1994 (II Ed.)

(2) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(3) T. Vishwanathan : " Telecommunication Switching systems and Networks", PHI learning Private Ltd., 2009

Reference Books

(1) Wayne Tomasi, "Electronic Communication Systems", Pearson Education, third edition

(2) Simon Haykin : "Communication System, John Wiley and Sons Ltd., New York, (Third Edition), 1994

(3) B. P. Lathi : " Modern Digital and Analog Communication systems" 4th Edition Oxford university Press.

(4) Hari Bhat: "Analog communication", 2nd Edition Pearson India, 2010

(5) S. Kundu: " Analog and Digital communication" Pearson India 2010

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FREE ELECTIVE- I

5FEXN5 (1) CONSUMER ELECTRONICS

SECTION-A

Unit I : **(8 Lectures)**

Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalizers and Mixers, Electronic Music Synthesizers, Commercial Sound, Theater Sound System

Unit II : **(8 Lectures)**

Video Systems and Displays: Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Remote Controls, Video Telephone and Video Conferencing

Unit III : **(8 Lectures)**

Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, Computers Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System,

SECTION-B

Unit IV : **(8 Lectures)**

Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System

Unit V : **(8 Lectures)**

Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set Top Boxes, Remote controls, Bar codes, ATM, Dish washers

Unit VI : **(8 Lectures)**

Calculators: Structure, internal organization, servicing; In-Car-Computers: electronic ignition, electronic ignition lock system, Antilock Braking System (ABS), Electronically controlled Suspension (ECS), Instrument panel displays, ultrasonic car safety belt system, Air Bag System, Vehicle proximity detection system, car navigation system

Text Book:1. Consumer Electronics S P Bali Pearson Ed 2005

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FREE ELECTIVE-I
5FEXN5 (2) FIBER OPTICS
SECTION-A

Unit I : **Light Ray Theory** **(8 Lectures)**

Propagation of light in different media : propagation of light in an optical fiber, Basic structure and optical path of an optical fiber, Acceptance angle and acceptance cone, Numerical aperture (NA) (General), Modes of propagation, Meridional and skew rays, Number of modes and cut-off parameters of fibers.

Unit II : **Losses and Dispersion in Optical Fiber** **(8 Lectures)**

Fiber Losses : Attenuation in optic fibers, Materials losses, Rayleigh scattering losses, Absorption loss, Leaky modes, Bending losses, Radiation losses.

Dispersion in optical fiber : Electrical Vs. optical bandwidth. Bandwidth-length product, Intermodal dispersion, Mixing modes, Material chromatic dispersion.

Unit III : **Light Sources and Detectors for Optical Fiber** **(8 Lectures)**

Light Sources : Introduction, LED (Light Emitting Diode), Processes involved, structure material and output characteristics of LED, Fiber LED coupling, Bandwidth, Spectral emission of LEDs, LASERS : Operation types, Spatial emission pattern, Current Vs. output characteristics.

Detectors : Introduction, Characteristics of photo detectors (General), Photoemissive type, Photoconductive and photo voltaic devices, PN junction type, PIN photo diode, Avalanche photo diode (APD).

SECTION-B

Unit IV: **Fiber optic Communication systems and Modulation** **(8 Lectures)**

Fiber Communication systems : Transmitter for fiber optic communication, High performance transmitter circuit LED – Analog transmitter, LASER transmitter, Digital laser transmitter, Analog laser transmitter with A/D conversion and digital multiplexing, Fiber optic receiver, Fiber based modems : Transceiver.

Modulation : LED analog modulation, Digital modulation, Laser modulation, Pulse code modulation (PCM), Intensity modulation (IM).

Unit V: **Optical Fiber Communication application** **(8 Lectures)**

Optical fiber communication systems : Introduction, Important applications of integrated optic fiber communication technology, Long haul communication, Coherent optical fiber communication, Principle of coherent detection.

Unit VI : **Measurements on Optical Fibers** **(8 Lectures)**

Introduction, Measurements of numerical aperture (NA),Measurements of Fiber- attenuation, Optical time Domain Reflectometry (OTDR), Measurements of dispersion losses, Measurements of refractive index, Cut-off wavelength measurement, Measurements of Mode Field Diameter (MFD),

Text Books:

1. Optical Fiber Communications : Principles and Practices- John M. Senior (PHI)
2. Optical Fiber and Optical Fiber Communication Systems S. K. Sarkar (S. Chand and Co.)

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5XN6 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage. Comprehension –A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :-Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization.

Unit II : **Theoretical background -** Importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictorial devices.

Unit III : Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED:

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.

2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.

3) Raman Sharma "Technical Communication", Oxford University Press..

4) F. Frank Candlin : General English for Technical Students, University of London Press Ltd.

5XN7: Electronic Devices & Circuits-II Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XN1(Electronic Devices & Circuits-II)

5XN8: Power Electronics Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XN2(Power Electronics)

5XN9: Communication Engineering-II Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XN4 (Communication Engineering-II)

5XN10: Communication Skills Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 5XN6 (Communication Skills)

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6XN1 DIGITAL INTEGRATED CIRCUITS

SECTION-A

Unit I : Combinational Logic Design: Function of binary variables, Boolean Algebraic Theorems, Standard form of logic functions, K-Map up to 5 variables, Quine McCluskey Method, Don't Care Conditions and its effects, Synthesis using AND-OR Gates **(8 periods)**

Unit II: Combinational Logic Design using 74/54 MSI chip series concerning to MUX, DEMUX, Decoders, Encoders, Comparators, Code converters, Priority Encoders, Parity Generator/Checker and BCD to Seven Segment Decoders **(8 periods)**

Unit III: Combinational Logic Design using ROM array, PLA, PAL, preliminary design concepts using FPGAs, N-bit binary adder using 7480, Look-ahead carry adder construction **(8 periods)**

SECTION-B

Unit IV: Design of counters and sequential networks. Analysis of clocked sequential networks, general models of sequential machines, equivalence and minimization networks, deviation of state graphs and tables, reduction of state assignments, SM charts **(8 periods)**

Unit V: Analysis of asynchronous sequential networks, derivation and reduction of primitive flow tables, state assignments and realization of flow tables, hazards, , asynchronous sequential network design **(8 periods)**

Unit VI: Fault detection and location in combinational circuits. Paths sensitizing method, equivalent – normal – Form method (ENF), two level fault detection, fault detection and location in sequential circuit using circuit test approach **(8 periods)**

Textbooks:

1. Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico Publication
2. Lee S. C., "Digital Circuit and Logic Design", PHI
3. Jain R. P. "Modern Digital Electronic Circuits and Systems", TMH

Reference Books:

1. Digital IC Reference data manuals
2. Texas Instruments Inc. Design with TTL ICs
3. Morris Mano, "Digital Electronics: Circuits and Systems", PHI
4. Parag K. Lala, "Fault tolerance and fault testable hardware design, B. S. Publications, Hyderabad

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6XN2 LINEAR INTEGRATED CIRCUITS
SECTION-A

Unit I: Operational Amplifier, block diagram of op-amp, Differential amplifier: gain expressions using *h* - parameters, constant current source, level shifting, transfer- characteristics, frequency response, frequency compensation methods, study of ICuA741, measurement of parameters of op-amp and offset nulling and their importance.

Unit II: Linear Applications of Op-Amp: Inverting and non inverting amplifiers, voltage followers (AC & DC), integrator, differentiator, differential amplifier, instrumentation amplifiers, precision rectifiers, RMS to DC converter, voltage to current converter, sinusoidal RC oscillators, constant voltage sources, frequency to voltage and voltage to frequency converter.

Unit III: Non Linear Applications of Op-Amp and Filter Circuits: Clipping and clamping circuits, comparator, zero crossing detector, Schmitt trigger, peak detector, astable, monostable and bistable multivibrator, voltage sweep generator.
Active filters : Butterworth filters using op-amp. Log and Antilog amplifiers.

SECTION-B

Unit IV: Voltage Regulator: Block schematic of regulator IC 723, regulated power supply using IC 723, short circuit protection, switch mode power supply, dual tracking regulators, regulator using 78**, 79**, and LM 317.

Unit V: 1. Timers : Block schematic of IC 555, application of timer 555 as astable, monostable and bistable multivibrators, frequency divider, pulse stretcher, sawtooth generator, free running ramp generator, FSK generator.

2. Sample & hold circuit.

Unit VI: 1. PLL: Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC-LM 565 and its applications as AM detector, FM detector and frequency translator.

2. Introduction to Audio Function Generator IC 8038.

Text Books :-

1) Gayakwad R.A. : OP-Amps and Linear Integrated Circuits, Prentice Hall of India Pvt. Ltd., New Delhi (Second Edition), 1980.

2) Robert F. Coughlin, Frederick F. Driscoll: Operational Amplifier and Linear Integrated Circuits, Sixth Edition, PHI Pub.

Reference Books :

1) Tobey J.E. and Grame J.E. : Operational Amplifier Design and Applications, International Student Edition, 1983.

2) T.R. Ganesh Babu, B. Suseela: Linear Integrated Circuits, Third Edition, Scitech Pub.

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6XN3 INTRODUCTION TO MICROPROCESSORS
SECTION-A

Unit I : 8085 : Architecture, Register Structure, Addressing modes, Instruction set of 8085, Timing diagrams.

Unit II : Assembly Language Programming of 8085, Introduction to assemblers, Simulators, Stack, Subroutine. Address space partitioning schemes: Memory mapped I/O and I/O mapped I/O, Address decoding techniques.

Unit III: Interrupt system of 8085, software and hardware interrupts, Data transfer schemes: Serial data transfer through SOD and SID, USART 8251 and its interfacing.

SECTION-B

Unit IV : Internal architecture, programming and interfacing of PPI 8255, programmable interval Timer/ Counter 8254, Introduction to DMA data transfer , DMA Controller 8237 and its interfacing.

Unit V : 8086 : CPU architecture, internal operations, addressing modes, instruction formats, execution timing.

Unit VI : Instruction set of 8086, Assembly language programming (ELEMENTARY PROGRAMMING) Assembly Directives, Operators.

Text Books :

1) Gaonkar R.S. : Microprocessor Architecture Programming and Applications with the 8085, Penram International Pub. (Third Edition), 1997.

2) A. K. Ray and K. M. Bhurchandi: Advanced Microprocessors and Peripherals, Architecture Programming and Interfacing, TMH.

3) Gibson G.A., Liu Y.C. : Microcomputer system the 8086/8088 family, Prentice Hall India Pvt. Ltd.

Reference Books:

1) Hall D.V. : Microprocessor and Interfacing Programming and Hardware, McGraw Hill Co., New York, 1986.

2) Data sheet manuals by INTEL.

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6XN4 RADAR & TELEVISION ENGINEERING
SECTION - A

Unit I : Radar : The Radar equation-Pulse Radar-CW Radar- CW Radar with non zero IF, equation for Doppler frequency- FM-CW Radar using sideband superhetrodyne receiver, MTI Radar-Delay line canceller, MTI Radar with power amplifier & power oscillator, Non coherent MTI Radar, Pulse Doppler Radar

Unit II : Radar Transmitters. Radar Modulator-Block diagram. Radar receivers- noise figure, low noise front ends, Mixers – Different types of Displays – Duplexers- Branch type and balanced type. Navigation- Loop Antenna, Radio compass. Hyperbolic Systems of Navigation, LORAN – A. Distance Measuring Equipment . Instrument Landing System – Localizer, Glide Slope, Marker beacons.

Unit III : Television: Scanning, Blanking and synchronisation, Picture signal - composite video signal- Vestigial sideband transmission-Principle of CCD Camera - Monochrome picture tube- Monochrome TV receivers- RF tuner ,VHF tuner- Video amplifier, IF section, Vestigial sideband correction- Video detectors

SECTION - B

Unit IV : Sound signal separation, AGC, sync separation, horizontal and vertical deflection circuits, EHT generation. Colour TV system: Principle of colour signal transmission and reception, PAL, NTSC, SECAM (block schematic description), Picture tube – delta gun.

Unit V: Digital TV: Digitized Video, Source coding of Digitized Video compression of Frames – DCT based – (JPED), Compression of Moving Pictures (MPEG). Basic blocks of MPEG2 and MPEG4. Digital Video Broadcasting (DVB) – Modulation: QAM – (DVB-S, DVB-C)

Unit VI: OFDM for Terrestrial Digital TV (DVB –T). Reception of Digital TV Signals (Cable, Satellite and terrestrial). Digital TV over IP, Digital terrestrial TV for mobile. Display Technologies – basic working of Plasma, LCD and LED Displays.

Text Books:

1. Merrill I. Skolnik: Introduction to Radar Systems,3/e, Tata McGraw Hill,

2. N.S.Nagaraja: Elements of Electronic Navigation, 2/e, Tata McGraw Hill

3. R.R. Gulati: Monochrome and Colour Television. New Age international, 2008.

4. Herve Benoit, Digital Television Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework, 3/e, Focal Press, Elsevier, 2008

Reference Books:

1. Shlomo Ovadia: Broadband Cable TV Access Networks, PH-PTR, 2001

2. Byron Edde: Radar Principles, Technology & Applications, Pearson Education.

3. Mark E Long: ¯The Digital Satellite TV Hand Book, Butterworth-Heinemann.

4. K.R.Rao, J.O.Hwang, Techniques and standards for Image, Video and Audio coding, Prentice Hall,1996

5. John Arnold, Michael Frater, Mark Pickering, Digital Television Technology and Standards, John Wiley & Sons, Inc, 2007

6. Robert L. Hartwig, Basic TV Technology: Digital and Analog, 4/e, Focal Press, Elsevier, 2005

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FREE ELECTIVE - II

6FEXN5 (1) INTRODUCTION TO WIRELESS TECHNOLOGY

SECTION-A

Unit I : **(8 Lectures)**

Introduction to networking: the Internet reference model, layering and protocols, OSI and other models, Network types, network media, network topologies, connectivity devices, evolution of networking, types and range of wireless communication, wireless technologies

Unit II : **(8 Lectures)**

Wireless LAN, satellite communication, wireless application protocol (WAP), antennas, narrow-band and spread-spectrum technologies, cellular telephony, propagation, frequencies and spectrum and personal communication system

Unit III : **(8 Lectures)**

Wireless Application Protocol model, WAP architecture component, Trends: technology and culture, 3G, wireless in local proximity, Bluetooth: design and principle of operation, transmitter characteristics, spurious emissions, baseband characteristics, physical channel, channel control, Bluetooth security, inter-operability requirements for blue-tooth as a WAP bearer

SECTION-B

Unit IV : **(8 Lectures)**

Cellular telephony, history of cellular telephony, design and principle of cellular operation, cellular telephony operation, analog cellular telephones, digital cellular telephones, digital networks, personal communication systems, the third generation, recent events in cellular telephony

Unit V : **(8 Lectures)**

Wireless LAN: introduction, benefits of WLANs, design and principle of operation, WLAN configuration, micro-cells and roaming, types of WLANs, WLAN customer consideration, wireless LAN standards, IEEE 802.11, 802.11b and 802.11a, selecting the WLAN, microwave LANs

Unit VI : **(8 Lectures)**

Communicating with a satellite, LEOs, MEOs, GEOs and HEOs systems, design and principle of operation of Global Positioning System (GPS); satellite, control and user segments, Differential GPS, geometric earth models and future of GPS

Textbook: An Introduction to Wireless Technology by Garry S. Rogers and John Edwards, Pearson Education

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FREE ELECTIVE II

6FEXN5 (2) ELECTRONIC TEST INSTRUMENTS: ANALOG AND DIGITAL

SECTION-A

Unit I : **(8 Lectures)**

Analog meters, digital meters, dc voltmeter, ac voltmeters, RF probes, ammeters, ac ammeters, ohm-meters, 4-wire ohm measurements, multi-meters, meter range, other multi-meter functions: continuity indicators, diode tests, frequency counters, minimum, maximum, average read-outs, capacitance and temperature measurements, specifications

Unit II : **(8 Lectures)**

Floating and grounded outputs, sine wave sources, imperfections in sine wave sources,: frequency accuracy, frequency stability, amplitude accuracy, distortion, spurious responses, close-in-sidebands , Function Generators: Arbitrary waveform generators, arbitrary waveforms, AM and FM modulation, bursts, Frequency Shift Keying, Frequency sweep, sync output, phase locking, pulse generators, RF signal generators

Unit III : **(8 Lectures)**

Oscilloscopes: the concept of oscilloscope, digital scope block diagram, sample rate, real time and repetitive sampling, triggering, acquisition/sweep control, vertical amplifier, vertical resolution, ac and dc coupling, bandwidth limit, X-Y display mode, High impedance inputs, 50 ohm inputs, digital acquisition and display techniques, specifications of oscilloscopes, mixed signal oscilloscope, oscilloscope probes, probe compensation, active probes, differential measurements, high voltage probes, current probes

SECTION-B

Unit IV : **(8 Lectures)**

Oscilloscope measurements, basic waveform measurements, voltage gain measurements, phase measurements, frequency measurements, digital signal measurements, frequency response measurements, square wave tests, linearity measurements, curve tracer measurement techniques, diode I-V and resistor I-V characteristics, amplitude modulation measurements, power measurements, FFT measurements, basic time domain reflectometry

Unit V : **(8 Lectures)**

Spectrum and network analyzers: spectrum analyzer, bank-of-filters spectrum analyzers, FFT spectrum analyzers, wave-meters, resolution bandwidth, narrow-band and broadband

measurements, swept spectrum analyzers, spectrum analyzer measurements, Network Analyzers, distortion analyzers, RF power measurements, RF power meter,

Unit VI : **(8 Lectures)**

Logic Analyzers: logic probes, oscilloscope logic measurements, logic analyzers, timing analyzers, glitch detect, state analyzers, data formats, state displays, timing displays, microprocessor measurements, trigger events and sequencing, microprocessor program flow, logic analyzer probing, combined scope and logic analyzer, PC-hosted logic analyzers

Text Book: Electronic Test Instruments: Analog and Digital by Robert A. Witte, Second Edition, Pearson Education

6XN6: Digital Integrated Circuits Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 6XN1(Digital Integrated Circuits)

6XN7: Linear Integrated Circuits Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 6XN2 (Linear Integrated Circuits)

6XN8: Introduction to Microprocessors Lab

Minimum 8 experiments uniformly distributed based on the syllabus of 6XN3 (Introduction to Microprocessors)

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FOUR YEAR DEGREE COURSE IN
B TECH CHEMICAL ENGINEERING
SEMESTER - V
CREDIT & GRADE SYSTEM
5CH01 HEAT TRANSFER

Objective:
To introduce the concepts of heat transfer to enable the students to design components subjected to thermal loading.

SECTION-A

UNIT I: Importance of heat transfer in chemical process industries. Modes of heat transfer, steady state conduction in one dimension. Fourier's law. Heat transfer through plane, cylindrical and spherical walls, compound resistance in series, thermal insulation, critical and economic thickness. Extended surface equipments, types, their design and operation, introduction to unsteady state heat transfer. **(7)**

UNIT II: Heat transfer by convection, film concept, individual and overall coefficients and factors affecting them. Natural and forced convection. Dimensional analysis applied to heat transfer. Dittus-Boelter equation, Limitations and application. **(7)**

UNIT III: Heat transfer by parallel and counter current flow, concept of log mean temperature difference, rate of heat transfer. Heat transfer by film wise and drop wise condensation in horizontal & vertical tube. **(7)**

SECTION-B

UNIT IV: Heat exchange equipments and their design, double pipe, parallel, counter current, shell and tube heat exchangers, condensers, fouling factors, concepts of transfer units in heat exchangers, NTU concept for heat exchangers. **(8)**

UNIT V: Boiling and Evaporators: Theory of boiling. Classification, types and field applications of evaporators. Single and multiple effect evaporators. Heat transfer through submerged coils, jacketed vessels. **(8)**

UNIT VI: Heat transfer by radiation, concept of black body, Kirchhoff's law, Stefan's law, Black and gray body radiation, view factors luminous and non-luminous gases. Heat transfer in packed and fluidized beds.

Recent developments and technological forecasting in heat transfer. **(8)**

Text Books:

1) Heat Transfer by Sukhatme
2) Heat Trasnfer by Mc Adams

Reference Books:

1) Unit Operations of Chemical Engineering by McCab and Smith
2) Chemical Engineering by Coulson & Richardson, Vol. I
3) Heat Transfer by R.C.Sachdeva

5CH02 CHEMICAL ENGINEERING PROCESS-I (Inorganic Chemical Technology)

Chemical Engineers are trained primarily to work in chemical industries. Its basic purpose is to start from one ore or other chemical raw material and end up with a consumer product through series of chemical and physical changes, and here it differs from other manufacturing industries which are assembly industries not creative industries. It will be shown in the study of a number of types of chemical industrial process that the fundamentals chemistry, thermodynamics, kinetics, engineering and economics are always valid.

Objective:

After studying this subject the chemical engineering student will have a comprehensive picture of the chemical industry, particularly as to the reasons and the basis for many and diverse operations which are carried out in process.

SECTION A

UNIT-I : 1. Sugar and Starch Industries: Sugar, Starches and related products.
2. Soap and Detergents: Detergents, Soap and Glycerin. **(7)**

UNIT-II: 1. Pulp and Paper Industries: Types, raw materials, manufacture of pulp and paper.
2. Cement and Lime Industries: Portland Cement, types, raw materials, setting and hardening of cement, manufacturing processes of Portland cement; Manufacture, use of lime and gypsum. **(8)**

UNIT-III: 1. Industrial Gases: Manufacture and application of carbon dioxide, hydrogen, oxygen, nitrogen.
2. Fuel Gases: Manufacture and uses of producer gas, water gas, natural gas, synthesis gas. **(8)**

SECTION B

UNIT-IV: 1. Acids: Sulfuric acid, nitric acid, hydrochloric acid.
2. Fertilizer Industry: Manufacture of ammonia, urea, diammonium phosphate, super phosphates (SSP and TSP) **(8)**

UNIT-V: Principles of electro-chemical technological process; Electrolytic process in igneous and molten system; caustic soda, chlorine. **(7)**

UNIT-VI: Electro-thermal Industries: aluminum, lithium, titanium. Electro-chemical sources of energy and storage. **(7)**

Note: The students are expected to visit the various industries to have a thorough understanding of the subject.

Text Books:

1. Austin, G.T., "Shreve's Chemical Process Industries ", Fifth Edition, McGraw-Hill International Book Co, Singapore, 1984.
2. Dryden, C.E., "Outlines of Chemical Technology ", Edited and Revised by Gopala Rao M.and M. Sittig, Third edition, Affiliated East-West press, 1997

Reference Books:

1. Kent, J.A., "Riggel's Hand Book of Industrial Chemistry ", 7th Edition, Van Nostrant Reinhold, 1974.
2. CHEMTECH 1-4, "Chemical Engineering Education Development Centre ", I.I.T., Madras 1975-78.

5CH03 ECONOMICS & MANAGEMENT

Engineers are trained primarily to work in industries, market as managers. They should have knowledge about the basic concepts of economics, latest developments in the field, foreign trades, banking, etc. As a manger they should have basic knowledge about management from production to marketing.

Objective:

After studying this subject the engineering student will have understanding of the happenings in the field of economics and preliminary idea about management.

SECTION A

UNIT-I: Nature and scope of economics, Demand and Supply, Demand: concepts, specification, types of demand. Demand Analysis: significance of demand analysis, law of diminishing utility, consumer surplus. Demand Forecasting: concept of forecasting, types of forecast, steps in demand forecasting, techniques of demand forecasting. **(8)**

UNIT-II: Market: Meaning, types of market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition. Inflation: Causes, measurement, effects, controlling of inflation. **(7)**

UNIT-III: Nature and characteristics of Indian economy, Privatization – meaning, merits and demerits.
Globalisation of Indian economy – merits and demerits. Concepts of VAT, WTO, GATT & TRIPS agreement, Banking, Foreign exchange. **(8)**

SECTION B

UNIT-IV: Basic concepts and functions of Management, Personal Management. Production Management: Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Concepts of material management, inventory control; its importance and various methods. **(8)**

UNIT-V: Marketing Management: Definition of marketing, marketing concept, objectives and functions of marketing.
Marketing Research – Meaning; Definition; objectives; Importance; Limitations; Process.
Advertising – meaning of advertising, objectives, functions, criticism. **(7)**

UNIT-VI: Financial Management: Introduction, Objectives of Financial Management, Functions and Importance of Financial Management. Concept of capital structure and various sources of finance. **(7)**

Text Books:

1. Modern Economic Theory – K.K. Dewett, S.Chand
2. Principles and Practice of Management: R.S. Gupta, B.D.Sharma, N.S. Bhalla Kalyani Publishers

Reference Books:

1. Principles of Economics: P.N. Chopra (Kalyani Publishers).
2. Micro Economic Theory – H.L. Ahuja (S.Chand)
3. Indian Economy: Rudar Dutt & K.P.M. Sundhram
4. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)
5. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).
6. Financial Management – I.M. Pandey (Vikas Publishing House, New Delhi)

5CH04 MATERIAL SCIENCE & ENGINEERING

Materials Science & Engineering is the study of mechanical, physical, and chemical properties of engineering materials, such as metals, ceramics, polymers, and composites.

Objectives: The objective of a Materials Engineer is to predict and control material properties through an understanding of atomic, molecular, crystalline, and microscopic structures of engineering materials.

SECTION A

UNIT I: Introduction to materials and their principle properties, Simple stresses and strains, Concept of stress, strain, shear stress, shear strain, Hooks law, Elastic limit, stress-strain curve for mild steel and elastomeric materials, factor of safety, Poisson's ratio, Strain energy due to axial load and impact. Introduction to determination of mechanical properties of materials ASTM methods. **(7)**

UNIT II: Basic principles in their selection for fabrication and erection of chemical plant. Testing of materials, destructive and nondestructive tests, structure of atom and chemical bonds, crystal structures and their influence on material properties, Deformation and slip processes. **(7)**

UNIT III: Metals and their alloys: Iron – carbon diagram, Ferrous and nonferrous alloys, mild steel, special steels, stainless steels, brasses, brasses, aluminum alloys and titanium alloys, high and low temperature material, insulation, refractories. Methods for fabrication, rolling, bending, central punching, revetting, welding. Nickel and its alloys: aluminum and its alloys. **(8)**

SECTION B

UNIT IV: Corrosion and its control: Corrosion attack methods, Different types of corrosion: chemical, biochemical, and electrochemical; Internal and external factors affecting corrosion of chemical equipments, Methods to minimize corrosion, corrosion charts for process equipments.
Polyaniline and anticorrossive surface coatings electrochemical corrosion prevention corrosion case studies from the chemical industry. **(8)**

UNIT V: Polymers, natural and synthetic: Selection of polymetric materials for equipment linings, fiber reinforced plastic, application of special polymers like Nylon 66, Teflon in engineering. Polymer
Composites. **(7)**

UNIT VI: Ceramic and glasses: Definition of ceramics and glasses; interaction between structure, processing, and properties; Applications of ceramic and glass materials; Crystalline and noncrystalline ceramics, silicates, refractories, clays, cements, glass vitreous silica, and borosilicate. **(7)**

Text Books:

1. James F. Shacketford, Introduction to Material Science, McMillan publishing company, New York ISBN 1990
2. D.Z. Jestrazebaski, Properties of Engineering Materials, 3rd Ed. Toppers. Co. Ltd.

Reference Books:

1. J.L. Lee and Evans, Selecting Engineering materials for chemical and process plants, Business Works 1978
2. Design of machine elements, Spott M.M. Prentice Hall
3. A text book of machine design, Khurmi R.S. and Gupta J.K.
4. Material Science & Metallurgy for Engineers, Dr.V.D.Kodgire, Everest Publishing House.

5FECH05 FREE ELECTIVE - I
5FECH05 (1) AIR POLLUTION CONTROL

Objective:

This subject covers the sources, characteristics and effects of air pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

SECTION A

UNIT I: Sources of air pollution: Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution –Source inventory. **(7)**

UNIT II: Effects of air pollution: Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles. **(8)**

UNIT III: Dispersion of pollutants: Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models–Applications. **(7)**

SECTION B

UNIT IV: Air Pollution Control: Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion –Pollution control for specific major industries. **(8)**

UNIT V: Air Quality Management: Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts–

Zoning – Town planning regulation of new industries – Legislation and enforcement –Environmental Impact Assessment and Air quality. **(8)**

UNIT VI: Sampling and Analysis: Basic principle of sampling – Statistical Techniques - Source and ambient sampling – Analysis of Gaseous and Particulate pollutants - Standards. **(7)**

Text Books:

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi,1996

Reference Books:

1. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996
2. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New Yark, 1997
3. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991
4. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985
5. Garg, S.K., “Environmental Engineering Vol. II”, Khanna Publishers, New Delhi
6. Mahajan, S.P., “Pollution Control in Process Industries”, Tata McGraw-Hill, New Delhi,1991

5FECH05 (2) RISK AND SAFETY MANAGEMENT IN INDUSTRIES

Public awareness of hazards and risks has enhanced the importance of safety assessment andmanagement in today’s increasingly litigious society. Worldwide the burden of responsibility for safety is shifting towards those who own, manage and work in industrial and commercial organizations. The management of safety and risk needs to be integrated into the overall

management of the organization. It should be appropriate and cost-effective without dampening the innovative entrepreneurial spirit of employees with inflexible bureaucratic rules and procedures. An organization’s exposure to potential hazards needs to be managed so as to reduce the chance of loss and mitigate any effects. Risk and safety issues need to be evaluated in a structured and calculated manner but in the light of an overall organizational strategy.

SECTION A

UNIT-I: Hazard identification methodologies, risk assessment methods - PHA, HAZOP, MCA, ETA, FTA, consequence analysis, probit analysis. **(8)**

UNIT II : Hazards in work places - nature and type of work places, types of hazards, hazards due to improper house-keeping, hazards due to fire in multi-floor industries and buildings, guidelines and safe methods in the above situations. **(7)**

UNIT- III: Workers' exposures to hazardous chemicals, TLVs of chemicals, physical and chemical properties of chemicals leading to accidents like fire explosions, ingestion and inhalation, pollution in work places due to dangerous dusts, fumes and vapours, guidelines and safe methods in chemicals handling, storage and entry into confined spaces. **(8)**

SECTION B

UNIT-IV: Hazards peculiar to industries like fertilizer, heavy chemicals, petroleum, pulp and paper, tanneries, dyes, paints, pesticides, glass and ceramics, dairy and sugar industries, guidelines for safeguarding personnel and safeguarding against water, land and air pollution in the above industries. **(8)**

UNIT- V: Safety education and training - safety management, fundamentals of safety tenets, measuring safety performance, motivating safety performance. **(7)**

UNIT VI: Legal aspects of industrial safety, safety audit. **(7)**

Text Books:

1. F. P. Lees, "Loss prevention in process industries", 2nd, Butterworth-Heinemann, 1996.
2. W. Handley, "Industrial safety handbook", 2nd ed., McGraw-Hill, 1977.

Reference Books:

1. S. P. Levine, "Protecting personnel at hazardous waste sites", Martin-Butterworth, 1971.
2. R. P. Blake, "Industrial safety", Prentice Hall, 1953.
3. D. Patterson, "Techniques of safety management", McGraw-Hill, 1978.

5CH07 HEAT TRANSFER - LAB

List of Experiments:

1. Heat conduction
2. Natural convection
3. Thermal radiation-determination of emissivity
4. Double pipe heat exchanger
5. Shell and tube heat exchanger
6. Plate Heat exchanger
8. Heat transfer in agitated vessels
9. Double effect evaporator
10. Open pan evaporator
11. Heat pipe demonstrator
12. Fluidized bed heat transfer

Note: The students should perform minimum EIGHT experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

5CH08 MATERIAL SCIENCE & ENGINEERING -LAB

List of Experiments:

1. Microstructure observation and study of metals and alloys. (Minimum five) low carbon steel, medium carbon steel, high carbon Steel, tin, bronze, brass, phosphor bronze.
2. Study of properties of polymeric materials; impact test and polymeric Tests.
3. Corrosion testing (salt spray test for different samples such as plain carbon steel, chrome plate steel, galvanized steel.)
4. Different types of hardness test on metals, i.e. Rockwell hardness test, Brinell hardness test, Shore scleroscope tests.
5. Izod and Charpy impact test on mild steel, copper, brass and aluminium.
6. Chemical analysis of metals and alloys (Any one element to be analysed e.g. molybdenum from stainless steel, carbon from steel, copper from brass etc.
7. Macrostructure observation: (flow lines observation in forging by macro etching sulphur printing of steel.)
8. Study experiments based in, i) Dye penetration ii) Rubber lining, iii) Ultrasonic test, iv) Heat treatments.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

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6CH01 CHEMICAL ENGINEERING OPERATION-II (MASS TRANSFER-I)

SECTION-A

UNIT I: Importance of Mass Transfer Operation. Classification of mass transfer, operations based on gasliquid-solid contacts. Concepts of flux, resistance, driving force, equilibrium, direction of mass transfer, Dimensionless numbers in mass transfer. Diffusion, Fick's law I and II,
Dependence of diffusivity on physical properties, Schmidt's no. calculation, Determination of diffusivity in liquid-liquid, gas-gas, gas-liquid diffusion. **(7)**

UNIT II: Interphase mass transfer, various coefficient of mass transfer and their determination, resistance concept, controlling phase concept, Mass transfer in turbulent flow, Analogies of mass transfer, Empirical equations. Theories of mass transfer, two film theory, Higbies penetration theory, Derivation of flux equation, surface renewal theory, Applications and problems. **(7)**

UNIT III: Absorptions, stagewise absorption, material balance overall, stepwise minimum irrigation rate, Absorption and stripping factor calculation of number of stages, McCabe-Thiele graphical method, Kremsor-Brown-Sounder's equation. Equipments of absorption, tray towers, packed towers. Continuous absorption, concept of HTU, NTU, HETP, comparison with stepwise columns, design concepts, determination of height and diameter of packed absorption column. **(8)**

SECTION-B

UNIT IV: Adsorption: Adsorption equilibria, types of adsorption, properties of adsorbents, single and multi-stage adsorption, adsorption isotherms, principles of adsorption, Break through curves, adsorption of liquids, basic equations, adsorber design, adsorption equipments. Ion Exchange: Principles of ion exchange, techniques and applications, Ion exchange equilibria, rate of ion exchange. **(7)**

UNIT V: Drying and humidification: Principles of drying, phase equilibrium, cross circulation drying, through circulation drying, drying of suspended particles, rate of drying curve, dryers for solids and pastes, dryers for solutions and slurries, i.e. various types of dryers, Humidification: Terms, definitions, wet bulb temp., dry bulb temperature and measurement of humidity, adiabatic saturation temperature, study of

temperature humidity chart, Enthalpy-humidity charts, determination of humidity, and concept of dehumidification, equipments for humidification operations. **(8)**

UNIT VI: Crystallisation: Principles of crystallisation, equilibria, calculation of yield, heat effects, crystal growth, properties of crystals nucleation, fractional crystallisation, caking of crystals, Various types of crystallise's and their applications. Membrane separation process, Types of membrane, separation of gases, separation of liquids, Dialysis, Reverse Osmosis, pervaporisation, desalination. Recent developments in mass transfer operation. **(8)**

Text Books:

1) Unit Operation in Chemical Engineering: W.L. McCabe & J.C. Smith, McGraw Hill
2) Mass Transfer Operation: R.E. Treybal

Reference Books:

1) Mass Transfer: T.K. Sherwood, R.I. Pigford, McGraw Hill
2) Chemical Engineering: Coulson & Richardson

6CH02 CHEMICAL ENGINEERING PROCESS-II (Organic Chemical Technology)

Chemical Engineers are trained primarily to work in chemical industries. Its basic purpose is to start from one ore or other chemical raw material and end up with a consumer product through series of chemical and physical changes, and here it differs from other manufacturing industries which are assembly industries not creative industries. It will be shown in the study of a number of types of chemical industrial process that the fundamentals chemistry, thermodynamics, kinetics, engineering and economics are always valid.

Objective:

After studying this subject the chemical engineering student will have a comprehensive picture of the chemical industry, particularly as to the reasons and the basis for many and diverse operations which are carried out in process.

SECTION A

UNIT I: 1. Fermentation Industries: Industrial alcohol, absolute alcohol, wine.
2. Organic acid production: Acetic acid, lactic acid, citric acid. **(7)**

UNIT II: 1. Polymerization Industries: Polyethylene, polypropylene, PVC, polyester synthetic fibers.
2. Rubber Industries: Natural rubber, synthetic rubber, SBR. **(8)**

UNIT III: 1. Petroleum Refinery: Refining of crude oil, products of refining.
2. Petrochemicals: Significant petrochemicals and their derivatives. **(8)**

SECTION B

UNIT IV: 1. Nitration: Nitration agents, kinetics, mechanism, industrial preparation of nitrobenzene, nitronaphthalene, chloro-nitronaphthalene, nitroacetanilide.
2. Sulphonation and Sulfation: agents, kinetics, mechanism, technical preparation of aliphatic sulphonates, sulphonation of lauryl alcohol, dimethyl ether. **(8)**

UNIT V: 1. Hydrogenation: Catalytic hydrogenation, kinetics, mechanism, hydrogenation of fatty oils, synthesis of methanol.
2. Hydrolysis: Hydrolysis of fat, carbohydrate, starch: Manufacture of ethanol from ethylene, manufacture of phenol. **(7)**

UNIT VI: 1. Halogenation: Technical preparation of halogen compounds- allyal chloride, DDT, BHC, chlorobenzene, vinyl chloride.
2. Oxidation: Liquid and vapour phase oxidation, technical oxidation of isopropyl benzene, naphthalene, benzene, ethyl benzene, naphthalene sulfonic acid. **(7)**

Note: The students are expected to visit the various industries to have a thorough understanding of the subject.

Text Books:

1. P.H. Groggins, "Unit Processes in Organic Synthesis", McGraw Hill Book Co., Kogakusha (1984)
2. J.A. Kent, "Riegel's Hand book of Industrial Chemistry", 7th Edition, Van Nostrand Reinhold Co., New York (1974)

Reference Books:

1. Peter Wiseman, "An Introduction to Industrial Organic Chemistry", 2nd Edition, Applied Science Publishers Ltd., London (1979)
2. CHEMTECH 1-4, "Chemical Engineering Education Development Centre ", I.I.T., Madras 1975-78

6CH03 COMPUTER PROGRAMMING & APPLICATIONS

Application of the following techniques is for problems of interest in chemical engineering, writing and testing of programs in C Language.

SECTION-A

UNIT I: Numerical solution of first order differential equations with initial condition, Euler's method,Runge-Kutta method. **(7)**

UNIT II: Systems of linear equations, solution by the method of determinants, matrix inversion for the solution of linear equations, Gauss elimination method. **(7)**

UNIT III: Roots of algebraic and transcendental equation, iteration methods, Regula-Falsi method, Newton-Raphson method, roots of simultaneous and solution set of transcendental and algebricequations. Development of equations for heat transfer, fluid mechanics and reaction engineering problems. **(8)**

SECTION-B

UNIT IV: Regression analysis - Least Square, error approach, approximation by Chebychev orthogonal polynomial. **(7)**

UNIT V: Elements of optimization techniques, single variable function, optimization-direct search, with and without acceleration, method of regular intervals and fibonacci search method, gradient methods. **(8)**

UNIT VI: Computer programming in modular form, use of subroutine libraries, Block diagrams of preliminary aids in programming, capacity optimization. **(8)**

Text Books:

1. Digital Computation for Chemical Engineering by Leon Lapidas, McGraw Hill.

6CH04 PROCESS EQUIPMENT - DESIGN & DRAWING

SECTION - A

UNIT I: Material behaviour under stresses, theories of failures. **(7)**

UNIT II: Fabrication methods and their effects: Design method for atmospheric storage vessels, unfired pressure vessel subjected to internal and external pressure. **(7)**

UNIT III: Vessels for high pressure operations, Agitated vessels. Tail columns, internals of the reactors. **(8)**

SECTION - B

UNIT IV: Design of process equipment accessories and support systems. **(7)**

UNIT V: Complete design and preparation of working drawing for typical process equipment, such as large storage vessels, thick wall pressure vessels. Self supported tall columns, agitated pressurevessels with heat transfer requirements etc. **(8)**

UNIT VI: Design and layout of piping system and preparation of piping diagram for a typical process.
Material selection and piping coding. **(8)**

Note: Drawings of minimum eight design problems are expected.

Text Books:

1) Process Design of Equipments: S. D. Dawande
2) Process Equipment Design: M.V. Joshi, McMillan

Reference Books:

1) Introduction to Chemical Engineering Design, Mechanical Aspects
2) I.S. Code for Unfired Pressure: IS No. 2825 - 1969 pressure vessel
3) Process Equipment Design: I.E.Brownell, E.H.Young, John Wiley
4) International & Indian Standard codes for Piping

6FECH05 FREE ELECTIVE-II
(1) RENEWABLE ENERGY SOURCES

Objectives:

- To explain concept of various forms of renewable energy
- To outline division aspects and utilization of renewable energy sources for both domestics and industrial applications
- To analysis the environmental and cost economics of using renewable energy sources compared to fossil fuels.

Course-Outcome:

- At the end of the semester the student will have knowledge about various renewable energy sources and be able to choose the appropriate renewable energy as an alternate for conventional power in any application.

SECTION A

UNIT I : Solar-Energy : Solar radiation its measurements and prediction - solar thermal flat plate collectors concentrating collectors - applications - heating, cooling, desalination, power generation, drying, cooking etc - principle of photovoltaic conversion of solar energy, types of solar cells and fabrication. Photovoltaic applications: battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. **(7)**

UNIT II: Wind-Energy : Atmospheric circulations - classification - factors influencing wind - wind shear - turbulence - wind speed monitoring - Betz limit - Aerodynamics of wind turbine rotor-site selection - wind resource assessment - wind energy conversion devices - classification, characteristics, and applications. Hybrid systems - safety and environmental aspects. **(8)**

UNIT III: Bio-Energy : Biomass resources and their classification - chemical constituents and physicochemical characteristics of biomass - Biomass conversion processes - Thermo chemical conversion: direct combustion, gasification, hydrolysis and liquefaction - biochemical conversion: anaerobic digestion, alcohol production from biomass - chemical conversion process: hydrolysis and hydrogenation. Biogas - generation - types of biogas Plants- applications. **(7)**

SECTION B

UNIT IV : Hydrogen and Fuel Cells: Thermodynamics and electrochemical principles - basic design, types, and applications, production methods, Biophotolysis: Hydrogen generation from algae biological pathways, Storage gaseous, cryogenic and metal hydride and transportation. Fuel cell: principle of working, various types, construction and applications. **(8)**

UNIT V: Other Types of Energy : Ocean energy resources, principles of ocean thermal energy conversion systems, ocean thermal power plants, principles of ocean wave energy conversion and tidal energy conversion, hydropower, site selection, construction, environmental issues, geothermal energy, types of geothermal energy sites, site selection, and geothermal power plants. **(8)**

UNIT V: Analysis of the cost effectiveness of renewable energy sources, present status, comparison, forecast. **(7)**

Text Books:

1. Rai G. D., Non-conventional Energy Sources, Khanna Publishers, New Delhi, 2007
2. John Twidell, Tony Wier, 'Renewable Energy Sources', Taylor & Francis Publishers, New York, 2005

Reference Books:

1. Sukhatme, S.P., Solar Energy, Tata McGraw - Hill Publishing Company Limited, 2006

2. Khandelwal K.C, Mahdi S.S., Biogas Technology - A Practical Handbook, Tata McGraw Hill, 1986
3. Thomas .b. Johansson, Henry Kelly, Amulya K.N .Reddy, Robert .H. Williams, 'Renewable Energy Sources for Fuels and Electricity', Island Press, Washington DC, 2009
4. Anthony San Pietro, Biochemical and Photosynthetic aspects of Energy Production, Academic Press, 1980

FREE ELECTIVE - II
6FECH05 (2) WATER TECHNOLOGY

Objectives: To make the students aware about the issues involved in water and water quality aspects and also to learn about physical, chemical and biological techniques available for managing water quality.

SECTION A

UNIT I: Conventional water and waste water treatment methods, their capabilities and limitations, Need for advanced treatment of water and waste water. **(7)**

UNIT II: Advanced water treatment- Iron and manganese removal, colour and odour removal, activated carbon treatment, carbonate balance for corrosion control, ion exchange, electro-dialysis, reverse osmosis and modern methods and flouride management. **(8)**

UNIT III: Advanced waste water treatment- Nutrient control in effluents, Nitrogen and phosphorus removal methods including biological methods, Methods for the removal of heavy metals, oil and refractory organics. **(7)**

SECTION B

UNIT IV: Microsreening, ultra-filtration, centrifugation and other advanced physical methods- aerobic digestion, anaerobic filtration, rotating biological contractor, novel methods of aeration etc. **(7)**

UNIT V: Combined physico-chemical and biological processes, Activated carbon treatment, chlorination of waste water, Pure oxygen systems. **(8)**

UNIT VI: Filtration for high quality effluents, multistage treatment systems, Land treatment and other resources recovery systems. **(8)**

Text Books:

1. Introduction to Environmental Engineering, By P.A. Veslind, PWS Publishing Company, Boston, 1997
2. Activated Sludge Process: Theory and Practices, By N.F Grey, Oxford University Press, 1990.

Reference Books:

1. Wastewater Treatment and disposal, By S.J. Arceivalla, Marcel Dekker, 1981.
2. Wastewater Treatment Plant Planning, Design and Operation, By S.R. Quasim, Holt, Rinehart & Winston N.Y.

6CH06 CHEMICAL ENGINEERING OPERATION-II LAB (MASS TRANSFER-I)

List of Experiments:

1. To calculate the diffusivity of vapors of volatile liquid into air by Stefan's tube. (Winklemann's Experiment)
2. To find coefficient of mass transfer of naphthalene ball in stagnant air.
3. To find yield of crystallization with and without seeding.
4. To establish Freundlich and Langmuir isotherm.
5. To determine liquid diffusion coefficient of solute diffusing in water.
6. To determine the critical moisture content of given material.
7. To measure humidity of air from humidifier.
8. To study unsteady state adsorption.
9. To compare the mass transfer in stagnant infinite medium in laminar and turbulent flow.
10. To determine gas film mass transfer coefficient by wetted column for G/L system.
11. Use of humidity or psychometric chart.
12. To compare the mass transfer coefficient for different liquids from free surface by evaporation.
13. Separation of NaNO3 by fractional crystallization.
14. To study the efficiency of tray drier.

Note: The students should perform minimum EIGHT experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

6CH07 COMPUTER PROGRAMMING & APPLICATIONS - LAB

List of Experiments:

1. Design an algorithm, draw a flow chart and write program to perform addition, subtraction, multiplication and division of two numbers by taking two values from users.
2. Algorithm quadratic equation (for root of).
3. Program for solving ordinary differential equation with initial value of Euler's method.
4. To find value of unknown of simultaneous by Gauss elimination method.

5. To find roots of equation using Bisection method.
6. Algorithm for Regula-Falsi method.
7. Find the roots of equation by Newton-Raphsons method.
8. Program for modified Newton-Raphson method.
9. Design algorithm for regression.
10. Algorithm for print the grades of students using if-else-if statement.
11. Design algorithm and flow chart for Runga-Kutta method.
12. Design algorithm and flow chart to find greatest and smallest element.

Note: The students should perform minimum EIGHT experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

6CH08 MINOR PROJECT

The students in a group of not more than four members have to work on a topic which is experimental and analytical in the area of **Chemical Engineering**. Each project shall have a guide. On completion of the work, a project report should be prepared and submitted to the Department. The project work and the report will be evaluated by an internal assessment committee for 25 marks. The university examination for 25 marks will be a Viva-Voce examination conducted by a committee of one external examiner and one internal examiner /Guide appointed by the University.

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SYLLABUS PRESCRIBED FOR FOUR YEAR DEGREE COURSE IN B TECH POLYMER (PLASTIC) TECHNOLOGY SEMESTER - V (CREDIT & GRADE SYSTEM)

5PP01 HEAT TRANSFER

OBJECTIVE:
To introduce the concepts of heat transfer to enable the students to design components subjected to thermal loading.

SECTION A

Unit I: Importance of heat transfer in chemical process industries. Modes of heat transfer, steady state conduction in one dimension. Fourier's law. Heat transfer through plane, cylindrical and spherical walls, compound resistance in series, thermal insulation, critical and economic thickness. Extended surface equipments, types, their design & operation, introduction to unsteady state heat transfer.

Unit II : Heat transfer by convection, film concept, individual and overall coefficients and factors affecting them. Natural and forced convection. Dimensional analysis applied to heat transfer. Dittus-Boelter equation. Limitations and application.

Unit III : Heat transfer by parallel and counter current flow, concept of log mean temperature difference, rate of heat transfer. Heat transfer by film wise and drop wise condensation in horizontal & vertical tube.

SECTION B

Unit IV : Heat exchange equipments and their design, double pipe, parallel, counter current, shell and tube heat exchangers, condensers, fouling factors, concepts of transfer units in heat exchangers, NTU concept for heat exchangers.

Unit V : Boiling & Evaporators: Theory of boiling. Classification, types and field applications of evaporators. Single and multiple effect evaporators. Heat transfer through submerged coils, jacketed vessels.

Unit VI: Heat transfer by radiation, concept of black body, Kirchhoff's law, Stefan's law, Black and gray body radiation, view factors luminous and non-luminous gases. Heat transfer in packed and fluidized beds.

Text Book:

1) Heat Transfer: Sukhatme
2) Chemical Engg.: Coulson & Richardson, Vol. I (ELBS, Pergamon Press, 1970)

Reference Books:

1) Heat Trasnfer: Me Adams
2) Basic Heat Transfer: Necati Orisik, McGraw Hill Co., Kogakusha-
3) Heat Transfer: J.P.Hokman, McGraw Hill Co., Kogakusha.
4) Unit Operations of Chemical Engg.: McCab and Smith.
5) Introduction to Chemical Engg.: Bedger and Banchero.
6) Heat Transfer: Gebhart, McGraw Hill, 2nd edition, 1979.

5PP02 POLYMER MATERIALS

OBJECTIVE:

To understand the materials, properties, production method along with the application of various polymer material

SECTION A

Unit I : History and development of polymer materials. Basic raw materials for polymer and their availability, Production, Properties and application of Polyolefin's such as HDPE, LDPE, LLDPE, & PP

UNIT II: Production, properties and application of PVC, characteristics & compounding of PVC, Natural and modified natural polymers such as cellulose, cellulose nitrate. Cellulose Acetate. CAB polymers their manufacture, properties & applications.

Unit III : Production, Properties & applications of Acrylic Plastics such as PMMA & Styrene based Polymers such as PS, HIPS, SAN, EPS, & MBS

SECTION B

Unit IV: Production, Properties & applications of engineering plastics such as Polycarbonate, PPO, PPS, ABS, PET, Polyamide, polyimide's, Fluro Polymers. Acetal resins.

Unit V : Thermoset Technology, production, properties & applications of Phenolics,Urea, and Melamine resins. Chemistry and Molding powder preparation,

Unit VI: Properties & application of Cellyl and Epoxy resins, unsaturated Polyesters. Chemistry and Molding powder preparation, Polyurethane resins

Text Books:

1) Plastic Materials : J.A.Brydson
2) Polymer Science & Technology of Plastics & Rubbers : P.Ghosh

Reference Book:

1) Encyclopedia of PVC, Vol. I, II & III : L.I.Nass.
2) Manufacture of Plastics : Maya Smith.
3) Vinyl & Diene Monomers Part I & II : E.C.Leonard.

4) Fibers Fillers Plastics & Rubbers : W.J.Roff.
5) Plastics Materials Proof & Application (1, 2, 3) : Birley.
6) Hand Book of Plastics & Elastomers : Harmansen.
7) Plastic Materials Handbook : Athalye.
8) Handbook of Plastics Materials & Technology : Rubin.

5PP03 ENGINEERING PLASTICS AND SPECIALTY POLYMER

Objective

To familiarize the students with specific class of advanced polymers defined on the basis of their specific properties. This paper will emphasize on the study of processing requirements for specialty polymers, engineering and specialty application of these materials in various vital fields like high performance applications, biomedical, aerospace engineering, electronics and other areas and manufacture.

SECTION A

Unit I : **Liquid Crystalline Polymers (LCPs):** Concept of liquid crystalline (LC) phase, liquid crystalline polymers and their classification. Theories of liquid crystallinity, characteristics of LC state and LCPs, synthesis, structure property relationship, rheology of liquid crystalline polymers, blends of LCPs, self reinforced composites, applications of LCPs.

Unit II: **Conducting Polymers** Classification of Conducting Polymers, Theory of conduction, semi conductors and conducting polymers, band theory, requirements for polymer to work as conductor, types of conducting polymers - intrinsic and extrinsic, doping of polymeric systems, synthesis, processing and testing of conducting polymers, applications and recent advances.

Unit III: **Heat Resistant Polymers:** Requirements for heat resistance, determination of heat resistance, synthesis, structure-property relationships, applications of heat resistant polymers like polyamides, polyamides and its derivatives, engineering plastic blends.

SECTION B

Unit IV : **Photosensitive Polymers and Polymers as Coating Additives** Photosensitive polymers - synthesis, curing reactions, applications in various fields. Membranes, their types, methods of casting and their applications. Water soluble polymers, Polymer as coating additives - types, synthesis, requirements for polymer to work as coating additives and applications

Unit V : Biopolymers and Biomaterials : Biopolymers - Study of natural biopolymers and synthetic biopolymers and their applications like bioassays, biocatalysts, etc., need of biomaterials and biopolymers, biodegradation, environmental impact, biomaterials and their medical applications, orthopedic applications, rehabilitation aids, etc., testing procedures (ASTM). Biodegradable polymers

Unit VI : Polymers in Miscellaneous Specialty Applications Polymers in agricultural applications: Polymers in automobile, aerospace, light emitting polymers, polymers for ion exchange resins and membranes.

Text Books:

1) Recent Advances in Liquid Crystalline Polymers; L. Lawrence Chapoy, Ed. Elsevier Science, New York, 1985
2) Engineering Polymers; R.W. Dyson, Chapman and Hall, New York, 1990

Reference books:

1. Polymers for High Technology Electronics and Photonics; M.J. Bowden and S.R. Tumer, Amer. Chem. Soc., 1987
2. Additive for coatings, John Bieleman, Wiley-VCH, 2000
3. Additives in water borne coatings, Gerry Davison, Bruce Lane, Royal society of Chemistry, 2003
4. Encyclopedia of Polymer science and Engineering Vol.1-17, Jacqueline I. Kroschwitz, 2007.

5PP04 INSTRUMENTATION AND CONTROL

OBJECTIVE:

To understand the concepts of different instrument which are used in Industries also to enable the students to design components during the process.

SECTION A

Unit I : Measuring Instruments: Qualities of measurement, elements of instrument, static & dynamic characteristics, measurements of temperature and levels.

Unit II : Measurement of pressure, vacuum, humidity & pH in process industry.

Unit III : Methods for composition analysis. Principle and techniques of instruments for composition analysis in process industry, such as chromatography, spectroscopy, refractrometry etc.

SECTION B

Unit IV: Flow measuring instruments: Flow measuring devices for incompressible and compressible fluids. Electro-hydraulic valves, hydraulic servomotors, electro-pneumatic valves. Pneumatic actuators.

Unit V: Introduction to Simple system analysis: Laplace Transformation. Block diagrams, linearization. First and higher order system.

Unit VI: Frequency response, distributed parameter system, dead time. Feed back control, servo and regulator control. Time domain closed loop responses, closed loop frequency response.

Text Books :

1. Industrial Instrumentation: Eckman, Wiley Eastern
2. Instrumental Methods of Chemical Analysis : Erwing, McGraw Hill.

BOOKS RECOMMENDED:

1) Instrumentation & Process Measurements : W.Bottom, Orient Longman.
2) Industrial Control & Instrumentation : W.Bottom, Orient Longman.
3) Outlines of Chemical Instrumentation & Process Control : A. Suryanarayan, Khanna Pub., New Delhi.

FREE ELECTIVE – I
5FEPP05 (1) POLYMER SCIENCE & TECHNOLOGY

OBJECTIVE:

To understand the concepts polymer Technology.

UNIT I : History of Polymer, Introduction to polymers, classification & types of polymers. Nomenclature. Thermoplastics and thermosets. Linear, branches an cross linked polymer Block and graft copolymer. Avg. Mol. wt, Number Avg. Mol. Wt., degree of polymerization, poly dispersity, and mol. Wt. distribution, size of polymer molecules, Chemistry of Polymerization

Unit II : History and development of polymer materials. Basic raw & materials for polymer and their availability, Production, Properties and application of Polyolefin's, Vinyl halides, PVC

Unit III: Polymer processing techniques: Injection molding, compression molding, transfer molding

Section II

Unit IV : Polymer Processing Techniques: Extrusion molding, Blow molding, Thermoforming.Etc.

Unit: V: Polymer Degradation and recycling: Types of degradation, Thermal degradation, Mechanical Degradation, Degradation by ultrasonic waves, photo degradation, Biodegradation.

Unit VI: Polymers in agricultural applications: green houses, mulches, control release of agricultural chemicals, seed coatings, etc.,

polymers in construction and building applications, polymer concrete, polymeric materials used in communication applications, polymer composites in aerospace and other light weight applications, polymers in cosmetics and food applications,

Text Book:

1. Plastic Materials : J.A.Brydson
2. Polymer Science: V.R. Gowariker

Reference Book:

1) Manufacture of Plastics: Maya Smith.
2) Fibers Fillers Plastics & Rubbers: W.J.Roff.
3) Plastics Materials Proof & Application (1, 2, 3) : Birley.
4) Hand Book of Plastics & Elastomers : Harmansen.
5) Plastic Materials Handbook: Athalye.
6) Handbook of Plastics Materials & Technology : Rubin.
7) Polymer Science & Technology of Plastics & Rubbers : P.Ghosh.

FREE ELCECTIVE - I

5FEPP05 (2) RUBBER TECHNOLOGY:

Objective

This course the details pertaining to raw materials, formulations, processing, testing, applications have been presented. A sound understanding of these polymeric materials would equip the students for careers in rubber industry.

SECTION -A

Unit I : Introduction of elastomer , selection criteria for elastomers for intended application origin of rubber , latex technology, compounding, manufacturing techniques such as Dipping and washing , coagulation, slush molding and rotational casting, latex foam rubber ,properties of raw natural rubber , special types of rubber

Unit II : Mastication and compounding behavior , Principles of compounding, mechanism of reinforcement , method of incorporation , reinforcement phenomenon in unvulcanisate system, reinforcement phenomenon in vulcanisates, Requirements of textile for reinforcements of rubber products, machinery and methods used for compounding

Unit III : Materials for compounding and reinforcement, chemicals and additives used in rubber compounding , need for addition, Selection criteria and properties of carbon black, non black fillers, fibrous fillers , plasticizers, softeners, extenders , special types of additives, anti aging , antioxidants ,antiozonants , anti static

agents, blowing agents, colorants, processing aids, flame retardants

SECTION -B

Unit IV: Manufacturing process sequence in rubber industry such as mixing, forming and vulcanization, machinery used for different operation, internal mixers, Processing of rubbers by Extrusion process, calendaring process, Injection molding Compression molding, finishing of rubber compounds

Unit V : Tyre technology – Tyre components , processing of elastomer for pneumatic tyre and tube , its design consideration and aspects , tyre building process , preparation of raw tyre for vulcanization, molding and vulcanization , instrumentation and control system

Unit VI: Different test methods for determination of free sulfur, ash content, moisture contents Test methods for hardness, abrasion resistance, wear resistance, tear resistance, weathering resistance, heat resistance, compression set, and tensile strength

Text book:

1. Rubber Technology Edited by Maurice Morton Kluwer, Academic Publishers, 2010

2. Rubber Technology and Manufacture by C M Blow, Butterworth-Heinmann, 2nd Edition, 1982

References books:

1. Rubber Compounding Chemistry and Application by Bredan Rodgers Publisher: CRC Press; 1 edition, 2004
2. Rubber Compounding by Fred W Barlow, Mercel Dekker Inc, 1993
3. The Physics of Rubber Elasticity by L. R. G. Treloar, Publishers: Oxford University Press Inc, 2005
4. Natural Rubber Science and Technology by A. D. Roberts, Oxford Science Publication, 1988
5. Engineering with Rubber: How to design Rubber components by Alan N Gent Publishers: HANSER PUBLISHERS, 2001
6. Practical Rubber Compounding and Processing by B. W. Evans Publishers: Applied Science Publication, 1981
7. Rubber to Metal Bonding by B. G. Crowther, RAPRA TECHNOLOGIES , 1996
8. Advances in the bonding of rubber to various substrates by RAPRA TECHNOLOGIES (2001)
9. Rubber Handbook by Babbit (Author) , R T Vanderbilt Publishers, 13th edition,1990

5PP06 COMMUNICATION SKILLS:

Unit I : Comprehension over an unseen passage. Comprehension - A - word study :- Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage. Comprehension - B - Structure study :- Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc. Active and passive forms, negative and interrogative, punctuation and capitalization. Unit

UNIT II : Theoretical background - importance of communication, its process, model of communication its components & barriers. Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content. Non-verbal communication, types of graphics and pictoral devices. (10 Hours)

UNIT III: Specific formats for written communication like – business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for dayto day written communication like applications, notices, minutes, quotations, orders, enquiries etc. Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews. Methodology of conduction of meetings, seminars, symposia, conference and workshop.

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Curriculum Development Centre, TTTI WR, Bhopal : A Course in Technical English, Somaiya Publication Pvt. Ltd.
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

5PP07 HEAT TRANSFER – Lab

List of Practicals:

1. To study the temperature distribution, heat transfer and effectiveness in parallel flow heat exchanger.
2. To study the temperature distribution, heat transfer and effectiveness in counter current flow heat exchanger.
3. To study heat transfer through lagged pipe.
4. To determine thermal conductivity of insulating powder
5. To determine the emissivity by using the emissivity measuring apparatus.
6. To determine thermal conductivity by two slab guarded hot plate method.
7. To study heat transfer through composite wall.
8. To study Stefan Boltzman's constant
9. To study temp distribution, heat transfer in forced convection.
10. To study temp distribution, heat transfer in natural convection.
11. To study temp distribution, heat transfer in rectangular fin.
12. To study temp distribution, heat transfer in horizontal condenser.
13. To study temp distribution, heat transfer in vertical condenser.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

5PP08 POLYMER MATERIAL - Lab

List of Practicals:

1. To determine tensile strength of a given plastic material
2. To determine percentage elongation
3. To determine cross breaking or flexural strength of a given plastic specimen
4. To determine static & dynamic coefficient of friction of plastic film.
5. To determine vicat softening temperature of plastic specimen
6. To determine dart Impact strength of plastic sheet or film with the help of dart Impact tester.
7. To determine melt flow Index by extension plastometer.
8. To determine Izod Impact strength of given plastic material.
9. To determine temperature deflection under load of given plastic specimen
10. To determine haze percentage of specimen by using Haze Meter.
11. To determine ESCR of given plastic specimen with environmental stress cracking resistance.
12. To determine apparent bulk density and funnel flow of given material.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

5PP09 INSTRUMENTATION & CONTROL - Lab

List of Practicals:

1. To determine refractive index for mixtures and also to calculate molar refraction of liquid mixture and prepare plot of refractive index Vs Compositions using Abb's refractometer
2. To calibrate pressure gauge using dead weight pressure gauge tester.
3. To verify weather the temperature switch is accurate within the specified ranges and to calibrate thermometer against temperature switch.
4. To find amount of NaOH require for neutralization of given amount of HCL Using a PH Meter
5. To determine response of the bare measuring thermometer for
   i) positive step change
   ii) Negative step change.
6. To calibrate rotameter.
7. To study the response of single tank
8. To determine gas flow rate by gas flow meter and to compare the reading other sources.
9. To study thermocouple.
10. To find amount of sodium hydroxide required. Exactly to neutralize a known amount of hydrochloric acid using a khohlrauseh conductivity bridge and hence to verify the same titrate value with volume titration.
11. To measure wind velocity using van anemometer.
12. To measure the humidity (absolute, relative) using psychomotor.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

5PP10 COMMUNICATION SKILLS LABORATORY

Objective:

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be accessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for

problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter

6PP01 CHEMICAL ENGG. OPERATION – II (Mass Transfer)

SECTION A

Unit I : Introduction to mass transfer: Various industrially important mass transfer operations, their classification. Fundamental of mass transfer, flux, driving force, resistance, rate of mass transfer, co-current, cross current, counter current operations, Batch and continuous operations.
DIFFUSION: Molecular diffusion, Fick's law, equimolecular counter current diffusion, unicomponent diffusion in stagnant medium: stefen's law, Predication of diffusivities based on physical properties, Experimental determination of gas diffusivities winklemanns experiment. Liquid diffusivities. Gas diffusion through polymers, factors affecting gas permeability of polymers.

Unit II : Interphase mass transfer: Concept of equilibrium curves, mechanism of mass transfer. Two film theory and penetration theory. Mass transfer coefficient, relation between individual and over all mass transfer coefficient, conceptof controlling film resistance. Studies in turbulent mass transfer, dimensionless groups such as sherwood No., schimdt No., stanton no., grashoffho, JD factor.

Unit III: Flow through packed bed limiting flow rates, loading and flooding, fluidisedbed, principle of gas absorption, absorption factor, stripping factor material balance in absorption column. Equipments for gas absorption, scrubbers.

SECTION B

Unit IV & V: Distillation - Vapour liquid equilibria, Raoult's laws, & Henry's law, relative volatility, methods of distillation.-Differential distillation, (Rayleigh's equation), flash distillation, Description of fractionating column, McCabe Thiele method for calculating number of plates, Effects of reflux ratio on number of plates, fenske's equation, murphree plate efficiency and overall

efficiency. Introduction of Azeotropic and steam distillation. (Detailed design for isotropic and steam distillation is not expected)

Unit VI: Humidification and Drying: Basic definitions, psychometric chart, theory of humidification, equipments for humidification, cooling tower. Theory of drying, rate of drying, equipments for batch and continuous drying.

Text Books:

1. Unit Operation of Chemical Engg.: McCabe and Smith
2. Chemical Engineering Vol. 1: Coulson and Richardson.

Reference Books:

1) Principles of Unit Operation: A.S.Foust.
2) Unit Operation: C.G.Brown
3) Introduction to Chemical Engineering: Badger and Banchero.
4) Mass Transfer Operation: R.E.Trebal.
5) Momentum Transfer Operation: S.K.Gupta
6) Physical Chemistry of Polymers: A. Tager.
7) Fundamentals of Polymer: Anil Kumar and R.K.Gupta.

6PP02 ELASTOMER TECHNOLOGY

SECTION A

Unit I : Introduction of Elastomer, introduction of rubber , basic raw materials , natural rubber, other forms of natural rubber, properties of raw natural rubber, storage hardening and crystallization of natural rubber , mastication and compounding behavior , Manufacturing process sequence in rubber industry such as mixing, forming and vulcanization.

Unit II: Vulcanization of rubbers , vulcanization by sulfur, peroxides and by other methods , non sulfur vulcanization, kinetics of vulcanization , chemical reaction, Factors affecting rate of vulcanization , vulcanization conditions , techniques of vulcanization.

Unit III: Processing of Elastomer for pneumatic tire and tube its design aspects and consideration, tyre building process, difrent tyre components , Retreading of tyres Raw material , compounding , processing , properties and application of SBR, butyl rubber, Nitril Rubber , EPM and EPDM Rubber , polysulphides.

SECTION B

Unit IV: Additives in plastics & its requirements, types of filler and reinforcement, choice of fillers and properties. Theory of plasticizers. Types and requirement of plasticizers. Selection and properties of lubricants.

Unit V : Selection and properties of other additives such as Antioxidant Antiozonates. Antistatic agents. UV stabilizers. Ant blocking agent, Processing aids, colorants', Foaming agents, Toughening agents and Flame retardants.

Unit VI: Introduction to Adhesives, its classification & requirements. Formulation and application of adhesives in various fields, Manufacture and testing of adhesives. Recent advances in adhesive technology.

Text Books :

1. Introduction to Rubber Technology: Morris Morton
2. Plastics Materials: H.A.Brydson

Reference Books:

1) Rubber Technology & Mfg.: C.M.Blow
2) Science and Technology of Rubber: E.R.Eircich
3) Polymer Processes: Schidknechi
4) Rubber Materials & their Compounds: Brydson
5) Plastics Additives, An Introduction Guide: Flick
6) PVC Technology: Titow
7) H.B. of Plastics & Elastomers: Harper
8) Plastics Additives Handbook Illrd Edn.: Gachter
9) Adhesive Technology Handbook: Landrock
10) H.B. of Adhesives: Skiest
11) Fundamental of Adhesion: Lee

6PP03 COMPUTER PROGRAMMING AND APPLICATIONS

Note: Application of the following techniques for problems of interest in chemical engineering, writing and testing of programs written in C Language.

SECTION A

Unit I : Numerical solution of first order differential equations with initial condition, Euler's method, Runge-Kutta method.

Unit II: Systems of linear equations, solution by the method of determinants, matrix inversion for the solution of linear equations, Gauss elimination method.

Unit III: Roots of algebric and transcendental equation, iteration methods, Regula-Falsi method, Newton-Raphson method, roots of simultaneous and solution set of transcendental and algebric equations. Development of equations for heat transfer, fluid mechanics and reaction engineering problems.

SECTION B

Unit IV : Regression analysis - Least Square, error approach, approximation by Chebychev orthogonal polynomial.

Unit V : Elements of optimization techniques, single variable function, optimization-direct search, with and without acceleration, method of regular intervals and fibonacci search method, gradient methods.

Unit VI : Computer programming in modular form, use of subroutine libraries, Block diagrams of preliminary aids in programming, capacity optimization.

TEXT BOOKS:

1. Digital Computation for Chemical Engineering by Leon Lapidas, McGraw
2. Numerical methods and programming by S.S. Shastry

6PP04 POLYMER ENGINEERING THERMODYNAMICS

Unit I : Review of Fundamental Concepts: System, surrounding, boundary, thermodynamic processes, thermodynamic Junctions and variables. Extensive and intensive properties, Definitions and properties of state function. Concepts of enthalpy and free energy. Coefficient of thermal expansiona, compressibility coefficient b relation between a and b. Relation between Cp and Cv. Brier definitions of First, Second and Third law of Thermodynamics. State of equilibrium, Free energy functions and their properties. Variation of free energy with pressure at constant temperature, temperature dependence of free energy. Thermodynamic equilibrium and free energy functions, criteria for equilibria at Constant T and V, Criteria for equilibria at constant T and P.

Unit II: One Component System: Physical equilibria involving phase transitions, the Clapeyronequation, application of Clapeyron equation, The Clasius - Clapeyron equation. System of Variable Composition: Partial molar quantities, determination of partial molar quantities, Gibbs- Duhem equation, Chemical potential, Chemical potential and other thermodynamic functions, effect of temperature and pressure on chemical potential of a pure substance, chemical potential in an ideal gas mixture.

Unit III : Thermodynamic functions of mixing: Free energy of mixing, entropy of mixing, volume of mixing, enthalpy of mixing. Properties of Liquid solutions: Ideal solutions and Raoult's law. Vapour-Liquid equilibria, Chemical potential in an ideal liquid solution, mixing properties of ideal solution, solubility behaviour of ideal solution.

Colligative properties:

Lowering of vapour pressure, elevation of boiling point, freezing point depression, Osmosis and osmotic pressure, Determination of molecular weight of *non* volatile solute, Ebulliometric constant.

SECTION B

Unit IV & V : Polymer - Low molecular liquid systems: &Ideal, Non-ideal, Regular solutions, True solutions of Unit Polymers. Dissolution and swelling of polymers, unlimited swelling, limited swelling, factors affecting dissolution and swelling of polymers. Thermodynamics of polymer solution, Basic concepts of Flory - Huggins theory, criteria for polymer solubility, solubility parameter, Phase equilibrium of polymer - solvent system, Binary systems, LCST, UCST. Gels of polymers.

Unit VI : Chemical Equilibria Formulation of equilibrium law, equilibrium law for ideal gases, Free energy change in chemical reaction, chemical affinity and thermodynamic functions, Equilibrium constant, Relation between Kp, Kc and Kx. Variation of equilibrium constant with temperature, variation of equilibrium constant with pressure. Equilibria for condensation polymerization, Equilibria of radical polymerization.

Text Books:

1. An Introduction to Chemical Thermodynamics - Rastogi & Mishra, VikasPub.
2. Physical Chemistry of Polymer: A.Tager, Mir Pub.

LIST OF BOOKS:

1) An Introduction to Chemical Engg. Thermodynamics - J.M.Smith & H.C.Vanhess, Kogakusha, 1976.
2) The Principle of Chemical Equilibria and Applications in Chemistry and Chemical Engg. - K.Denbig, Cambridge Uni. Press, ELBS.
3) Fundamentals of Polymer Science and Engineering: Anilkumar and S.K.Gupta.
4) Text Book of Polymer Science: Billimeyar.
5) Polymer Chemistry: An Introduction: Seymour.
6) Polymer Science & Tech. of Plastics & Rubbers: P.Ghosh.

6FEPP05 FREE ELECTIVE – II
(1) PACKAGING TECHNOLOGY

Objective

Plastic material offer unique advantage in the area of packaging from aesthetics and functional point of view. Objective of this course is to introduce the students to the emerging area of plastic packaging technology.

SECTION I

Unit I : **Introduction** Need for packaging, packaging done by nature, purpose of packaging, types of packaging Packaging materials: glass, metal, wood, plastics etc, and complete detail of material selection criteria.

Unit II : **Packaging Engineering** New product development, market, self life, quality assurance, logistic, graphic design, regulation, temperature evidence packaging, child resistance packaging, quality management system, verification & validation protocols, life cycle assessment, waste hierarchy, importance of 3 R (Reduce, reuse & recycle).

Unit III : **Package Design Approach** Product–packaging relationship, product–package characteristics, compatibility factors, product type vs packaging requirements, product characteristics– physical state, centre of gravity, size / weight, volume. Product characteristics– chemical: effect of gases, moisture, atmospheric gases, product characteristics – biological: sensitivity to microbial factors. Product characteristics – physico chemicals: effect of moisture, vapor, oxygen & other gases

SECTION II

Unit IV: **Packaging Material Characteristics:** Packaging material properties – physical: influence of molecular / fiber directions, tensile, breaking load, tension, tear, torsion, puncture, burst, packaging, material Properties – chemical: pH, chloride / sulphate content, imbedded and un-reacted chemicals, packaging material properties – biological: sensitivity to micro organisms, packaging material properties – physic chemical: absorption & diffusion of moisture and gases – barrier properties.

Unit V: **Packaging Material Evaluation** Physical & mechanical properties: weight, dimensions, strength properties, stiffness, tear, tensile and others, chemical properties: alkalinity, acidity, resistance biological properties, sensitivity to microbes, chemicals, presence of chloride, sulphate, lignin, ash, flammability, physiological properties – odor / flavors.

Unit VI : **Packaging Machines** Bottle filling lines which includes bottle washing, sterilization, filling, screw capping/crown corking, induction sealing, labeling etc., form fill seal machines: types (vertical & horizontal), flow rap machine, retort machine, tetra packs, wooden packaging, miscellaneous packaging technique, bag in box, child resistance pack, packaging in canes etc, biodegradable and ecofriendly packaging, advantages and disadvantages, packaging used for export, advancements and developments and application.

Text Books:

1. Packaging Handbook– A.S. Athalye, Tata McGraw Hill, New Delhi, 1992
2. Fundamentals of Packaging Technology – F.A. Paine (Blackie & Sons Publication) 1967

Reference Books:

1. Packaging, Materials and Containers – F.A. Paine (Blackie & Sons Publication), 1967.
2. Plastics in Packaging – A.S. Athalye, Tata McGraw Hill, New Delhi, 1992
3. 5.. Plastic Packaging- Susan E.M. Selke (Hanser Gardner Publication), 2004
4. Plastics Packaging – Properties, Processing, And Applications.[2nd Edition] By Susan E. M. Selke, John Culter, 2010.
5. Plastics Materials for Packaging By Barnetson [Rapra Publications], 1996
6. Understanding Plastics Packaging Technology By Susan E. M. Selke, John Culter,
7. Rigid Plastics Packaging – Materials, Processes And Applications By F. Hannay [Rapra Publications], 2002.

6FEPP05 COMPOSITE TECHNOLOGY

Unit I : Introduction to Composites, Classification of composites (on the basis of matrix materials-polymer, metal, wood, ceramic etc), Classification of Composites (on the basis of reinforcements types- particulate, sheets etc) , Fundamentals of Composites (matrix, reinforcement and interphase) and their role in formation and working of composites, Structural Types of reinforcements(particulate, sheets, whiskers etc) , Selection Criteria for material selection and composites formation, Factors affecting composites (Wet ability , Bonding, Compatibility ratio, surface tension etc.)

Unit II: Manufacturing, Chemistry, Properties and Application of various materials used as matrix (polymer-thermoplastic, thermosets, Elastomer, ceramics etc) Mechanical, thermal, electrical, environmental and viscoelastic etc properties in relation to matrix and processing.

Unit III : Manufacturing, Chemistry, properties and application of various materials used as reinforcements (Natural fibers, synthetic fibers - glass fibers, aramid fibers etc, whiskers, sheets, wovens etc.), Types of Fiber orientations- role and properties. Role and behavior of interphase in composites. Mechanical, thermal, electrical, environmental and viscoelastic etc properties in relation to reinforcements and processing.

Unit IV : Additives used in composites- properties and functions and examples (fillers, coupling agents, antioxidants, anti-ozonants, UV and light stabilizers, anti-static agents, dyes and pigments etc) Processing techniques for Composites- Open Moulding Techniques (Hand layup, Spray layup, Vacuum bag Molding, Encapsulation etc.

Unit V : Processing techniques for Composites- Close Molding Techniques (Filament winding, Pultrusion, Resin transfer molding etc). Advanced Composites, Advanced materials used for composites. Modifications and Advancements of advanced Composites over conventional composites.

Unit VI: Designing aspects of Composites with relation to processing (designing for hand layup & spray layup). Detail application wise study of different composite examples in diffenet fields- Automobile, Aerospace, electrical and electronics, Chemical Industries, Civil and Construction Industry and Textile Industry etc.

Text Books:

1. Polymer Engg. Composites, M.O. W.R.Richardson applied science London 1976.
2. SPI Handbook of Tech. and Engg. of Reinforcements for Plastics and Composites, J.G.Mohr.S.S.Oleesky, G.D.Shook, L.S.Meyer, Van Nostrand Renhold Co., New York 1973.

References Books:

1. Polymer Composite by Margolies.
2. Encyclopedia of composites by Nass
3. Composite material By S.P.Agrwal

6PP06 CHEMICAL ENGG. OPERATION –II (MASS TRANSFER) – LAB

List of Experiments:

1) To calculate diffusivity of vapours of volatile liquid into air by stefan's tube.
2) To determine the liquid diffusion of salt diffusing in water.
3) To compare the mass transfer coefficient for different liquids from free surface.
4) To prepare the b.p. diagram and plot x-y data. On equilibrium diagram.
5) To determine gas film mass transfer coefficient by wetted ball conlumn
6) To find mass transfer coefficient of napthalene balls in air.
7) Verification of rayleigh's equation for different (batch) distrillation.
8) To determine vaporization efficiency and thermal efficiency in case of steam distillation.
9) To determine critical moisture content of a given material.
10) To determine gas permeability of plastic film.

6PP07 ELASTOMER TECHNOLOGY - LAB

List of Experiments:

1. To determine of plastic / Films.
2. To find out point and softening range of polymer
3. To determine the resistance of liquid(swelling) of rubber sample
4. To determine tensile strength of a given rubber material before and after emulsion
5. To determine percentage elongation of a given rubber sample before and after emulsion
6. To determine flex strength of a given plastic material
7. To determine specific gravity of a given rubber sample
8. To study abrasion resistance of a given rubber sample
9. To determine moisture content and ash content of given sample
10. To determine the compressive strength of a given rubber sample
11. To determine the bursting strength of a different given sample
12. To evaluate adhesion between plies of fabric bonded with rubber by dead load methd.
13. To determine dielectric strength of plastic
14. To study the plasticity of rubber sample by rapid plastometer.
15. Industrial report.

6PP08 COMPUTER PROGRAMMING & APPLICATION - LAB

List of Experiments:

1. Design an algorithm, draw a flow chart and write program to perform addition, subtraction, multiplication and division of two numbers by taking two values from users.

2. Algorithm quadratic equation (for root of).
3. Program for solving ordinary differential equation with initial value of Euler's method.
4. To find value of unknown of simultaneous by Gauss elimination method.
5. To find roots of equation using Bisection method.
6. Algorithm for Regula-Falsi method.
7. Find the roots of equation by Newton-Raphsons method.
8. Program for modified Newton-Raphson method.
9. Design algorithm for regression.
10. Algorithm for print the grades of students using if-else-if statement.
11. Design algorithm and flow chart for Runga-Kutta method.
12. Design algorithm and flow chart to find greatest and smallest element.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

6PP09 MINOR PROJECT

The students in a group of not more than four members have to work on a topic which is experimental and analytical in the area of **POLYMER TECHNOLOGY**. Each project shall have a guide. On completion of the work, a project report should be prepared and submitted to the Department. The project work and the report will be evaluated by an internal assessment

committee for 25 marks. The university examination for 25 marks will be a Viva-Voce examination conducted by a committee of one external examiner and one internal examiner /Guide appointed by the University.

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SYLLABUS PRESCRIBED
FOR BACHELOR OF TECHNOLOGY
(CHEMICAL TECHNOLOGY)
FOOD TECHNOLOGY, PULP & PAPER TECHNOLOGY,
OIL & PAINT TECHNOLOGY AND
PETROCHEMICAL TECHNOLOGY
SEMESTER PATTERN
FIFTH SEMESTER

5CT 01 HEAT TRANSFER

SECTION-A

Unit I : Importance of heat transfer in chemical process industries. Modes of heat transfer, steady state conduction in one dimension.

Fourier's law.

Heat transfer through plane, cyclindrical and spherical walls, compound resistance in series, thermal insulation, critical and economic thickness. Extended surface equipments, types, their design & operation, introduction to unsteady state heat transfer.

Unit II : Heat transfer by convection, film concept, individual and overall coefficients and factors affecting them. Natural and forced convection dimensional analysis applied to heat transfer. Dittus-Boelter equation. Limitations and application.

Unit III : Heat transfer by parallel and counter current flow, concept of log mean tempeature difference, rate of heat transfer. Heat transfer by film wise and dropwise condensation in horizontal & vertical tube.

SECTION-B

Unit IV : Heat exchange equipments and their design, double pipe, parallel, counter current, shell and tube heat exchangers, condensers, fouling factors, concepts of transfer units in heat exchangers, NTU concept for heat exchangers.

Unit V : Boiling & Evaporators : Classification of types and field applications of evaporators single and multiple effect evaporators.

Heat transfer through submerged coils, jacketted vessels.

Unit VI : Heat transfer by radiation, concept of black body, Kirchoff's law, Stefan's law, Black and gray body radiation, view factors luminous and non-luminous gases. Heat transfer in packed and fluidised beds.

Recent developments in heat transfer.

PRACTICALS : Based on above syllabus.

BOOKS RECOMMENDED :

1)	Heat Trasnfer	:	Mc Adams
2)	Heat Transfer	:	Sukhatme
3)	Basic Heat Transfer	:	Necati Orisik, McGraw Hill Co., Kogakusha.
4)	Heat Transfer	:	J.P.Hokman, McGraw Hill Co., Kogakusha.
5)	Unit Operations of Chemical Engg.	:	McCab and Smith.
6)	Introduction to Chemical Engg.	:	Bedger and Banchero.
7)	Chemical Engg.	:	Coulson & Richardson, Vol. I (ELBS, Pergamon Press, Latest Edition)
8)	Heat Transfer	:	Gebhart, McGraw Hill, 2nd edition, Latest Edition
9)	Fundamentals of Engg.	:	R.C.Sachdeva, Wiley Eastern.
10)	Heat Transfer	:	R.C.Sachdeva.
11)	Heat & Mass Transfer	:	S.D.Dawande,Central Techno Pub., Nagpur

5CT 02 MECHANICAL OPERATIONS

SECTION - A

Unit I : Relevance of mechanical operations in industry.
I. Size reduction, stages of reduction, Equipments operating variables, laws of energies, energy requirements.
2 Screening: Screen analysis, particle size distribution.

Unit II : 1. Classification: Equal falling particals, equipments, jigging, tabling.
2 Gravity settling, drag force, terminal settling velocity.
3. Sedimentation : Continous thickners.

Unit III : 1. Storage and handling of solids, transporation
2 Mixing, Mixers, agitation, types of equipments.

SECTION - B

UnitIV : 1. Filtration : Theory, operation, types, Flotation agents, flotation cells.
2. Filter Calculations, filtration equation for compressible and non-compressible cakes, specific cake resistance.
3. Filtration - Constant pressure and constant rate and their equipments.

Unit V : 1. Centrifuges: Theory, Equipments, types and calculations.
2. Cyclones: Hydrocyclones, liquid scrubbers and electronic precipitators.

Unit VI : 1. Adsorption, theory, type and application, Langmuir's Freundlich's equation, nature of adsorbents, industrial adsorbents.
2. Adsorption on fixed bed, fluidised beds. Adsorption equilibria calculations for vapour, gas & liquid adsorption. Adsorption, operation such as single stage, multi stage, cross current & multistage counter current operation & equipments.
3. Recent developments in mechanical operation equipments.

PRACTICALS: based on above syllaubs.

BOOKS RECOMMENDED:

1. Momentum Transfer Operation:S.K.Gupta, TMC, Latest edition.
2 Unit Operations of Chemical Engineering: McCabe and Smith, TMC
3. Chemical Engineering Vol. I : Coulson & Richardson, Pergamon, Latest edition.
4. Principles of Unit Operations: A.S.Foust, et-al.
5. Unit Operations: C.G.Brown.
6. Introduction to Chemical Engg. : Beder & Bachero.
7. Mass Transfer Operations: R.E. Treybal
8. Mechanical Operations Vol-I : R.S.Hiremath & A.P.Kulkami.

5CT03 CHEMICAL ENGINEERING THERMODYNAMICS

SECTION-A

Unit I : Scope of thermodynamics and its importances to chemical Engineers, Basic concepts, extensive & intensive properties. state function & chemical systems. Definition, symbols & interrelation, concepts of Entropy, Enthalpy & internal energy. First law of thermodynamics, Equations of state, critical properties, Vander Wall's constants, Virial expansions, Redlich-Kwong equation, Beattie-Bridgeman equation.

Unit II : First law applied to thermodynamic processes & calculation of Workdone, free energy & heat changes. Maxwell relation equation, second law and third law of thermodynamics.
Thermodynamics relations based on second law. Relation between Cp & Cv, compressibility factor & coefficient of thermal expansion, concept of residual entropy & entropy of equilibrium.

Unit III : Partial molar and apparent molar properties, Gibbs Duhem equation, Chemical potential, effect of temperature and pressure fugacity, excess thermodynamic properties and thermodynamic properties of mixing. Gibbs-Duhem-Morgules equation, Konovalov laws. Colligative properties. Ebulliometric constant. Determination of Molecular Weight of unknown chemical substances. Solubility law.

SECTION-B

Unit IV : Vapour liquid equilibrium, T-X-Y diagrams & X-Y diagram for ideal & non ideal system. Raoult's law and Henry's law. Deviations from Raoult's law. Comparision of ideal & non-ideal systems. Phase equilibria in non reaching multi-comonents, Binary, ternary systems. Graphical representation of L/L, L/S & G/S systems. Right angled triangular diagrams. Equilateral triangular diagrams, Janecke diagram, Effect of temp. & pressure on ternary equilibrium, Phenol-Wafer systems. auiline-water-chlorobenzene systems.

Unit V : Statistical thermodynamics, thermodynamics probability, its relation with Entropy, partition function and its relation with termodynamics functions, the Boltzman distribution law, Distribution law for chemically reactive system. Thermodynamics charts & their uses. Searching of thermodynamics data.

Unit VI : Chemical Equilibrium, feasibility of chemical reaction, free energy change, Reaction co-ordinate, equilibrium constant, Effect of temp. & pressure, Relation between Kp, Kc & Kv, Le-Chatelier's principle, Endo-Exothermic relations, Heterrogeneous equilibria, various methods of calculating free energy charge. Equilibrium conversions, case study of feasibility report for manufacture of industrial chemicals.

Practicals :- based on above syllabus.

Books Recommended :

1)	An Introduction to Chemical Thermodynamics	:	R.P.Rastogi, R.R.Misra.
2)	Chemical Engineering Process	:	Houghen-Watson.
3)	Introduction to Chemical Engg. Thermodynamics	:	J.M.Smith, H.C.Vauhess
4)	Thermodynamics for Chemical Engg.	:	H.C.Weber, J.P.Meissner
5)	Engineering Thermodynamics	:	P.K.Nag.

6)	Chemical Thermodynamic	:	M.R.Awode, Dattson, Nagpur.

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SPECIAL TECHNOLOGY-II
(RELATED TO CONCERNING TECHNOLOGY)
5FT04 (i) FOOD TECHNOLOGY-II
BIO-CHEMlSfRY AND NUTRITION

Organisation cell and cellular constituents. Introduction and classification of enzymes, specificity, enzymes Kinetics, activnetrs and inhabitors. Assay techniques, Isolation of enzymes trom sources and their application.

Bio-energetics, Digestion and metabolism of carbohydrates, proteins and fats. Photosynthesis, Nucleic acids and their functions.

Vitamins: Classification, sources, Chemistry, functions and deficiency symptoms. Assay of vitamins.

Minerals: Macro and micro-minerals, sources, functions and efficiency symptoms.

Nutrition: Functions of foods Energy, value of foods. BMR and its measurement, Energy requirement of individuals. Recommended dietary allowances of proteins, fats, carbohydrates, vitamins and minerals. Nutritional evaluation of proteins. Factors influencing nutritive value of foods. Loss of nutrients during processing. Enrichment and fortification of foods. Formulation of diets and foods for specific needs.

Antinutritional Factors of Foods :

Toxic compounds, enzyme inhabitors, alkaloids etc.

Techniques of biochemical analysis like spectrophotometry Chromatography, electro-phoresis Light and electro microscopy. Histochemical techniques, isotopic methods.

Recent Advances in the field.

Books Recommended :

1. Outlines of Biochemistry by E.E.Conn & P.K.Stump, Wiley Eastern Pvt.Ltd., New DeIhi.
2. Biochemistry of Foods by Eskin, N., A.M.Handerson, H.M. & Town End RJ., Academic Press, New York.
3. Cell Physiology by A.C.Giese, Sanders & Company, Toppan, Japan.
4. Integrated Biology by L.Hill, D.Bellamy, I Chester, Jones Chapman & Hall Ltd., London, EC4.
5. Principles of Enzymology for the Food Science by Whitaker J.R., Marcel Dekker, INC, New York.

6. Applied Nutrition by R.Rajalaxmi, Oxford & IBH Publishing Co., New York.
7. Heinz Handbook of Nutrition by Benzamin T. Burton, McGraw Hill . Book Company, New York.
8. Nutrition - An Integrated Approach by R.C.Pyke & M.L. Brown, Wiley Eastern Pvt.Ltd., New Delhi.
9. Hawk's Physiological Chemistry, Edited by Bernard L.Oser, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
10. Biochemistry: White A. Handler P., Smit E.L., McGraw Hill, Tokyo.
11. Text Book of Biochemistry : H.R.Mahler and E.H.Chordes, Harper & Row Publisher, New York.

SPECIAL TECHNOLOGY-ll (PRACTICAL)- LAB

5FT10 FOOD TECHNOLOGY

A.BIOCHEMISTRY

1. Estimation of carbohydrates and proteins by various methods.
2. Estimation of minerals, Phosphorus, Iron, Calcium.
3. Estimation of vitamin C and effect of heat.
4. Qualitative demostration of enzyme with salivary amylase.
5. Study of rate of enzyme reaction, effect of environmental factors on rate of enzyme action.
6. Detection of trypsin inhibitor.
7. Chromatographic separation of carbohydrates and aminoacids.
8. Simple histological studies on plant tissue.

B. MICROBIOLOGY

1. Preparation and sterilisation of nutrient media.
2 Cultivation and morphological study of common species of bacteria yeasts and moulds.
3. Isolation of pure culture from natural sources.
4. Imunelation of bacteria Haemoeytometer, standard plate count MBRT tests for milk.
5. Bacteriological analysis of water.
6. Microbial spoilage of various foods and effect of extrinsic and intrinsic factors on food spilage.

BOOKS RECOMMENDED:

1. Microbiological Methods, C.H.Collins & P.M. Lyme. Butterworth Co.Ltd., London.
2 Microbes in Action - A Laboratory Manual of Microbiology; H.W.Seeley (JR.) and P.J.Von. Denmark - Taraporewala I.,W. Pvt. Ltd., Bombay.
3. Introduction to Practical Biochemistry: D.T.Plummer, Tata McGraw Hill Co., New Dellii.

4. Hawk's Physiological Chemistry Edited by Bernard L.Oser, Tata McGraw Hill Pub. Co. Ltd., New Delhi.

SPECIAL TECHNOLOGY-ll

5PT04 (ii) PULP & PAPER TECHNOLOGY TECHNOLOGY OF PULPING PROCESSFS

Collection grading and storage of various raw material, wood preparation for pulping, units for measuring wood handling wood barking chipping. screening. chip. handling and storage. relationship between wood and quality.

Introduction to pulping. Fiber separation commercial processes. types of pulping processes. advances and trends in pulping.

Manufacture of mechanical pulp: Types. grades and uses of mechanical pulp stone ground wood process, types of grinders. theory of grinders. theory of grinding. variable in ground wood process, characteristics of groundwood pulp, pulp mill operations control, practice and testing methods, whole wood fiber manufacture. ground wood from pretreated wood, refiner mechanical pulping scheme, thermomechanical pulping.

Semichemical pulping and Semimechanical pulping; Neutral sulfite semichemical pulping, bisulfite semichemical pulping, craft semichemical pulping. cold soda semichemical pulping, hot sulfite chemomechanical semichemical pulp.

Sulfite pulpinp. Description of various sulfite processes, sulfite liquor preparation. variables in sulfite pulping. mechanics and kinetics of sulfite pulping. delignification, digestion in sulfite process. characteristics of sulfite pulp.

Alkaline pulping: General description of alkaline pulping process. alkaline digestion. chemical reactions during alkaline digestion. Variables in alkaline pulping process, digester operation. material and heat balance bamboo. reeds. hemp. jute, etc.

Recent advances in the field.

BOOKS RECOMMENDED :

1. Pulping processes by A.Rydholm. Interscience Pub., John Wiley &
Sons Inc., New York. London. Sydney.
2 Pulp & Paper: Chemistry & Chemical Technology, 3rd Edn., Vol I by James P.Casey, John Wiley & Sons, New York.
3. Pulp and Paper Manufacture, 2nd Edn., Vol I by Ronald G.McDonald.
4. Pulp and Paper Science Technology. Vol. I by C.E.Libby. McGraw Hill Co.
5. Hand book of Pulp & Paper Technology. 2nd Edn.. by Bitt Van Nostrad. Reinhold Co.. New York, London.

SPECIAL TECHNOLOGY -II (PRACTICAL) - LAB
5PC10 PULP & PAPER TECHNOLOGY

Analysis of fibrous materials; Pulp analysis: Determination of moisture ash content, permaganate number, copper number, kappa number of pulps 2, B, V, cellulose, solubility of pulp in alkali.

Analysis of non-fibrous materials: Analysis of black, green and white liquors, bleaching powder, soda ash, caustic soda, lime stone etc.

Books Recommended :

I. Technology of Textile Properties by M.A.Taylor,
2. Textile Analysis by S.K.
3. Identification of Textile Materials, 7th Edn., Textile Inc., Manchester,7.
4. Analytical methods for a Textile Lab., 2nd Edn., AATCC monog No.3 Research Triangle Park. North Carolina, Printed in U.sA
5. ISI Standards for Textile Testing
6. Textile Testing by Sinkale.

5OT04 SPECIAL TECHNOLOGY-ll
CHEMIS1RY AND BIOCHEMISTRY OF FATS
(iii) (OIL & PAINT TECHNOLOGY)

Techniques of separation of fats and fatty acids : Low temperature crystallization, esterification, urea adducts, counter distribution, chromatographic methods of separation with special reference to thin-layer chromatography and gas-liquid chromatography.

Methods for quantitative investigation on the component, fatty acids of natural fats and processed fats.

Lipase hydrolysis, X-ray diffraction and polymorphism of glycerides and other fatty acids and their derivatives. Dilatimetric measurements and their significance.

Infrared (IR), Ultraviolet (UV), Unclear Magnetic Resonance (NMR) and mass spectroscopy for the analysis of fatty materials.

Reichert-Missel and Polanske and Krischner values. Advanced method of analysis of fats, fatty acids and glycerides. .

Chemical reactions pertaining to the manufacture of fatty acid derivatives including metal salts other than alkali metals.

Quantitative investigation of component triglycerides of natural fats. Theories of fatty acid distribution in natural fats. Effect of fatty acid distribution on the physical properties. Polymorphism of fats and fatty acids. Biosynthesis of fatty acids, phosphlipids and triglycerides in plants and animals. Elongation and desaturation of acyl chains. Biological utilization of fats. Fat assimilation;

Essential fatty acids.

Recent advances in the field.

Books Recommended :

1. Industrial Oil and Fat Products: A.E.BaiIey : Interscience Publishers, New York, Latest Edition.
2 Fatty Acids: K.S. Markley (5 Volumes),lnterscience Publishers, New York, Edn., Latest Edition.
3. Structure and Utilization of Oil Seeds : J.G.Vaughon.
4. Melting and Solidification of Fats : A.E.Bailey, Interscience Publishers, New York, Latest Edition..
5. The Analysis of Fats and Oils: V.C.Mehlenbacher : The Garrard Press Champing, Edn., Latest Edition..
6. Progress on the Chemistry of Fats and other Lipids: T.T.Homan, W.O. Lundberg and T.Malkia, Pergamon Press, New York, Latest Edition (7 Vols.)
7. The Chemical Constitution Natural Fats: Wiley Books Publishers, New York, Latest Edition..
8. Vegetable Fats and Oils: G.S.Jamiesan, Renehold Publishers, New York, Latest Edition..
9. Vegetable Fats and Oils: E. W.Eckey : Renehold Publishers, New York, Latest Edition..
10. Gas-Liquid Chromatography - Theory and Practice: S.Dal Nagore and R.SJuvent; Interscience Publishers, New York, Latest Edition.
11. Lipid Chromatographic Analysis: C.V.Marinelt.
12. Fatty Acid Synthesis and Application: N.E.Bednareyk & W.L.Erickson.
13. The Lipids: H.D.Dauel : Interscience Publishers, New York, Latest Edition.
14. Analysis and Characterization of Oil, Fats Products : H.A.Bookenoogen.
15. Thin-layer Chromatography: Babbit.

SPECIAL TECHNOLOGY - II (PRACTICAL) - LAB
5OT10 OIL & PAINT TECHNOLOGY

Analysis of nickel catalyst and acids oils, Preparation of mixed fatty acids and determination of composition.Analysis of commercial fatty acids. Preparation of pure fatty acids. Determination of mono, di and tri-glycerides. Analysis of soaps and detergents. Detection of Adulteration. Analysis of Oils by thin layer and column chromatography.

SPECIAL TECHNOLOGY-II
5PC04 (iv) PETRO CHEMICAL TECHNOLOGY-II
PETROLEUM REFINING TECHNOLOGY

Petroleum refining industry in India, practice and prospectus : Commercial petroleum products, quality requirements.Indian specifications.

Testing methods and their significance: crude assay, refining processes, integration of these processes:. typical refining schemes in India. Descriptive account of atmosphere , vaccum distillations, use of process steam, steam stripping vaccum producing systems.etc.

Industrial practice of various conversion processes, such as catalytic cracking, hydro-cracking,cooking visbreaking, polymerization, alkylation, hydro-desulphurisation etc. and their role and place in Indian refineries.

Production of cube base stocks, solvent extraction, dewazing, finishing and blending; Finishing processes in a modem refinery.

Petroleum speciality products.

Descriptive account of various aspects of a refinery such as instrumentation and automatic control, refinery utilities off site facilities refinery layout, corrosion, safety, energy saving, environmental aspects etc; conservation of petroleum products, Techno-economic aspects of optimum refining schemes.

Recent Advances in the field.

Books Recommended :

1. Petroleum Refinery Engg., W.L. Nelson : Mc Graw Hill Kogakusha, 4th Edn., Latest Ed.
2. Modem Petroleum Technology, Applied Science. G.D.Hobson and W.Pol Publisher 4th Edn., Latest Ed.
3. Petroleum Processing, Principles and Applications, RJ .Hengatabes,
   McGraw Hill, Latest Ed.
4. Petroleum Refiing, Technology and Economics: J.H.Gary and G.E., Hand-work, Merceidekker, New York, Latest Ed.
5. Petroleum Processing Handbook : W.E.Bland and P.L.Daviason. McGraw Hill, Latest Ed.
6. Petroleum Refinery Manual : M.M.Noel, Rinebold, New York, 1959.
7. V.B.Guthrie, Petroleum Products Handbook, McGraw Hill, 1960.

SPECIAL TECHNOLOGY-II (PRACTICAL)- LAB
5PC10 PETRO-CHEMICAL TECHNOLOGY-II

Analysis and testing of petroleum and petroleum products.

ASTM distillation of motor gasoline, kerosene and high speed diesel, viscosity index. demulsification number and forming characteristics of lubricating oils; Existent gum in motor gasoline; oxidation tests for lubricating oils, oxidation stability of gasoline, water washout characteristics and roll stability of grease. Ductility of bitumen; Electric strength-transfoer oil, PONA analysis by FIA method, aniline point method liquid vapour pressure, Heat of combustion of liquid hydrocarbon fuels, calorific value of' gases, mercaptan sulphur content, salt content, Sulphur by lamp and bomb methods, P,Ca and Cl lubricating oils, study of Vapour-Liquid equilibrium for binary systems using Othmer still study of ternary equilibrium systems and representation triangular diagrams.

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5 FE CT 05 FREE ELECTIVE - I
(2) ECONOMICS AND MANAGEMENT

SECTION-A

Unit I : Nature and Scope of Economics, introduction to managerial economics.

Demand concepts : Demand specification, types of demand.

Demand analysis : law of diminishing utility, Consumer's surplus.

Demand forecasting : Concept of forecasting, types of forecasts (8)

Unit II : Production Concept, production function, Laws of return, scales of production, factors of production, production planning and control : Its meaning, essential factors for the success of production planning and control. (8)

Unit III : Meaning of Management, Principles of management, meaning and principles of scientific management, levels of management, delegation and authority, Organisation, forms of organisation. (8)

SECTION-B

Unit IV : Sources of Finance Banking and Credit structure in India : Financial institutions, promotional polices and programmes of industrialisation, functions of Commercial Banks, functions of Central Bank. (8)

Unit V : Economic and Social Environment : Brief idea about economic environment of business, socio-cultural environment, Health hazards of chemical industries, awareness about AIDS & other diseases.

Brief idea about economic recession & its effect.

Introduction to World Trade,

Globalisation, Libertion and their effects.

Introduction to Patenting & intelleatual property protection (8)

Unit VI : Entrepreneur and Entrepreneurship :

Entrepreneurial competencies, institutional interface for small scale enterprises, opportunity scanning and identification.

Market assessment for SSE, choice of technology and selection of site, Ownership structure and organisational framework, preparation of business plan, main features of Indian factories act & minimum wage act.

Brief idea of Taxation in India. (8)

BOOKS RECOMMENDED :

1) Managerial Economics : K.K.Seo, Richard D. Irwin Inc.
2) Engineering Economics : J.L.Riggs, McGraw Hill, New York, Latest Edition.
3) Managerial Economics : Adhikary M., Khosla Pub. House, New Delhi.
4) Small Business Management Fundamentals : Dan Strenhoff and J.F.Burgess, McGraw Hill Book Company.
5) Effective Small Business Management : Richard M.Hodgills, Academic Press Incorporated, Harcourt, Brace Jovanovich.
6) Marketing Management for Small Units : Jain Vijay K., Management Publishing Co., Latest Edition.
7) Marketing Management :- Analysis, Planning, Implementation and Control : Kotler, Phillip, Prentice Hall of India Pvt. Ltd., Latest Edition.
8) Modern Economics Theory : K.K.Dewett.

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5 CT 06 COMMUNICATION SKILLS

Unit I : Comprehension over an unseen passage.

Comprehension - A - word study :-

Synonym, antonym, meanings, matching words, adjectives, adverbs, prefix and suffix, correct forms of commonly misspelled words, understanding of the given passage.

Comprehension - B - Structure study :-

Simple and compound sentences, types of conjunctions, singular and plural, tenses and their effect on verb forms. Use of - not only - but also, if clause, since, may, can, could, would, too etc.

Active and passive forms, negative and interrogative, punctuation and capitalization. (10 Hours)

Unit II : Theoretical background - importance of communication, its process, model of communication its components & barriers.

Verbal communication, its significance, types of written communication, organization of a text (Titles, summaries, headings, sequencing, signaling, cueing etc.), Important text factors (length of paragraph, sentences, words, clarification and text difficulty). Evaluation of written communication for its effectivity and subject content.

Non-verbal communication, types of graphics and pictoral devices. (10 Hours)

Unit III : Specific formats for written communication like - business correspondence, formal reports, technical proposals, research papers and articles, advertising and graphics. Format for day-to-day written communication like applications, notices, minutes, quotations, orders, enquiries etc.

Oral communications - Important objectives of interpersonal skills, (verbal and non-verbal), face to face communications, group discussion and personal interviews.

Methodology of conduction of meetings, seminars, symposia, conference and workshop. (10 Hours)

BOOKS RECOMMENDED :

1) Krishna Mohan, Meera Banerjee : Developing Communication Skills, MacMillan India Limited.
2) Chrissie Wright (Editor) : Handbook of Practical Communication Skills, Jaico Publishing House.
3) Curriculum Development Centre, TTTI WR, Bhopal : A Course in Technical English, Somaiya Publication Pvt. Ltd.
4) F.Frank Candlin : General English for Technical Students, University of London Press Ltd.

5 CT 11 COMMUNICATION SKILLS LABORATORY

Objective :

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation.

The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

TEXT BOOK : Norman Lewis : Word Power Made Easy

http://www.teachingenglish.org.uk

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SIXTH SEMESTER
FREE ELECTIVE - II
6 FECT 05 (3) CHEMICAL TECHNOLOGY

Study of the following proccsscs :

1. Nitration: Nitrating agensts. Kinetics and mechanism of aromatic nitration. Thennodynamics of nitrations. Equipments for nitration. Mixed acids for nitration and typical industrial nitration processes e.g. preparation of nitrabenzene, chloronitronapthalene and acetafiline.
2. Sulphonation and Sulfation : Sulphonation and sulfating agents:Kinetics, mechanism and thermodynamics. Industrial equipment and techniques. Technical preparation of sulphonates and sulphates. Sulphation of lauryl alcohol, dimethyl ether etc.
3. Hydrogenation: Catalytic Hydrogenation. Kinetics and thermodynamics of hydrogenation reactions. Apparatus and material of construction, hydrogenation of fatty oils. Synthesis of methanol. Hydroforming of naptha. Hydrogenation of heavy oils.

4. Halogenation: Thermodynamics and Kinetics of halogen. Pathohalogenation. Equipment and design for halogenation. Technical preparation or halogen compounds e.g. allyl chloride. D.D.T...B.H.C....Chlorobenzene dichlorodifluromethane. vinyl chloride etc.
5. Oxidation : Liquid and Vapour phase oxidation. kinetics and thermochemistry. apparatus for oxidation. Technical oxidation of isoeurenol. acetaldchyde. Cyclohexane Iso-propylbenzene. napthaleum refinary, electro-plating, tanning, coat mining and radio waste.
6. Wastewater Treatment : Classification of wastewater. Methods of treatment. sludge treatment and disposal. treatmcnt of effluent water from textiles rayon. pulp. dairy, distillery Petroleum refinary, electro-plating, tanning, coal mining and radio active waste.
7. Water : Source of water. Impurities in water. Requirements of water by different industrics. treatment of water for industrial and domestic purpose. boiler feed water treatment. reuse of water. Water conservation.
8. Industrial gases : CO, CO_2, CO_3, H_2,O_2, N_2, SO_2, C_2, H_2 synthesis gas, rare gases : Helium nitrous oxides.
9. Industrial Acids : Sulphuric, Nitric and hydrochloric acid.
10. Marine Chemicals : Salt from sea water. by product of salt industry viz, Bromine and Iodine.
11. Fertilizers: Ammonia Nitrogenious of fertilizers. Phosphatic fertilizers. Potassic fertilizers. Compound and complex fertilizers. Misccllanceous fertilizers,
12. Electrolytic and Electro-chemical Industries: Chlorates, perchlorates. Primary and Secondary cells, artificial abrasives. Calcium carbide Refractory carbides. borides, silicides and nitrides.

BOOKS RECOMMENDED:

1. Unit Processes in Organic Synthesis by P.H.Groggins. Vth Edn.. International Students Edn.. McGraw Hill Co.
2. Chemical Technology -Vols I, II, III by D.Venkateswarlu, Chemical Engg. Education Development Centre. I.I.T. Madras, Latest Edition.
3. Chemical Process Industries by R. N. Sherve and J. A. Brink. McGraw Hill, Co., Latest Edition.
4. Chemical Technology in two parts. Edited by I.P.Mukhlyanov, Mir Publishers Moscow, Latest Edition.

6 CT 01 PROCESS EQUIPMENT -DESIGN & DRAWING

SECTION-A

Unit I : Material behaviour under stresses, theories of failures. (8)

Unit II : Fabrication methods and their effects : Design method for atmospheric storage vessels, unfired pressure vessel subjected to internal and external pressure. (8)

Unit III : Vessels for high pressure operations, Agitated vessels. Tail columns, internals of the reactors. (8)

SECTION-B

Unit IV : Design of proess equipment accessories and support systems. (8)

Unit V : Complete design and preparation of working drawing for typical process equipment, such as large storage vessels, thick wall pressure vessels. Self supported tall columns, agitated pressure vessels with heat transfer requirements etc. (8)

Unit VI : Design and layout of piping system and preparation of piping diagram for a typical process. Material selection and piping coding. (8)

PRACTICALS : Based on the above syllabus.

BOOKS RECOMMENDED :

1) Process Equipment Design : I.E.Brownell, E.H.Young, John Wiley, Latest Edition.
2) Process Equipment Design : M.V.Joshi, McMillan, Latest Edition.
3) Introduction to Chemical Engg. Design, Mechanical Aspects
4) I.S.Code for Unfired Pressure : IS No. 2825 - 1969 pressure vessel.
5) Process Equipement Design & Drawing : S.D.Dawande.
6) International & Indian Standard codes for Piping.
7) Process Design of Equipments, 3rd Ed, S.D. Dawande, Vol I & II, Central Techno Pub., Nagpur

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6 CT 0 3 INSTRUMENTATION & CONTROL

SECTION-A

Unit I : Measuring Instruments : Qualities of measurement, elements of instrument, static & dynamic characteristics, measurements of temperature and levels.

Unit II : Measurement of pressure, vacuum, humidity & pH in process industry.

Unit III : Methods for composition analysis. Principle and techniques of instruments for composition analysis in process industry, such as chromatography, spectroscopy, refractrometry etc.

SECTION-B

Unit IV : Flow measuring instruments : Flow measuring devices for incompressible and compressible fluids. Electro-hydraulic valves, hydraulic servomotors, electro-pneumatic valves. Pneumatic actuators.

Unit V : Introduction to Simple system analysis : Laplace Transformation. Block diagrams, linearization. First and higher order system.

Unit VI : Frequency response, distributed parameter system, dead time.

Feed back control, servo and regulator control. Time domain closed loop responses, closed loop frequency response.

BOOKS RECOMMENDED :

1) Industrial Instrumentation : Eckman, Wiley Eastern
2) Instrumental Methods of Chemical Analysis : Erwing, McGraw Hill.
3) Instrumentation & Process Measurements : W.Bottom, Orient Longman.
4) Industrial Control & Instrumentation : W.Bottom, Orient Longman.
5) Outlines of Chemical Instrumentation & Process Control : A. Suryanarayan, Khanna Pub., New Delhi.
6) Donald R. Cougha Nowr : Process Systems Analysis and Control, McGraw Hill Pub., New York.
7) Vyas R.P. : Process Control and Instrumentation, Central Techno Pub., Nagpur.
8) Patranabis D. : Principles of Industrial Instrumentation, 2nd ed., Tata McGraw Hill Pub. Co., New Delhi.
9) Patranabis D. : Principles of Process Control, Tata McGraw Hill Pub. Co., New Delhi.
10) Gaikwad R.W., Misal S.A. : Process Dynamics & Control, Central Techno Pub., Nagpur.
11) Stephanopoulos G. : Chemical Process Control and Introduction to Theory & Practice, PHI, Latest Edition.
12) Considine D.N. : Process Instrumentation & Control Handbook, McGraw Hill.

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6 FT04 SPECIAL TECHNOLOGY-III
(i) FOOD TECHNOLOGY-III
MICROBIOLOGY AND PRINCIPLES OF FOOD PRESERVATION

Brief historical background, classification and terminology of micro-organisms. Study of morphology and physiology of bacteri-yeasts moulds and actinomicetes, introduction to viruses and bacteria. Methods of isolation, cultivation and enumeration of micro-organisms, Nutrition, reproduction and metabolism. Synchronised and balanced growth and continuous cultivation of microorganisms.

Control of microorganisms by physical and chemical methods, Sterilisation and disinfection, inadiation antibiotics, evaluation of antimicrobial agents, Microbiology of air, water and sewage. Immunological methods. Bacteriological analysis of foods, Role of microorganisms in food spoilage.

Principles of food preservation. Preservation of food by means of low temperature. Freozedrying thermal processing irradiation, dehydration chemicals antibiotics and C.A.storage. Sources and prevention of contamination. Food Production and Microbial toxins, Principles of a amitation in food technology and safety of foods. Fermented food like bread, cheese, yogurt, vinegar, alcohol, pickles.

Recent advances in the field.

BOOKS RECOMMENDED:

I. Food Microbiology: W.C.Frazier, Tata McGraw Hill Pub., Co., Bombay.
2. Microbiology: MJ.Pelkzar, Ried R.D., E.C.S.Chan, Tata McGraw Pub., Co. Ltd., New Delhi.
3. Fundamentals of Microbiology: M.Frobisher, W.B.Saunders Co., Philadelphia.
4. Microbiology: P.L.Carpenter, W.B.Saunders Co., Philadelphia.
5. Microbiological Methods: C.H.Collins & P.M.Lyne, Butterworth and Co., London.
6. Food Processing Operations: M.A.Goslyn & J.Hold, The AVI Pub. Co., INC, Westport.
7. Principles of Food Science, Vol. II : G.Borgestrom the MacMilIan Co. Ltd., London.
8. Technology of Food Preservation: Destosier, Norman W., AVI Pub. Co., INC, London.
9. Practical Food Microbiology and Technology: H.H. Weiser, The AVI Pub. Co., Westport (Coun.)

SPECIAL TECHNOLOGY PAPER-Illl
6 PT 04 (ii) PULP & PAPER TECHNOWGY
PULPING PROCESSES-II

Pulp Washing, Bleaching and Recovery of Spent Chemicals : Washing of Pulp : Delibration of sulphate pulp, brown stock washing, screening and clearing of sulphate pulp, washing of sulphite pulp, screening and clearing of sulphite pulp, screening and clearing of other pulps.

Recovery of spent chemical : Liquor recovery in alkaline pulping, evaporation of kraft liquors, recovery furnance, recausticizing treatment to digester and evaporator condensates, recovery of alkalining sulphate, turpentine, tall oil and other alkaline pulping by products.

Recovery process in sulfite pulping, Calcium, Magnesium, Amonia and Sodium bases recovery, other sulfitex recovery methods, recovery of by-products from sulfite process, whole spent liquor and ligoo sulfonates. Vaniline and alcohol from sulfite spent liquor, fermentation of sulfite spent liquor to produce proteins.

Bleaching: History of Bleaching, bleaching of mechanical pulps, semichemical pulps, chemi-mechanical and chemical pulps, multistage bleaching, control procedures in bleaching process, colour reversion of bleaching pulps, environmental aspects of Bleaching chemicals.

Recent advances inthe field.

Books Recommended:

1. Pulping Processes by S.A.Rydholm.
2. Pulp & Paper : Chemistry and Chemical Technology, 3rd Edn., Vol. I by James P.Casay
3. Pulp & Paper Manufacture, 2nd Edn., Vol.-I by R.P.Mc Donald.
4. Hand Book of Pulp & Paper Technology, 2nd Edn., by K. W. Britt.

6CT02 COMPUTER PROGRAMMING AND APPLICATIONS

Note : Application of the following techniques for problems of interest in chemical engineering, writing and testing of programs written in C Language.

SECTION-A

Unit I : Numerical solution of first order differential equations with initial condition, Euler's method, Runge-Kutta method.

Unit II : Systems of linear equations, solution by the method of determinants, matrix inversion for the solution of linear equations, Gauss elimination method.

Unit III : Roots of algebric and transcendental equation, iteration methods, Regula-Falsi method, Newton-Raphson method, roots of simultaneous and solution set of transcendental

and algebric equations. Development of equations for heat transfer, fluid mechanics and reaction engineering problems.

SECTION-B

Unit IV : Regression analysis - Least Square, error approach, approximation by Chebychev orthogonal polynomial.

Unit V : Elements of optimization techniques, single variable function, optimization-direct search, with and without acceleration, method of regular intervals and fibonacci search method, gradient methods.

Unit VI : Computer programming in modular form, use of subroutine libraries, Block diagrams of preliminary aids in programming, capacity optimization.

PRACTICALS : Based on above theory.

TEXT BOOK : Digital Computation for Chemical Engineering by Leon Lapidas, McGraw Hill, Latest Edition.

6 OT 04 SPECIAL TECHNOLOGY-III
(iii) OIL & PAINT TECHNOLOGY OF OIL BEARING MATERIAI:S

Domestic and World production of oil seeds and oils, storage, sampling, Grading of oil seeds and oils. Pre-Extraction treatments of oil seeds. Mechanical expression, solvent extraction and other methods of recovery of oils and fats. Economic aspects of these processes, processes and plants employed for refining, bleaching, deororisation and hydrogenation of oils and fats.

Manufacture of butter, Ghee, margarine, vanaspati and confectionary fats. Transesterified oils, fats, winterization of oils. Manufacture and evaluation of ancillary materials such as activated earths, activated carbons, nickel catalyst for hydrogenation. Cooking and salad oils, plastic shortening agents.

Environmental aspects in Oils seeds and oil processing units. Effective control according to Indian Standard specification.

Non Glyceride Constituents, general method of upgrading and utilization of oils and fats, oil-cakes and other products. Synthetic fatty acids and glycerides. Recent advances in the field.

BOOKS RECOMMENDED :

1. Cottonseed and Cottonseed Products : A.B.Bailey, Interscience Publishers, New York, Latest Edition.
2. Industrial Oil and Fat Products: A.E.Bailey, Interscience Publishers, NewYork, Latest Edition.

3. Soyabeans and Soyabean Products: K.B.NarkIev, Interscience Publishers, New York, Latest Edition.
4. Hydrogenation of Fatty Oilseeds : Waterman, Lquosevier Publishers, New York, Latest Edition.
5. Fatty Acids: K.S.Markely (5 Vols.), Interscience Publishers, New York.
6. Continuous Processing of Fats : M.K.Schwitzer, Latest Edition.
7. Refining of Oils and Fats for Edible Purposes: A.J.C. Anderson, Academic Press, New York.
8. Vanaspati Industry: G.S.Hattangadi
9. Practical Treaties on Vegetable Ghee Manufacture: Varma & Jaidev.
10. Solvent extraction of Vegetable Oils: H.Y.Parkb.
11. Refining and Technology of Oils and Fats: T.N.Mahatte, Small Business Publication, New Delhi.
12. Food Oils and their Uses: TJ.Weiss, Latest Edition.
13. Bleaching Earths: M.K.H.Siddiqui, Latest Edition.
14. Progress in the Chemistry of Fats and other Liquids: R.T.Holman, M.O.Luadberg & T.Malkin, Pergamon Press, New York (7Vols.)
15. Vegatable Fats and Oils: E. W.Eckay, Rinehold Publishers, New York, Latest Edition.
16. The Chemistry, Flavouring and Manufacture in Chocolate, Confectionary and Cocoa: H.PJenson, Blackiston Publishers, Philadelphia, Latest Edition.
17. The Butter Industry: O.F.Huzoker, Latest Edition.
18. Margarine: A.J.C.Anderson, Academic Press, New York, Latest Edition.

SPECIAL TECHNOLOGY-III
6 PC04 (iv) PETROCHEMICAL TECHNOLOGY-Ill
PETROLEUM REFINERY ENGINEERING CALCULATIONS

ASTM, TBP, EFV distilIation curves, computation of the curves from any one type by methods such as those or Nelson, Simister etc. Computation of various properties of petroleum fractions such as VABP,MABP, thermophysical properteis from refinery engineering chart. Phase behaviour of multicomponent hydrocarbon systems retrograde phenomena, K values and their estimate for complex mixtures K values corelations; Flash equilibrium calculation for multi component system by method of successive approximations and simple methods such as that of McHenry; Calculation of bubbic and dew points for complex mixtures, construction of phase diagram, successive flash for complex mixtures, multicomponent fractionation.

Separation criteria in crude oil fractionation, comparison with the simplest light hydrocarbon fractionation. Watkins method of covering crude TBP to product TBP curve, concept of overflash.

Energy balance in a topping tower, types of reflexes and calculations involved, estimation of top side draw bottom and stripper temperatures. Brief account of topping tower design procedures: according to Nelson, Watkins, Van Winkle (psudeo component design method), tray design.

Entrainers and solvents for hydrocarbon separation by azeotropic and extractive distillations. Types of pipe still heaters, calculation of radiant absorption rates, Wilson Lobo, Hetel equation, Labo Evans method piple still design.

Problems illustrating the use of solvent extraction, absorption and stripping in refinery operations and natural and refinery gas processing; multicomponent absorbers and strippers, calculation by Kremser-Brown absorption factor procedure.

Heat exchangers in refinery design and operational problems, fluid mechanics and refinery applications. Use of combustion charts.

Recent advances in the field.

(The subject has to be covemed entirely by Numerical)

Books Recommended:

1. Petroleum Refinery Engineering : W.L.Nelson, McGraw Hill, Kogakusha, 4th Edn., Latest Edition.
2. Petroleum Refinery Distillation: R.N. Watkins, Gulf Pub. Co., Texas, Latest Edition.
3. Data Book on Hydrocarbons: J.B.Maxwall, K.E.Kriegar Pub. Co., New York, Latest Edition.
4. Distillation: M. Van Winkle, McGraw Hill, Latest Edition.
5. Handbook of Natural Gas Engineering: D.L.Katz & Others, McGraw Hill, Latest Edition.
6. Applied Hydrocarbon Thermodynamics: W.C.Edmister, Gulf Pub. Co., Latest Edition, Vol. I & II.
7. Surface Operations in Petroleum Production: G.Y.Chilingar & C.M.Beeson, Elsevier, New York, Latest Edition.
8. Petroleum Processing Handbook: W.F.Bland & R.L.Davidson, McGraw Hill, Latest Edition.
9. Chemical Engg. : J.M.Coulson and J.F.Richardson, Pergamon Press 3rd Edn., Vols. I & II, Latest Edition.
10. Equipment Design Handbook for Refineries and Chemical Plants: Frank L.Evans, Jr., Gulf Pub. Co., Houston, Texas, Latest Edition.

6 CT 09 MINOR PROJECT

Students are required to prepare and submit report on mini project on Software Development / Market Survey / Design / Fabrication / Site Visit / Some Experimental Investigation / Validation in the relevant field under the guidence of teacher.

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FOUR YEAR DEGREE COURSE IN BACHELOR OF TEXTILE ENGINEERING SEMESTER - V (CREDIT & GRADE SYSTEM)

5 TX 01 YARN MANUFACTURING –III

Section- A

Unit I : **Speed Frame-** History of development, object, construction & working of speed frame. Top arm drafting system, Construction Flyer, Spindle and presser for twisting & winding operation. Objects, construction and working of Differential Mechanism and Building Mechanism. Various Parameters affecting roving quality and production. Gearing and production calculations of speed frame. Faults in roving. Features of modern speed frame.

Unit-II : **Ring Frame-** Object, construction & working of ringframe, Details of Creel, Drafting system, Balloon control ring, lappet, Travelers, Rings, Aprons, top roller cots, spacers of ringframe. Compact Spinning- Introduction, Pneumatic compact spinning, Magnetic compact spinning,yarn properties of compact yarn. Comparison of normal ring and compact yarn.

Unit-III : **Ring Frame -** Spinning Geometry- Spinning Angle, Spinning triangle, Angle of Wrap.Formation of twist and its effects. Ring and traveler combination effect. Change places in ring frame. Gearing & Building Mechanism of ring frame. Building of cops, Types of spindles, Spindle drives. Draft and production calculation. Development in Ring Spinning.

Section - B

Unit-IV : **Ring Frame-** Drafting, types of drafting system, types of draft. Drafting force, Roller slip, Floating fibres, Drafting waves, Drafting capacity. Different Weighing methods, its advantages & limitation, Factors affecting on roller setting and drafting performance. End Breakages-Causes, Effect & Control. High speed drafting in ring spinning. Hairiness –causes control and effect. Yarn Faults- causes, effects and control.

Unit-V : **Doubling-** Object of doubling, twist and twist direction effects, Tension effects, Balanced and unbalanced yarn, Properties of folded yarn,Doubling methods –dry, wet ,Doubling machine – Ring doubler , Up twister, Two stage twisting machine, Two For One twister and Three for One twister, Comparison of doubling machines. Fancy yarns- Introduction, types. Method of production, yarn properties, end uses.

Unit-VI : Blending- Object of blending, Type of Blending ,Measures & selection of blend constitutes. Mechanism of blending. Blend Ratio, it's effect on yarn properties. Blend Irregularities, Modern blending machines.

Reference Books:

1. Short Staple Spinning –W.Klein
2. Cotton Spinning-William Taggart
3. Cotton Spinning-Gillbert R. Merill
4. Manual of cotton spinning –Butter Worth Series
5. Essentials calculations of Practical Cotton Spinning – Pattabhiram
6. Spinning of Manmade fibres and Blends on Cotton System-K.R.Salhotra
7. Practical Cotton Spinning – Pattabhiram
8. Spun Yarn Technology-Subramaniam
9. Ring Spinning- Dr. A.R. Khare

5TX 02 FABRIC MANUFACTURING-III

Section -A

Unit I : Knitting: - Introduction, Woven and Knitted fabric comparison, general terms and principles of knitting technology, basic mechanical principles of knitting technology, elements of knitted loop structure, stitches produced by varying the sequence of the needle loop intermeshing, type of knitting .

Unit II : Weft knitting- Comparison of weft knitted and woven fabrics. Weft knit structures:- classification, technical terms, symbolic representation, anatomy of loop-stitch, cross-over points and configuration, laddering effect, characteristics of single jersey of plain structure, rib-knit structure, interlock-knit purl-knit. Weft knitting machines- plain knit, circular rib, circular interlock, purl. Float and tuck stitches- structure, effect of float and tuck structure.

Unit III : Warp knitting- Comparison of warp knitted and woven fabrics. Basic warp knitting principle- Construction of warp knitted fabrics, warp beams, guide bar. Warp knit structure:- classification, technical terms, symbolic representation, underlap and overlap, closed lap and open lap stitches. Warp knitting machine- classification, knitting elements and cycle on tricot machine, compound needle elements and its knitting cycle, difference between Tricot and Raschel machine.

Section - B

Unit IV : Nonwovens - History, definition, characteristics features and properties of nonwoven fabric, Comparison of nonwoven and

woven fabrics, differences in geometrical arrangement of fabrics in web, binding element and bonding structure. Classification of nonwoven fabrics by Albercht, by Krema and Meyer, by DIN standards, by their structure.

Unit V : Raw material for nonwoven production, function of fibre in nonwoven fabrics, effect of fibre properties on properties of nonwoven fabrics, application of industrial fibre in production of nonwoven, special fibre for nonwoven production, Brief overview of fibre preparation for nonwoven web formation. Different web formation technologies: - Airlaid web formation, Airlaying technology and Wet-laid web formation.

Unit-VI : Bonding technologies: - Mechanical bonding- needle punching, hydroentanglement, stitch bonding. Thermal bonding- contact, air and impingement, radiation/infra-red and ultrasonic. Chemical bonding- mechanism, method and drying, Fabrics for specific end use,

Reference Books :

1. Knitting technology by Ajgaonkar
2. Mannual nonwovens by Radko Kerma
3. nonwoven manufacture by Bannergee

5 TX 03 TEXTILE TESTING – I

Section- A

Unit- I : Introduction & Objects Of Testing. Tested Quality Schemes Like Wool Mark, ISI Mark.Introduction to Standards like ASTM, ISO, etc. Element of Statistics: Frequency Distribution Graphical Presentation Of Data, Measures of Location Like Mean, Mode, Median, Quartiles, Percentiles. Calculation Methods Measures Of Dispersion: Range, Quartile Deviation, Percentage Mean Deviation, Standard Deviation, CV%, Variance. Comparison of frequency distributions, Normal distribution.

Unit -II : Population values & sample values, Sampling Distribution, Standard Error, significance testing of mean & s. d., Level of confidence. Number of tests to be carried out, ANOVA (one way & two way) Quality Control Charts, X -chart, R-chart. Binomial & Poisson distribution, Correlation & Regression analysis.

Unit -III : Selection of sample for testing, Random sample, Biased sample, length & extent biased sample, sampling for raw cotton testing, Terms used in sampling, Fibre sampling from combed slivers, roving and yarns, Yarn sampling, fabric sampling.Moisture relations:

Introduction, Moisture Regain & content, measurement of atmospheric condition, regain- humidity relations & hysteresis. Absorption & desorption curves, effect of regain on fibre properties, Measurement of regain.

Section- B

Unit -IV : Fibre length measurement, Methods, Fibre sorter, Shirley Comb sorter, Analysis of Sorter diagrams, Uster staple diagram apparatus, Shirley photoelectric stapler, Fibrograph, Digital Fibrograph.Fibre fineness: Definition, Technical significance, principles of measurements. Gravimetric methods, optical methods. Microscopic methods, air flow methods, vibration methods, micronnaire value, The Sheffield micronnaire.

Unit -V : Maturity of Cotton : Introduction, Maturity ratio, Maturity Coefficient, Std. fibre wt. per cm., Determination of fibre maturity: NaOH Method, Dye Method, Air Flow Method, Polarized Light Method, Trash content: Measurement. Shirley analyzer, Cotton Colour, cotton grading. High volume instrument. Miscellaneous fibre properties: Friction & Cohesiveness, Cleanability static electricity compressibility & resilience, AFIS Tester.

Unit -VI : Yarn Dimension: Count, Direct & Indirect system of yarn numbering, Count Conversion, folded yarns, Measurement of Count, different methods, Yarn diameter.Twist: Introduction, Twist angle. Effect of twist on yarn & fabric properties, measurement of twist by different methods.

Reference Books :

1. Principles of Textile Testing: J. E. Booth
2. Textile Testing: Grover & Hamby
3. Physical Testing of Textiles: B. P. Saville
4. Textile Statistic: GAV Leaf

5 TX 04 TEXTILE COSTING AND ECONOMICS

Section- A

Unit- I : Costing: Meaning and various methods of costing, elements of cost, prime cost, over- head, factory cost, selling & distribution overhead, total cost, concept of BEP: Fixed cost, Variable cost.

Unit- II : Raw material purchase procedure, issue of material, bin cards, store ledger, material requisition slip, material transfer and

return slip, different basis of pricing of issued raw material (FIFO, LIFO, HIFO & Average)

Unit- III : Inventory: importance and meaning, consideration for fixing maximum and minimum stock to be maintained. Annual stock taking and perpetual inventory, ABC system of inventory control, Economic order quantity.

Section- B

Unit- IV : Economics: definition & scope, characteristics and classification of wants. Meaning of demand, law of demand. Supply, Law of supply. Price elasticity of demand, factors affecting elasticity of demand, demand supply interaction.

Unit- V : Type of markets: perfect market, imperfect market (monopoly, oligopoly, etc) money function, price level, inflation.

Unit- VI : Banking: commercial bank, function of commercial bank. Central Bank, function of central Bank. National income: definition, measurement of National Income, difficulties in measurement of National Income. International trade. Taxation: Direct and Indirect Taxes.

Assignments :

1) Determination of cost of yarn/kg.
2) Moisture content in relation to cost.
3) Cost calculation for standard fabrics.

Reference Books :

1. Elementary Economic Theory by K. K. Deweet and J D Verma
2. Cost Accounting by B. K. Bhar
3. Industrials Engineering and Management by O. P. Khanna

FREE ELECTIVE
5 FE TX O5 (i) TECHNICAL TEXTILES

Section- A

Unit-I : Introduction: Definition and scope, Classification of technical textiles, Brief idea about technical fibres, Role of yarn and fabric construction, Composite material. Growth of industrial textiles, Engineering textile structures for industrial purposes. Difference with non-industrial textiles.

Unit -II : Filtration textiles: Definition of filtration parameters, Filtration requirements, Role of fiber, Fabric construction and finishing treatments, Dust filtration - general, Protective masks and high temperature filtration- purification and separation of

gases - Cigarette filters - liquid filtration - solid liquid filtration, liquid - liquid separation - Textiles used for the above applications and their features.

Unit -III : Geotextiles: Definition of geo textiles - Basic functions of geo textiles, Brief idea about geosynthetics and their uses, Essential properties of geotextiles, Geotextile requirements for separation, filtration, drainage, reinforcement, protection and waterproofing - geo textiles in temporary and permanent road construction railway stabilisation -Fibre used and fabrics for above application. Geotextile testing and evaluation, application examples of geotextiles.

Section –B

Unit -IV : Medical textiles: Classification of medical textiles, Description of different medical textiles, Material used in bio-textiles; Non-implantations textiles; Textiles for extra-corporeal, Antimicrobial textiles - suture thread natural and synthetic - different types used - PTFE suture, used for cardio vascular textiles - woven, knitted - requirements of artificial blood vessels. Details of textiles used for vascular and hernia surgery - other uses in this surgery.

Unit -V : Protective Clothing: Brief idea about different type of protective clothing, functional requirement of textiles in defence including ballistic protection materials and parachute cloth, temperature and flame retardant clothing, chemical protective clothing, water proof breathable fabrics. Textiles in protective clothing: introduction, protection against heat, impact and others for safety. Fabrics in defence system and weapons; other applications. Automotive Textiles: Application of textiles in automobiles, requirement and design for different tyres, airbags and belts, methods of production and properties of textiles used in these applications.

Unit -VI : Sewing threads, cords and ropes: Types, method of production and applications, functional requirements, structure and properties. Sports and recreation textiles: Functional requirement of different type of product and their construction. Textiles in miscellaneous industrial applications: Introduction, paper makers felt, bearing and sealing materials, sound insulation, battery separators, electrical insulation textiles reinforced products; Transports bags and sheets; Fabrics to control oil spills; Canvas cover and tarpaulins.

Reference Books :

1. "Handbook of Technical Textiles", Ed. A R Horrocks and S C Anand, Woodhead Publication Ltd., Cambridge, 2000.
2. "Wellington Sears Handbook of Industrial Textiles", Ed. Sabit Adanaur, Technimic Publishing Company, Inc., Pennsylavania, USA, 1995.
3. "Engineering with Geosynthetics", Ed. G V Rao and G V S Raju, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.
4. "Industrial Textile", Ed., J Svedova, Elsevier, New York, 1990.
5. "Modern Textile Characterization Methods", Ed. M Raheel, Marcel Dekker, Inc., 1996.
6. Mukhopadhyay S K and Partridge J F, "Automotive Textiles", Vol. 29, No. ½, Textile Institute, 1999.
7. Sewing Threads' (Textile Progress, Vol. 30, No. 3/4, 2000) J. O. Ukponmwan, A. Mukhopadhyay & K. N. Chatterjee, Textile Institute, Manchester, UK, ISBN 1 870372387.
8. Medical Textiles-International Conference on Medical Textiles,Bolton,Woodhed Publication,Cambridge,1997
9. John,N.W.M"Geotextile"Blackie publication,Glasgow,1987
10. Industrial Textiles – Horrocks

FREE ELECTIVE

5 FE TX 05 (ii) FASHION AND CLOTHING SCIENCE

Section- A

Unit –I : Fashion Concept: Principles of fashion, Fashion cycle, Theories of fashion leadership, Changes in fashion, Fashion terminology for merchandising.Fashion Promotion: Fashion Promotion, factors influencing fashion promotion, Publicity, fashion show, Personal selling and communication process.

Unit –II : Fashion Marketing: Marketing concepts, fashion marketing, role of fashion marketer, market segmentation, Fashion marketing planning, Mass marketing, Marketing management, Franchising and goal of merchandiser and pricing policies.

Unit III : Fashion Buying: Interpreting customer demand, Developing fashion images, Analyzing and selection of resources. Buying in domestic & foreign market.Consumer Behavior: Psychological, Social, Economical, Practical, Family Background and other.

Section- B

Unit IV : Faric Properties: - Fabric Properties for woven and knit clothing: concept, significance importance and evaluation of dimensional stability, serviceability, drape, pilling, abrasion, crease, thickness, surface property and texture, Low stress

mechanical properties, Comfort and Handle propertie, Moisture transmission properties. Finishes used to improve these properties.

Unit-V: Properties of Garment:- Comfort properties of garment, Permeability to Air, Moisture, and Light. Water Absorbency, wicking and retention properties. Quality parameters for assessing sew ability, seam strength, seam pucker, seam slippage Needle cutting and seam appearance. Tailor ability, Formability and factors affecting Tailor ability, Formability.

Unit VI : Clothing care Detergents: - Classification and function of soap and detergents. Composition of commercial detergents. Properties and application of various laundry agents like bleaching, optical, whitening agents, stiffeners, softeners, Stain removal: - Nature and classification of stains, principle and classification of stain removals, common stain and their removal.

Reference Books:

1. Concept of Consumer, Stephen Fringes, Fairchild Publication.
2. Fashion Merchandising, Stephen Fringes, Stone & samples publisher.
3. Creative fashion presentation, Polly Guerin, Stone & samples publisher.
4. Fashion Marketing, Easey, Stone & samples publisher.
5. Fashion Advertising and Promotion, Winter& Standlay Goodman, Stone & samples publisher.
6. Physical Testing of Textile, Saville

5 TX 06 Minor Project
5 TX 07 Yarn Manufacturing-III - Lab
10 to 12 Practicals based on syllabus of 5 TX 01
5 TX 08 Fabric Manufacturing -III - Lab
10 to 12 Practicals based on syllabus of 5 TX 02
5 TX 09 Textile Testing -I - Lab
10 to 12 Practicals based on syllabus of 5 TX 03

SIXTH SEMESTER
6 TX 01 FABRIC STRUCTURE
Section-A

Unit- I : Methods of fabric representation; repeat of weave; drafts; lifting plan; construction of weave from a given draft and lifting plan; construction of draft from a given lifting plan and weave. Plain weave; twill weaves; satin and sateen weaves; irregular sateen and satins & their derivatives. Weaves constructed on plain base, Weaves constructed on twill bases; Weaves constructed on satin or sateen bases:

Unit -II : Diamonds (even no & odd no); and diaper designs; honey comb (ordinary & Brighton), huck-a-back; mock leno; Stripe and check weave combination: Welts and piques: Ordinary, wadded, fast back welts; piques; idea of loose back, half fast back and fast back fabrics.

Unit- III : Light & pigment theory of colour, Elements of colour; simple colour and weave effects; construction of line effects; Hound's tooth pattern; Bird's eye & spot effects; Hairline effects; step pattern; idea of compound color and weave effects

Section- B

Unit- IV : Bed ford cords- plain face, wadded, crepon, twill face Bedford cords. Backed cloth: Warp backed cloth; weft backed cloth; backed cloth with wadding threads; warp and weft wadded cloths; reversible backed cloths. Classifications of double cloth construction; concept of self stitched; stitched by thread interchange; stitch by cloth interchange; centre stitched.

Unit -V : Leno structure: Principles of leno structures; methods of producing leno and idea of simple constructions, Weft-pile introduction; concept of simple constructions; Jacquard design, Card cutting machine, types of card cutting

Unit -VI : Terry pile introduction; formation of pile; simple terry weaves; idea of a terry pile forming mechanism. Tapestry structures: Introduction; idea of simple weft faced structures; carpet structures Different types of selvedges and their applications, Multi-axial fabrics: Introduction; weave.

Reference Books :

1. Grammar of Textile Design: Nisbet
2. Fabric Design: Blinov
3. Textile Design and Colour: Watson
4. Advanced Textile Design & colour: Watson
5. NCUTE- Woven fabric

6 TX 02 ADVANCE YARN MANUFATURING TECHNOLOGY
Section -A

Unit –I : Blowroom- Modern Mixers – Introduction, Principles, Construction , working, features – multimixer MPM, Aeromixer, unimix. etc. Modern Opener/Blenders/Cleaners - Blendomat BDT, Unifloc., Cleanomat System, ERM Cleaner, Striker Cleaner, Flock Feeder, Tuft Blender, Blender Feeder, Aero feed system. Modern opening,Cleaning, Blending machine .

Unit-II : Carding- Aerodynamic Card- Introduction, construction, working and limitation. Suction Cleaning in card, Chute Feed System. Autolevelling- Introduction, Principle, Types of control system-Closed loop, Open Loop, mix loop control system. Card mastertops, maxiclean card. Granular Card, Small Card & other developments of Card.

Unit-III : Carding-Development in L-in Region- Unidirectional Feed, Conventional Feed System, Multiple licker-in Deflector plate. Fibre Retriver. Intrigrated grinding System, On-line neps monitoring system. Features of Modern high production Cards-DK803,DK903, C-51.

Section-B

Unit-IV : Rotor Spinning- Introduction, Principle, Stages in yarn production, Advantages and Limitation of Ring spinning & Rotor Spinning Construction & Working of Rotor Spinning machine. Different types Groove & Naval. Process Parameters and its effects on yarn properties. Yarn Structure- core/sheath. Properties of Rotor Spun Yarn, Application. Comparison of Rotor & Ring Spun Yarn. Developments in Rotor Spinning.

Unit-V : Air jet Spinning, Air Vortex, Friction Spinning- Friction Spinning- Introduction, Principle, Stages in yarn production, Advantages and Limitation of Friction Spinning. Construction & Working of Friction Spinning machine- DREF-1, DREF-2, DREF-3, DREF-4, DREF-2000 ,3000. Process Parameters and its effects on yarn properties. Yarn Structure- core/sheath. Properties of Friction Spun Yarn, Application. Recent developments in Friction Spinning. Air jet Spinning - Introduction, Principle, Stages in yarn production,Construction & Working of Air Jet Spinning machine- MJS801H, MJS801,Yarn Structure, Properties of Air jet Yarn, Application. Air Vortex Spinning- Introduction, Principle, Stages in yarn production, Construction & Working of Air vortex Spinning machine,Yarn Structure, Properties of Air vortex Yarn, Application.

Unit-VI : Other Spinning Techniques- Wrap Spinning, Electrostatic Spinning, Ply Fil Spinning, Siro Spinning – Principle, construction, working, Yarn Structure & Properties of yarn. Woollen and Worsted spinning– Principle, construction, working, Yarn Structure & Properties of yarn. 1)Twist less yarns 2) Self Twist yarns 3) Network Yarns 4) Core Spun yarns.

Reference Books :

1) New Spinning System–W.Klein
2) New Spinning System- R.V.Gowda
3) Spun Yarn Technology-Oxtoby
4) Spun Yarn Technology, Vol-I-Subramaniam
5) Spun Yarn Technology, Vol-II-Subramaniam

6TX03 TEXTILE TESTING-II

Section-A

Unit -I : Hairiness of yarn measurement. Shirley yarn hairiness tester, Zweigle G 565, Uster tester-3 hairiness meter attachment. Yarn bulk. Textured filament yarns: testing of textured yarns. Friction: Coil friction & its measurement.

Unit -II : Types of tensile testing machines: CRL, CRE & CRT principle, pendulum lever principle with CRT, Stelometer, The balance principle, The Pressley fibre strength tester, loading by springs, inclined plane principle. Ballistic Tester, Electronic dynamometer strain gauge transducer, Instron, Tenso-jet.

Unit –III: Tensile Testing : Terminology & definitions load elongation curves, stress strain curve, initial young modulus, yield point, work of rupture, work factor, elastic recovery, instantaneous & time dependent effects, creep, factors affecting tensile properties of textiles. fibre strength testing, yarn strength testing, fabric strength testing

Section-B

Unit -IV : Evenness Testing: Introduction, nature of irregularity. Index of irregularity, variance length curves, methods of measurement & assessment of irregularity of sliver, roving & yarn. Clasimat yarn fault test.

Unit -V : Electronic capacitance tester, photoelectric testers. The cause and effect of irregularity, interpretation of results of irregularity tests, determination of periodic variation. Spectrograph, Uster yarn standards, Location of sources of periodic faults.

Unit VI: Fabric Dimension: Length, Width, Thickness, their measurement, Fabric weight, ends & picks per inch, crimp of yarn in fabric, crimp & fabric properties, measurement of crimp, cloth cover & fabric geometry.

Reference Books :

1) Principle of Textile Testing-I.E. Booth
2) Physical Testing of Textiles - B. P. Saville
3) Textile Testing - Grover & Hamby.

6 TX 04 APPAREL MERCHANDISING

Section-A

Unit-I : Organization of the Apparel Business- Introduction to Apparel Industry, organization of the apparel industry, types of exporters, Business concepts applied to the Apparel industry- International trade.

Unit- II : Marketing- Functional organization of an apparel firm. Responsibilities of a marketing division- marketing objectives and strategies- marketing research -types of markets: Retails and wholesale strategies for merchandise Distribution - retailers – sourcing flows and practices. Marketing plan. Labeling and licensing.

Unit-III : Merchandising- Definition of merchandising - functions of merchandising division - Role and responsibilities of merchandiser-different types of buyers- Communications with the buyers- awareness of current market trends- product development- ling planning line presentation.

Section-B

Unit IV: Sourcing- Need for sourcing - sourcing materials- manufacturing resources planning principles of MRP- Overseas sourcing-sourcing strategies. Supply chain and demand chain analysis - Materials management for quick response -JIT technology.

Unit-V: Documentation-Order confirmation, various types of export documents, pre-shipment post- shipment documentation. Terms of sale, payment, shipment etc. export incentives: duty drawback. DEPB, I/E incentives duty drawback, DEPB, I/E: license-exchange control regulation - foreign exchange regulation acts - export management riskexport finance. WTO / GATT / MFA - Functions and objectives, successes and failures.

Unit–VI : Quality Management System- ISO 9000 Quality Policy, data, records and traceability documenting the Quality System, quality manual, quality audit, ISO 9000 Registration ISO 14000.

Reference Books:

1. D. Sinha.. - Export Planning and Promotion, -II Ms, Calcutta (1989*)*
2. Tunin K Nandi.,-Import-Eeport Finance "IIMS, Calcutta (1989)

3. Elaine stone. Jean A Samples., - Fashion Merchandising, "McGraw Hill Book company(1985)ISBN: 81-07-O6l742-2
4. S. Shivaramu.-'Export Marketing - A practical guide to Exporters", Wheeler publishing (1996) ISBN: 81-7544-166-6.
5. J,A. Jamow; M , Guerreiro. B. Judelle., - Inside the Fashion Business" Publishing Company (1987) ISBN: 0-02-360000-4.

FREE ELECTIVE - II
6 FE TX 05 (i) COMPUTER AIDED TEXTILE & FASHION DESIGNING

Section- A

Unit - I : Introduction to textiles: Fibers; Natural and synthetic, Parameters, uses. Yarn: Types of yarns, numbering system, Quality parameter of yarns and uses. Fabric: Types of fabric, fabric design, comforts properties of fabric and uses. Fashion: Introduction to fashion and apparel design.

Unit - II : Origin of fashion, Fashion Theories: Fashion of different eras, French and Greek revolutions, fashion promotion, style-fad-trends. Fashion Design fundamentals, elements of art, Definition of line shape, form, size, space, texture and colour.

Unit - III : Fashion software: Reach Fashion & Reach CAD, Configuration and Installation, commands, library, model E-fashion style, photo, material studio,

Section- B

Unit - VI : Display of fashion materials: definition and importance, source technique and window display, classic fashion shows. Important fashion centers of the world and India**.**

Unit - V: Computer aided designing: Fashion sketching, color matching and computer graphics. Autotex software Introduction, Configuration and Installation, Colour Library, Weave library, Checks & stripes, yarn library, Dobby, CAD in Dobby industry

Unit -VI : Computer aided designing, fabric simulation, generation of Peg plan report, generation of report colour combination, Create design in weave library, Electronic jacquard, printing of weave, use of digital pen

Reference Books :

1. E.P.G Gohl, "Textile Science" CBS Publishers & Distributors, New Delhi, (India)
2. Bernard P. Corbman, " Textiles Fiber to Fibric" McGraw-Hill International Editions, Singapore

3. Tate and Sharon Lee, "*Inside fashion design*", Harper Publication Inc., UK (1976).
4. Mary Kefgen, "*Individuality in Clothing – Selection and Personal Appearance*", Mac Millan Publications, New York (1981). Page | 41
5. Mikell P, Grover and E Mory, "*Computer Aided Design and Manufacturing*", Prentice Hall of India
6. Mehta P V and Bhardwaj S K, " *Managing Quality in apparel industry*", Om Book Service, New Delhi
7. Cooklin Gerry, "*Garment Technology for Fashion Designers*", OM Book Service, New Delhi (1997).
8. Auto tex & Reach tech manuals

FREE ELECTIVE-II
6 FE TX 05 (ii) FASHION TECHNOLOGY
Section-A

Unit –I : Fashion Terms: Fashion, style, change, acceptance, taste. Fashion Evolution – fashion cycle, length of cycle consumer identification with fashion cycle, consumer group, fashion leaders, fashion innovators, fashion motivators or role model, fashion victims, fashion followers.

Unit –II : Adoption of fashion- Trickledown theory reverses adoption, mass dissemination. Motives for consumer buying, fashion selection, Aesthetic appeal, practical considerationsFashion categories-Womens wear, size range, styling and price range. mens wear ,price range styling, children wear- styling, size range, price range.

Unit-III : Fashion Research and Analysis- fashion forecasting, market research, consumer research, shopping, sales records, evaluating the collections, fashion services, fashion editing, design sources.

Section-B

Unit –IV: Fashion Concept: Principles of fashion, Fashion cycle, Theories of fashion leadership, Changes in fashion, Fashion terminology for merchandising. Fashion Promotion: Fashion Promotion, factors influencing fashion promotion, Publicity, fashion show, Personal selling and communication process.

Unit –V : Fashion Marketing: Marketing concepts, fashion marketing, role of fashion marketer, market segmentation, Fashion marketing planning, Mass marketing, Marketing management, Franchising and goal of merchandiser and pricing policies.

Unit –VI : Fashion Buying: Interpreting customer demand, Developing fashion images, Analyzing and selection of resources. Buying in domestic & foreign market. Consumer Behavior: Psychological, Social, Economical, Practical, Family Background and other.

Reference Books:

1) Concept of Consumer, Stephen Fringes, Fairchild Publication.
2) Fashion Merchandising, Stephen Fringes, Stone and samples publisher.
3) Creative fashion presentation, Polly Guerin, Stone and samples publisher.
4) Fashion Marketing, Easey, Stone and samples publisher.
5) Fashion Advertising and Promotion, Winter& Standlay Goodman, Stone and samples publisher.
6) Fashion from concept to consumer – Gini Stephens Frings.
7) Elements of fashion and appreal design.

6 TX 07 Minor Project

6 TX 08 Fabric Structure - II Lab
10 to 12 Practicals based on syllabus of 6 TX 01

6 TX 09 Advance Yarn Manufacturing Technology - Lab
8 to 10 Practicals based on syllabus of 6 TX 02

6 TX 10 Textile Testing II - Lab
10 to 12 Practicals based on syllabus of 6 TX 03

6 TX 11 Communication Skill - Lab
10 to 12 Practicals based on syllabus of 6 TX 06

FOUR YEAR DEGREE COURSE IN COMPUTER SCIENCE & ENGINEERING FIFTH SEMESTER (CREDIT & GRADE SYSTEM)

5KS01/ 5KE01 DATA COMMUNICATION

Unit I: Introduction: Components, Networks, Protocols and standards, Basic Concepts: Line Configuration, Topology Transmission mode, analog and digital signals, periodic and aperiodic signals, analog signals, time and frequency domains, composite signals, digital signals. **08Hrs**

Unit II: Encoding and modulating: digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion, digital data transmission, DTE-DCE interface, modems, cable modems. Transmission media: guided media, unguided media, and transmission impairment. Performance, wavelength, Shannon capacity, media comparison. **8Hrs**

Unit III : Multiplexing: Many to one/ one to many, frequency division multiplexing, wave division multiplexing, TDM, multiplexing applications: the telephone system , Error detection and correction : types of errors, detection , VRC, Longitudinal redundancy check, cyclic redundancy check, checksum, error correction. **08Hrs**

Unit IV : Data link Control: Line Discipline, flow control, error control, Data link Protocols: Asynchronous Protocols, synchronous protocols, character oriented protocols, bit - oriented protocols, link access procedures. **08Hrs**

Unit V : Local Area Networks: Ethernet, other Ethernet networks, token bus, token ring, FDDI, Comparison, IEEE802.6 (DQDB) SMDS, Switching: circuit switching, packet switching, message switching, integrated services digital networks (ISDN): services, history, subscriber access to ISDN. **08Hrs**

Unit VI: Frame relay: introduction, frame relay operation, frame relay layers, congestion control, leaky bucket algorithm, traffic control, and other features. **08Hrs**

Text Book:

Behrouz A. Forouzan: Data Communication and Networking, (2/e) (TMH)

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education.
2. William L. Schweber : Data Communication, McGraw Hill.
3. J.Freey : Computer Communication & Networks, AEW Press.
4. D. Corner : Computer Networks & Internet, Pearson Education.

5KS02 /5KE02 FILE STRUCTURES & DATA PROCESSING

UNIT I : Introduction: File structure design, File processing operations : open, close, read, write, seek. Unix directory structure. Secondary storage devices: disks, tapes, CD-ROM. Buffer management. I/O in Unix. **08 Hrs**

UNIT II : File Structure Concepts: Field & record organization, Using classes to manipulate buffers, Record access, Record structures, file access & file organization, Abstract data models for file access. Metadata. Extensibility, Portability & standardization. **08 Hrs**

UNIT III: Data Compression, Reclaiming spaces in files, Introduction to internal sorting and Binary searching. Keysorting. Indexing concepts. Object I/O. Multiple keys indexing. Inverted lists, Selective indexes, Binding. **08 Hrs**

UNIT IV : Cosequential processing : Object-Oriented model, its application. Internal sorting: a second look. File Merging : Sorting of large files on disks. Sorting files on tapes. Sort merge packages. Sorting and Cosequential processing in Unix. **08 Hrs**

UNIT V: Multilevel indexing : Indexing using Binary Search trees. OOP based B-trees. B-tree methods Search, Insert and others. Deletion, merging & redistribution. B*trees. Virtual B-trees. VL records & keys. Indexed sequential file access and Prefix B+trees. **08 Hrs**

UNIT VI: Hashing : Introduction, a simple hashing algorithm. Hashing functions and record distributions. Collision resolution. Buckets. Making deletions. Pattern of record access. External hashing. Implementation. Deletion. Performance. Alternative approaches. **08 Hrs**

Text Book: Michael J.Folk, Bill Zoellick, Greg Riccard :File Structures : An Object-Oriented Approach using C++. (Addison-Wesley) (LPE)

Reference Books:

1. M, Loomis: “Data Management & File Processing” (PHI)
2. O.Hanson: “Design of Computer Data Files” McGraw-Hill (IE)
3. D. E. Knuth: “ The Art of Computer Programming”, Volume 3, (Addison Wesley).
4. James Bradly: “ Files and Database Techniques”, (Mc Graw Hill).

5KS03 /5KE03 SYSTEM SOFTWARE

Unit I : Introduction to Compiling: Phases of a compiler, Lexical Analysis: The role of lexical analyzer, input buffering, specification of tokens, recognition of tokens, and language for specifying lexical analysis, lex and yacc tools, state minimization of DFA. **08 Hrs**

Unit II : Syntax Analysis: The role of the parser, Review of context free grammar for syntax analysis. Top down parsing: recursive descent parsing, predictive parsers, Transition diagrams for predictive parsers, Non recursive predictive parsing, FIRST and FOLLOW, Construction of predictive parsing tables, LL (1) grammars. Error recovery in predictive parsing. **08 Hrs**

Unit III: Bottom up parsing: Handle pruning, Stack implementation of Shift Reduce Parsing, conflicts during shift reduce parsing, LR parsers: LR parsing algorithm, Construction of SLR parsing table, canonical LR parsing tables and canonical LALR parsing tables. Error recovery in LR parsing. **08 Hrs**

Unit IV: Syntax Directed Translation: Syntax directed definitions, attributes, dependency graphs, construction of syntax trees. Syntax directed definition for constructing syntax trees, directed acyclic graphs for expressions. Bottom up evaluation of s-attributed definitions, L-attributed definition. Top down translation, Design of a predictive translator. **08 Hrs**

Unit V : Run Time Environments: Source language issues: Activation trees, control stacks, storage organization, subdivision of run time memory, activation records, Storage allocation strategies, static allocation, stack allocation, dangling references. Symbol table: Entries, Storage allocation, Hash tables, Scope information. **08 Hrs**

Unit VI: Code Generation: Intermediate languages, Translation of Declarations & Assignments statements. Design issues of a Code generator, Target machine, Runtime storage management, Basic blocks and flow graphs. **08 Hrs**

Text Book:

A V Aho, R Sethi, J D Ullman "Compilers Principles, Techniques and Tools", Pearson Education (LPE).

Reference Books:

1. D. M. Dhamdhere, Compiler Construction—Principles and Practice, (2/e), Macmillan India
2. Andrew Appel, Modern Compiler Implementation in C, Cambridge University press
3. K C. Louden "Compiler Construction—Principles and Practice" India Edition, CENGAGE
4. Bennett J.P., "Introduction to Compiling Techniques", 2/e (TMH).

5KS04 /5KE04 SWITCHING THEORY AND LOGIC DESIGN

Unit I : VHDL Modeling Concepts, VHDL Fundamentals: Constants, Variables, Scalar types, Type Classification, Expressions, Operators, Sequential Statements, If, Case, Null, Loop, Assertion, Reports statements. **08 Hrs**

Unit II : Array & VHDL, Unconstrained array types, Array operations & referencing, Records Basic Modeling constructs: Entity declarations, Architecture bodies, Behavioral descriptions, Structural descriptions, Design processing, Sub Programs and Procedures. **08 Hrs**

Unit III : Minimization of Switching Function: Review of Karnaugh-map up to four variables, Limitation of K-Maps, Implementation of Logic Functions, Nondegenerate Forms, Quine – McCluskey Method. **08 Hrs**

Unit IV : Combinational Logic Design: Introduction, Design Procedure, Adders, Subtractors, Binary Parellel Adder, 4-bit Parallel Subtractor, Binary Adder-Subtractor, The Look-ahead-carry Adder, 2's Complement Addition and subtraction Using Parallel Adders. **08 Hrs**

Unit V : Serial Adder, BCD Adder, Excess-3 Adder and Subtractor, Binary Multipliers, Code Converters, Parity Bit Generators/Checkers, Comparators, IC Comparator, Encoders, Keyboard Encoders, Decoders, Multiplexers. **08 Hrs**

Unit VI : Sequential Circuits Design: Conversion of Flip-Flops, Design of Synchronous, Asynchronous Counters and Shift Register Counters. Finite State Machine, Mathematical Representation of Synchronous Sequential machine, Mealy and Moore Model. **08 Hrs**

Text Book:

1. Peter J. Ashenden, "The Designer's Guide to VHDL", 2nd Edn, Harcourt Asia
2. Anand Kumar "Switching Theory and Logic Design" (PHI)

Reference Books:

1. J.F. Wakerly, "Digital Logic Design", PHI.
2. V.P. Nelson Et al, "Digital Logic Circuits, Analysis & Design", PHI.
3. Moris Mano & Kime."Logic and Computer Design Fundamentals" Pearson Education.
4. J. Bhaskar, "VHDL Primer", Person Education

FREE ELECTIVE-I
5FEKS05 (i) DATA STRUCTURES & ALGORITHMS

Unit I : Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. **08Hrs.**

Unit-II : Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi-demensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices. **08Hrs.**

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion operations on linked lists. Header linked lists, Two- way linked lists. **08Hrs.**

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. **08Hrs.**

Unit-V : Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffman's algorithm. General trees. **08Hrs.**

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. **8Hrs.**

Text Book:

Seymour Lipschutz: "Data Structures with C", Schaum's Outline Series.

Reference Books:

1. Forouzan, Gilberg: Data Structures and Algorithms, CENGAGE Learning.
2. Reema Thareja: Data Structures using C, Oxford University Press, 2011.
3. Arpita Gopal: Magnifying Data structures, PHI (EEE), 2010.
4. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.

FREE ELECTIVE-I
5FEKS05 (ii) DATA COMMUNICATION AND NETWORKING

Unit I : Introduction: Components, Networks, Protocols and standards, Basic Concepts: Line Configuration, Topology, Transmission mode, analog and digital signals, periodic and aperiodic signals, analog signals, time and frequency domains, composite signals, digital signals.

Unit II : Encoding and modulating: digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion, digital data transmission, DTE-DCE interface, modems, cable modems, transmission media: guided media, unguided media, transmission impairment.

Unit III : Multiplexing: Many to one/ one to many, frequency division multiplexing, wave division multiplexing, TDM, multiplexing applications: the telephone system , Error detection and correction : types of errors, detection , cyclic redundancy check, checksum, error correction.

Unit IV: Data link Control: Line Discipline, flow control, error control, Data link Protocols: Asynchronous Protocols, synchronous protocols, character oriented protocols, bit - oriented protocols.

Unit V : Local Area Networks: Ethernet, other Ethernet networks, token bus, token ring, FDDI, Comparison, MAN: IEEE802.6 (DQDB) SMDS, Switching: circuit switching, packet switching, message switching.

UNIT VI: Networking and Internetworking Devices: Repeaters, Bridges, Routers, Gateways. Transport Layer: Functions of transport layer, connection, the OSI transport protocol, upper OSI Layer: Session layer, presentation layer, Application Layer.

Text Book:

Behrouz A. Forouzan: Data Communication and Networking, (2/e), TMH.

Reference Books:

1. William Stallings: Data & Computer Communications, (6/e) Pearson Education.

2. William L. Schweber : Data Communication, McGraw Hill.

3. J.Freey : Computer Communication & Networks, AEW Press.

4. D. Comer : Computer Networks & Internet, Pearson Education.

5KS06 / 5KE06 COMMUNICATION SKILLS

Unit I: Introduction to Communication: Introduction- Importance of Communication, Basics of Communication, Purpose and Audience, Cross-cultural Communication, Language As a tool of communication, Communicative Skills-LSRW, Effective Communication, Modes of Communication, Importance of Technical Communication, Barriers to Communication: Introduction, Classification of Barriers, Information Gap Principle-Given and New Information, Filters, Basics of Technical Communication: Introduction, Objective and Characteristics of Technical Communication, Process of Communication, Levels of Communication, Flow of Communication, Communication Networks, Visual Aids in Technical Communication

Unit II : Active Listening: Introduction, Reason for poor Listening, Traits of a Good Listener, Listening Modes, Types of Listening, Barriers to Effective Listening, Listening for General Content and Specific Information, Effective Speaking: Introduction, Achieving Confidence, Clarity, and Fluency, Paralinguistic Features, Barriers to Speaking, Types of Speaking, Persuasive Speaking, Public Speaking, Listening and Speaking: Introduction, Conversations, Telephonic Conversations and Etiquette, Dialogue Writing, Effective Presentation Strategies: Introduction, Planning, Outlining and Structuring, Nuances of Delivery, Controlling Nervousness and Stage Fright, Visual Aids in Presentations, Application of Ms PowerPoint, Interviews: Introduction, Objectives of Interviews, Types of Interviews, Job Interviews, Media Interviews, Press Conferences, Group Communication: Introduction, Forms of Group Communication, Use of Body Language in Group Communication, Discussions.

Unit III : Reading: Introduction, Reading Rates, Reading and Interpretation, Intensive and Extensive Reading, Critical Reading, Reading for different Purposes, Reading Comprehension, Reading Techniques: Introduction, Improving Comprehension Skills, Techniques for Good Comprehension, General Kitchen Layout, Predicting the Content, Understanding the Gist, SQ3R Reading technique, Study Skills, Technical Writing: Introduction, Audience Recognition/Analysis, Language, Elements of Style, Techniques for Good Technical Writing, Reports: Introduction, Characteristics of a Report, Categories of Reports, Formats, Prewriting, Structure of Reports (Manuscripts format), Types of Report, Technical Proposals:

Introduction, Definition and Purpose, Types, Characteristics, Structure of Proposals, Style and Appearance, Evaluation of Proposals, Research Paper, Dissertation, Thesis.

Text Book:

Raman & Sharma: "Technical Communication Principles & Practice" (2/e) Oxford University Press.

Reference Books:

1. M Ashraf Rizvi: " Effective Technical Communication" Mc Graw Hill.
2. Mohan, Banerjee: "Developing Communication Skills",MacMillan India Limited.
3. ChrissieWright(Editor): "Handbook of Practical Communication Skills", Jaico Publishing House.
4. CDC, TTTI WR, Bhopal: "A Course in Technical English, Somaiya Publication Pvt. Ltd."
5. F.Frank Candlin: "General English for Technical Students", University of London Press Ltd.

5KS07 System Software Lab.: Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

5KS08 Switching Theory & Logic Design Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units. Design Practical examples should be based on Unit III to Unit VI using VHDL.

5KS09 Communication Skills Lab.: Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus as follows.

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building, Phonetics.
2. Technical report writing
3. Group discussions
4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

Reference Book: Norman Lewis: Word Power Made Easy
Website: http://www.teachingenglish.org.uk

6KS01/ 6KE01 OPERATING SYSTEMS

Unit-I : Introduction: Operating System(OS) definition, OS Evolution, OS Components, OS Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Inter-process Communication, Threads: Multithreading Models, Threading Issues, Java Threads.

Unit-II: CPU Scheduling: Concepts, Scheduling Criteria, Scheduling Algorithms, Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Monitors. Deadlocks: Definition & Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock. **08 Hrs**

Unit-III: Memory Management: Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging. Virtual Memory: Background, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing. **08 Hrs**

Unit-IV: File-System Interface: Directory Structure, File-System Mounting, File Sharing, Protection. File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, File Recovery. **08 Hrs**

Unit-V : I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations. Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. **08 Hrs**

Unit-VI: The Linux System: History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File systems, Input and Output, Inter process Communication, Network Structure & Security in Linux. **08Hrs**

Text Book:

Avi Silberschatz ,P.B.Galvin, G.Gagne: "Operating System Concepts" (6/e) John-Wiley & Sons.

Reference Books:

1. A.S Tanenbaum "Modern Operating Systems" Pearson Education.
2. William Stallings "Operating Systems" Prentice-Hall.
3. D M Dhamdhere "Operating Systems" Tata McGraw-Hill.
4. P.Balkrishna Prasad: "Operating Systems" Scitech Pubications(I) Pvt. Ltd.

6KS02 / 6KE02 DATABASE SYSTEMS

Unit-I : Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, Transaction Management, Database System Structure, Application architectures, History of Database Systems. Entity- Relationship Model, Basic Concepts, Constraints, Keys, Design Issues, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables. **08Hrs**

Unit-II: Relational Model: Structure of Relational Databases, The Relational Algebra, Extended Relational-Algebra Operations, Modification of the Database, Views, The Tuple Relational Calculus, The Domain Relational Calculus, SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Views. **08Hrs**

Unit-III: Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL, Encryption and Authentication, Relational-Database Design:, First Normal Form, Pitfalls in Relational-Database, Design, Functional Dependencies, Decomposition, BCNF, Third, Fourth and more Normal Forms, Overall Database Design Process. **08 Hrs**

Unit-IV: Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Optimization: Overview, Estimating Statistics of Expression Results, Transformation of Relational Expressions, Choice of Evaluation Plans, Materialized Views. **08Hrs**

Unit-V : Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability, Implementation of Isolation, Transaction Definition in SQL, Testing for Serializability. **08Hrs**

Unit-VI: Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularities, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations Weak Levels of Consistency, Concurrency in Index Structures. Recovery System: issues & solutions. **08Hrs**

Text Book:

Silberschatz, Korth, Sudarshan: "Database System Concepts" , (5th Edition)McGraw Hill,

Reference Books:

1. Garcia-Molina, Ullman, Widom: Database System Implementation, Pearson education.
2. S. K. Singh: Database Systems, Concepts, Design and Applications, Pearson Education.
3. G.K. Gupta: Database Management Systems, McGraw Hill.
4. Toledo and Cushman: Database Management Systems, (Schaum's Outlines)

6KS03 / 6KE03 COMPUTING RESOURCES MANAGEMENT

Unit-I : Systems Management: Definition, Building a Business Case for Systems Management, Organizing for Systems Management, Factors to Consider in Designing IT Organizations and Infrastructure. Staffing for Systems Management, IT as Service, and IT Service Management.

Unit-II : Availability, Methods for Measuring Availability, Seven ' Rs' of High Availability. Performance and Tuning, Definition and characteristics. Performance and Tuning Applied to the Five Major Resource Environments. Problem Management: Definition and scope. Key Steps to Developing a Problem Management Process.

Unit-III : Storage Management: Definition, Desired Traits, Capacity, Performance, Reliability, Recoverability.Network Management: Definition, Key Decisions about Network Management, Assessing, Measuring and Streamlining an Infrastructure's Network Management Process.

Unit-IV : Configuration Management, Definition, Practical Tips for Improving Configuration Management. Capacity Planning: Definition, reasons for poor Capacity Planning, Developing an Effective Capacity Planning Process, Benefits and hints for effective capacity planning.

Unit-V : Strategic Security: Definition, Developing a Strategic Security Process, Assessing, Measuring and Streamlining the Security Process. Facilities Management: Definition, Major Elements, Tips, Assessing, Measuring and Streamlining the Facilities Management Process.

Unit-VI: Developing Robust Processes: Features of World-Class Infrastructure. Characteristics of a Robust Process. Integrating Systems Management Processes. Client-Server Environment Issues. Web-Enabled Environment Issues.

Text Book:

Ritch Schiesser "IT Systems Management", 2nd Edition, Prentice Hall.

Reference Books :

1. Bill Holtsnider, Brian Jaffe, Brian D Jaffe "IT Managers Handbook" (2/e) Morgan Kaufmann.
2. Jan Van Bon,et.el.,"Foundation of IT Service Management Based on ITIL V3" Van Haren.
3. Harrise Kern, Rich Schiesser " IT Systems Management", 1st Edition, Prentice Hall.

6KS04 / 6KE04 COMPUTER ARCHITECTURE

Unit I : Instruction Sets: Machine Instruction Characteristics, Types of Operands, Intel x86 and ARM Data Types, Types of Operations, Intel x86 and ARM Operation Types. **08 Hrs**

Unit II: Instruction Sets: Addressing, x86 and ARM Addressing modes, Instruction Formats, x86 and ARM Instruction Formats, Assembly language. **08Hrs**

Unit III : Processor Structure and Function: Processor Organization, Register Organization, The Instruction Cycle, Instruction Pipelining, The x86 Processor Family, The ARM Processor. **08 Hrs**

Unit IV: Reduced Instruction Set Computers (RISCs): Instruction Execution Characteristics, The Use of Large Register File, Compiler-Based Register Optimization, RISC Architecture, RISC Pipelining. RISC versus CISC. **08 Hrs**

Unit V : Control Unit Operation: Micro-operations, Control of the Processor, Hardwired Implementation, Microprogrammed control, Basic Concepts, Microinstruction Sequencing & Execution. **08Hrs**

Unit VI : Parallel Processing: The Use of Multiple Processors, Symmetric Multiprocessors, Multithreading and Chip Multiprocessors, Clusters, Multicore Organization, Intel x 86 Multi-Core Organization. **08 Hrs**

Text Book:

William Stallings: "Computer Organization and Architecture", (8/e) Pearson Education.

Reference Books:

1. Behrooz Parhami: "Computer Architecture", Oxford University Press.

2. J.P. Hayes: "Computer Architecture and Organization" ,McGraw Hill.

3. D.A. Patterson, J.L. Hennessy: "Computer Architecture" Morgan Kauffmann, 2002.

4. Hwang and Briggs: "Computer Architecture and Parallel Processing" McGraw-Hill.

6FEKS05 FREE ELECTIVE-II
(i) DATABASE MANAGEMENT SYSTEMS

Unit-I : Introduction: Database System Applications, Purpose of Database Systems, and View of Data, Database Languages, Database Architecture, Database Users and Administrators. Relational Model: Structure of Relational Databases, Fundamentals of Relational-Algebra.

Unit-II : SQL: Background, Data Definition, Basic Structure of SQL queries, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Complex Queries, Views, Modification of Database, Joined relations. SQL Data Types and Schemas, Integrity Constraints, Authorization.

Unit-III: Database Design: Overview of the Design Process, Entity-Relationship Model, Constraints, Entity-Relationship Diagrams, Reduction to Relational Schemas. Relational Database Design: Atomic Domains, Normalization and Normal Forms, Functional Dependencies, Decomposition using Functional Dependencies.

Unit-IV : Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions. Query Optimization: Overview, Transformation of Relational Expressions, Materialized Views.

Unit-V : Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability, Testing for Serializability.

Unit-VI : Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Weak Levels of Consistency, Recovery System: Failure Classification, Recovery and Atomicity, Log-Based Recovery.

Text Book :

Silberschatz, Korth, Sudarshan: "Database System Concepts", (5/e) McGraw Hill.

Reference Books:

1. Raghu Ramkrishnan, Johannes Gherke: Database Management Systems, TMH.

2. C.J.Date: Introduction to Database Systems, Pearson Education.

3. Connolly & Begg: Database System, Low Price Ed.

4. El-Maseri, Navathe: Fundamentals of Database Systems, Pearson Education.

6FEKS05 FREE ELECTIVE-II
(ii) SOFTWARE PROJECT MANAGEMENT

Unit I: Evolving role of Software. Software crises & myths. Software engineering. Software process & process models: Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts: People, Product, Process, Project. WSHH principle, critical practice.

Unit II : Measures, Metrics & Indicators. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection, refinement & RMMM plan.

Unit III: Project Scheduling: Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.

Unit IV : System engineering: Hierarchy, Business Process & Product engineering: Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.

Unit V: Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation.

Unit VI: Software testing fundamentals; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.

Textbook:

Pressman Roger. S: "Software Engineering, A Practitioner's Approach", TMH.

Reference Books :

1. Somerville: Software Engineering (Addison-Wesley) (5/e)
2. Davis A: Principles of Software Development (McGraw Hill)
3. Jawadekar W.S.: Software Engineering Principles and Practice, Mc Graw Hill.
4. Jalote Pankaj: An Integrated Approach to Software Engineering, Narosa Publications.

6KS06 / 6KE06 PROFESSIONAL ETHICS

Unit I : Introduction: Computers in a Social Context. Moral and Legal Issues. Computer Ethical Issues. Philosophical Ethics: Descriptive and Normative Claims, Ethical Relativism, Utilitarianism, Deontological Theories, Rights, Virtue Ethics, Individual and Social Policy Ethics. Professional Ethics: Characteristics and system of Professions, Computing as Profession, Professional Relationships, Conflicting Responsibilities, Code of Ethics and Professional Conduct, Collective Responsibility. **08 Hrs**

Unit II : Ethics and The Internet: Three Morally Significant Characteristics, Hacking and Hacker Ethics, New Species of Old Crime, Netiquette, And Policy Approaches. Computers and Privacy issues, Legislative Background, Global Perspective, Proposals for Better Privacy Protection. Property Rights in Computer Software: Definitions, Current Legal Protection, Philosophical basis and analysis of Property, Proprietary Software, and Software Copying. **08 Hrs**

Unit III : Accountability, Computer and Information Technology: Different Senses of Responsibility, Buying and Selling Software, Y2K Problem, Diffusion of Accountability, Internet Issues, ISP Liability, and Virtual Action. Technology and Social change, Embedded Values, Enhanced and Impeded Values, Democratic Values in the Internet, Internet as Democratic Technology, Access and the Digital Divide, Free Expression, Overarching and Future Issues. **08Hrs**

Text Book:

Deborah G. Johnson: "Computer Ethics" Pearson Education (Third Edition).

Reference Books:

1. George Reynolds: "Ethics in Information Technology" Cengage Learning.
2. Hester and Ford: "Computers and Ethics in the Cyberage.
3. Duncan Langford: "Internet Ethics"
4. Richard A. Spinello: "Case Studies in Information Technology Ethics" PHI.

6KS07 Operating Systems Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

6KS08 Database Systems Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units along with one mini project.

6KS09 Computer Lab-II (Hardware Lab): This lab is based on PC organization, troubleshooting & maintenance.

Student should perform practical on the following areas of PC:

1. PC models.
2. Inside the PC.
3. Preventive maintenance.
4. PC troubleshooting.
5. Semiconductor memories
6. Power supplies & power protection
7. Hard Disks: installing, configuring & maintenance
8. SCSI drives
9. Printers & their troubleshooting
10. Modems & serial interfaces, USB's and Devices.
11. Keyboard, Mice, Video adapters & displays
12. Sound boards, Video capture & CD ROMs.
13. Study of PC Ports & Interfacing Cards.

Books :

1. Mark Minasi : Complete PC upgrade & Maintenance Guide (BPB)
2. Scott Muller: Upgrading and Repairing PCs 12/e (Que)

FOUR YEAR DEGREE COURSE IN
COMPUTER ENGINEERING
FIFTH SEMESTER (CREDIT & GRADE SYSTEM)

5KE01 DATA COMMUNICATION

Unit I: Introduction: Components, Networks, Protocols and standards, Basic Concepts: Line Configuration, Topology Transmission mode, analog and digital signals, periodic and aperiodic signals, analog signals, time and frequency domains, composite signals, digital signals. **08Hrs**

Unit II: Encoding and modulating: digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion, digital data transmission, DTE-DCE interface, modems, cable modems. Transmission media: guided media, unguided media, and transmission impairment. Performance, wavelength, Shannon capacity, media comparison. **8Hrs**

Unit III : Multiplexing: Many to one/ one to many, frequency division multiplexing, wave division multiplexing, TDM, multiplexing applications: the telephone system , Error detection and correction : types of errors, detection , VRC, Longitudinal redundancy check, cyclic redundancy check, checksum, error correction. **08Hrs**

Unit IV : Data link Control: Line Discipline, flow control, error control, Data link Protocols: Asynchronous Protocols, synchronous protocols, character oriented protocols, bit - oriented protocols, link access procedures. **08Hrs**

Unit V : Local Area Networks: Ethernet, other Ethernet networks, token bus, token ring, FDDI, Comparison, IEEE802.6 (DQDB) SMDS, Switching: circuit switching, packet switching, message switching, integrated services digital networks (ISDN): services, history, subscriber access to ISDN. **08Hrs**

Unit VI: Frame relay: introduction, frame relay operation, frame relay layers, congestion control, leaky bucket algorithm, traffic control, and other features. **08Hrs**

Text Book:
Behrouz A. Forouzan: Data Communication and Networking, (2/e) (TMH)

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education.
2. William L. Schweber : Data Communication, McGraw Hill.

3. J.Freey : Computer Communication & Networks, AEW Press.
4. D. Corner : Computer Networks & Internet, Pearson Education.

5KE02 FILE STRUCTURES & DATA PROCESSING

UNIT I : Introduction: File structure design, File processing operations : open, close, read, write, seek. Unix directory structure. Secondary storage devices: disks, tapes, CD-ROM. Buffer management. I/O in Unix. **08 Hrs**

UNIT II : File Structure Concepts: Field & record organization, Using classes to manipulate buffers, Record access, Record structures, file access & file organization, Abstract data models for file access. Metadata. Extensibility, Portability & standardization. **08 Hrs**

UNIT III: Data Compression, Reclaiming spaces in files, Introduction to internal sorting and Binary searching. Keysorting. Indexing concepts. Object I/O. Multiple keys indexing. Inverted lists, Selective indexes, Binding. **08 Hrs**

UNIT IV : Cosequential processing : Object-Oriented model, its application. Internal sorting: a second look. File Merging : Sorting of large files on disks. Sorting files on tapes. Sort merge packages. Sorting and Cosequential processing in Unix. **08 Hrs**

UNIT V: Multilevel indexing : Indexing using Binary Search trees. OOP based B-trees. B-tree methods Search, Insert and others. Deletion, merging & redistribution. B*trees. Virtual B-trees. VL records & keys. Indexed sequential file access and Prefix B+trees. **08 Hrs**

UNIT VI: Hashing : Introduction, a simple hashing algorithm. Hashing functions and record distributions. Collision resolution. Buckets. Making deletions. Pattern of record access. External hashing. Implementation. Deletion. Performance. Alternative approaches. **08 Hrs**

Text Book: Michael J.Folk, Bill Zoellick, Greg Riccard :File Structures : An Object-Oriented Approach using C++. (Addison-Wesley) (LPE)

Reference Books:

1. M, Loomis: “Data Management & File Processing” (PHI)
2. O.Hanson: “Design of Computer Data Files” McGraw-Hill (IE)
3. D. E. Knuth: “ The Art of Computer Programming”, Volume 3, (Addison Wesley).
4. James Bradly: “ Files and Database Techniques”, (Mc Graw Hill).

5KE03 SYSTEM SOFTWARE

Unit I : Introduction to Compiling: Phases of a compiler, Lexical Analysis: The role of lexical analyzer, input buffering, specification of tokens, recognition of tokens, and language for specifying lexical analysis, lex and yacc tools, state minimization of DFA. **08 Hrs**

Unit II : Syntax Analysis: The role of the parser, Review of context free grammar for syntax analysis. Top down parsing: recursive descent parsing, predictive parsers, Transition diagrams for predictive parsers, Non recursive predictive parsing, FIRST and FOLLOW, Construction of predictive parsing tables, LL (1) grammars. Error recovery in predictive parsing. **08 Hrs**

Unit III: Bottom up parsing: Handle pruning, Stack implementation of Shift Reduce Parsing, conflicts during shift reduce parsing, LR parsers: LR parsing algorithm, Construction of SLR parsing table, canonical LR parsing tables and canonical LALR parsing tables. Error recovery in LR parsing. **08 Hrs**

Unit IV: Syntax Directed Translation: Syntax directed definitions, attributes, dependency graphs, construction of syntax trees. Syntax directed definition for constructing syntax trees, directed acyclic graphs for expressions. Bottom up evaluation of s-attributed definitions, L-attributed definition. Top down translation, Design of a predictive translator. **08 Hrs**

Unit V : Run Time Environments: Source language issues: Activation trees, control stacks, storage organization, subdivision of run time memory, activation records, Storage allocation strategies, static allocation, stack allocation, dangling references. Symbol table: Entries, Storage allocation, Hash tables, Scope information. **08 Hrs**

Unit VI: Code Generation: Intermediate languages, Translation of Declarations & Assignments statements. Design issues of a Code generator, Target machine, Runtime storage management, Basic blocks and flow graphs. **08 Hrs**

Text Book:

A V Aho, R Sethi, J D Ullman "Compilers Principles, Techniques and Tools", Pearson Education (LPE).

Reference Books:

1. D. M. Dhamdhere, Compiler Construction—Principles and Practice, (2/e), Macmillan India
2. Andrew Appel, Modern Compiler Implementation in C, Cambridge University press

3. K C. Louden "Compiler Construction—Principles and Practice" India Edition, CENGAGE
4. Bennett J.P., "Introduction to Compiling Techniques", 2/e (TMH).

5KE04 SWITCHING THEORY AND LOGIC DESIGN

Unit I : VHDL Modeling Concepts, VHDL Fundamentals: Constants, Variables, Scalar types, Type Classification, Expressions, Operators, Sequential Statements, If, Case, Null, Loop, Assertion, Reports statements. **08 Hrs**

Unit II : Array & VHDL, Unconstrained array types, Array operations & referencing, Records Basic Modeling constructs: Entity declarations, Architecture bodies, Behavioral descriptions, Structural descriptions, Design processing, Sub Programs and Procedures. **08 Hrs**

Unit III : Minimization of Switching Function: Review of Karnaugh-map up to four variables, Limitation of K-Maps, Implementation of Logic Functions, Nondegenerate Forms, Quine – McCluskey Method. **08 Hrs**

Unit IV : Combinational Logic Design: Introduction, Design Procedure, Adders, Subtractors, Binary Parellel Adder, 4-bit Parallel Subtractor, Binary Adder-Subtractor, The Look-ahead-carry Adder, 2's Complement Addition and subtraction Using Parallel Adders. **08 Hrs**

Unit V : Serial Adder, BCD Adder, Excess-3 Adder and Subtractor, Binary Multipliers, Code Converters, Parity Bit Generators/ Checkers, Comparators, IC Comparator, Encoders, Keyboard Encoders, Decoders, Multiplexers. **08 Hrs**

Unit VI : Sequential Circuits Design: Conversion of Flip-Flops, Design of Synchronous, Asynchronous Counters and Shift Register Counters. Finite State Machine, Mathematical Representation of Synchronous Sequential machine, Mealy and Moore Model. **08 Hrs**

Text Books:

1. Peter J. Ashenden, "The Designer's Guide to VHDL", 2nd Edn, Harcourt Asia
2. Anand Kumar "Switching Theory and Logic Design" (PHI)

Reference Books:

1. J.F. Wakerly, "Digital Logic Design", PHI.
2. V.P. Nelson Et al, "Digital Logic Circuits, Analysis & Design", PHI.
3. Moris Mano & Kime."Logic and Computer Design Fundamentals" Pearson Education.
4. J. Bhaskar, "VHDL Primer", Person Education

FREE ELECTIVE-I
5FEKE05 (i) WEB TECHNOLOGIES

UNIT I: Introduction to the Web: History, Creating Websites, web applications, writing web projects, identification of objects, target users, web team. Web architecture: web servers, web browsers, TCP/IP protocol suite, IP Address, MIME. Hypertext Transfer Protocol (HTTP): Introduction, Resources, URL anatomy, Message Format, Examples, Web caching, Proxy. **08Hrs**

Unit II: Hypertext Markup language (HTML): History of HTML, HTML & its flavors, HTML basics, Elements, attributes and tags of HTML, Basic Tags, Advanced Tags, Frames, Images, Meta Tag, Planning of web page, Model and Structure of web site, Designing web pages, Multimedia content. **08Hrs**

Unit III: Cascading Style Sheet (CSS): Introduction, advantages, Adding CSS, Browser compatibility, CSS and page layout, Selectors, Grouping, and Type Selectors. Extensible Markup Language (XML): Common Usage, Role of XML, Prolog, Body, Elements, Attributes, Validation, Displaying XML, Namespaces. **08 Hrs**

Unit IV: XML DTD: Introduction to DTD, Purpose of DTD, DTD in XML document, Element type declaration, Attribute declaration, Entity declaration, DTD validation. XML Schema: Introduction, comparison with DTD, schema structure, schema element, element declaration, schema validation, built in data types, declaring simple elements. **08Hrs**

Unit V: Java Script: Introduction, variables, literals, operators, control structure, conditional statements, Arrays, Functions, Parameter Passing, Function Pointer, Inner/Nested Functions, and Objects. Client side programming. **08Hrs**

Unit VI: Common Gateway Interface (CGI): Internet programming paradigm, Server side programming with JavaScript, Language for CGI, Applications, Server environment, Environment variables, CGI building blocks, CGI scripting using JavaScript, Shell script, writing CGI program, CGI security, alternatives and enhancement in CGI. **08 Hrs**

Text Book:

Roy Uttam K: Web Technologies, Oxford University Press, 2010.

Reference Books:

1. Dr. Raja Subramanian: Creating Web Sites in Engineering,University Science Press.
2. Mohler J.L. & Duff J.M.: Desiginig Interactive Web Sites, CENGAGE Learning.
3. Joel Sklar: Text Book of Web Design, CENGAGE Learning.
4. Meenakshi G.M.: Web Graphics, Scitech Publications(India) Pvt. Ltd.

FREE ELECTIVE-I
5FEKE05 (ii) OBJECT ORIENTED PROGRAMMING

Unit I: Objects & Classes in C++: Declaring & using classes, Constructors, Objects as function arguments, Copy Constructors, Static class data, Arrays of Objects, C++ String class.

Unit II: Operator Overloading: Overloading Unary & Binary Operators, Data Conversion, Pitfalls of Operator Overloading, Pointers & Arrays, Pointers & Functions, New & Delete Operators, Pointers for Objects.

Unit III: Inheritance in C++: Derived Class & Base Class, Derived class Constructors, Function overloading, Class hierarchies, Public & Private Inheritance, Multiple Inheritance, Containership: Classes within Classes.

Unit IV: Virtual Function Concepts: Abstract Classes & Pure Virtual Functions, Virtual Base classes, Friend functions, Static Functions, Assignment & copy initialization, the this pointer, Dynamic type information.

Unit V: Streams & Files in C++: Stream Classes, stream errors, disk file I/O with streams, File Pointers, Error handling in file I/O, File I/O with member functions, overloading the extractions & Insertions operator, Command Line Arguments, Multi-file programs.

Unit VI: Function Template, Class template, Exception Syntax, Multiple exceptions, Exception with Arguments, Introduction to Standard Template Library, Algorithms, Sequential Containers. Function objects.

Text Book:

Robert Lafore: Object Oriented Programming in C++, Galgotia Publication.

Reference Books:

1. Herbert Schildt: C++: Complete Refernce,TMH.
2. Bjarne Stroustrupe: C++ Programming Language, Addision Wesley.

3. Venugopal: Mastering C++, TMH.
4. Lipmann: C++ Primer, Addision Wesley.

5KE06 COMMUNICATION SKILLS

Unit I: Introduction to Communication: Introduction- Importance of Communication, Basics of Communication, Purpose and Audience, Cross-cultural Communication, Language As a tool of communication, Communicative Skills-LSRW, Effective Communication, Modes of Communication, Importance of Technical Communication, Barriers to Communication: Introduction, Classification of Barriers, Information Gap Principle-Given and New Information, Filters, Basics of Technical Communication: Introduction, Objective and Characteristics of Technical Communication, Process of Communication, Levels of Communication, Flow of Communication, Communication Networks, Visual Aids in Technical Communication

Unit II : Active Listening: Introduction, Reason for poor Listening, Traits of a Good Listener, Listening Modes, Types of Listening, Barriers to Effective Listening, Listening for General Content and Specific Information, Effective Speaking: Introduction, Achieving Confidence, Clarity, and Fluency, Paralinguistic Features, Barriers to Speaking, Types of Speaking, Persuasive Speaking, Public Speaking, Listening and Speaking: Introduction, Conversations, Telephonic Conversations and Etiquette, Dialogue Writing, Effective Presentation Strategies: Introduction, Planning, Outlining and Structuring, Nuances of Delivery, Controlling Nervousness and Stage Fright, Visual Aids in Presentations, Application of Ms PowerPoint, Interviews: Introduction, Objectives of Interviews, Types of Interviews, Job Interviews, Media Interviews, Press Conferences, Group Communication: Introduction, Forms of Group Communication, Use of Body Language in Group Communication, Discussions.

Unit III : Reading: Introduction, Reading Rates, Reading and Interpretation, Intensive and Extensive Reading, Critical Reading, Reading for different Purposes, Reading Comprehension, Reading Techniques: Introduction, Improving Comprehension Skills, Techniques for Good Comprehension, General Kitchen Layout, Predicting the Content, Understanding the Gist, SQ3R Reading technique, Study Skills, Technical Writing: Introduction, Audience Recognition/Analysis, Language, Elements of Style, Techniques for Good Technical Writing, Reports: Introduction, Characteristics of a Report, Categories of Reports, Formats, Prewriting, Structure of Reports (Manuscripts format), Types of Report, Technical Proposals: Introduction, Definition and Purpose, Types, Characteristics, Structure of Proposals, Style and Appearance, Evaluation of Proposals, Research Paper, Dissertation, Thesis.

Text Book:

Raman & Sharma: "Technical Communication Principles & Practice" (2/e) Oxford University Press.

Reference Books:

1. M Ashraf Rizvi: " Effective Technical Communication" Mc Graw Hill.
2. Mohan, Banerjee: "Developing Communication Skills",MacMillan India Limited.
3. ChrissieWright(Editor): "Handbook of Practical Communication Skills", Jaico Publishing House.
4. CDC, TTTI WR, Bhopal: "A Course in Technical English, Somaiya Publication Pvt. Ltd."
5. F.Frank Candlin: "General English for Technical Students", University of London Press Ltd.

5KE07 System Software Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

5KE08 Switching Theory & Logic Design Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units. Design Practical examples should be based on Unit III to Unit VI using VHDL.

5KE09 Communication Skills Lab.: Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus as follows.

On completion of this laboratory the candidate should be able to demonstrate adequate skills in oral and written communication for technical English language actively participate in group discussions and interviews and exhibit the evidence of vocabulary building. Candidates should be assessed through continuous monitoring and evaluation. The sample list of experiments is given below. This list can be used as guideline for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. Assignments and tests for vocabulary building, Phonetics.
2. Technical report writing
3. Group discussions

4. Interview techniques
5. Projects and tasks such as class news letter
6. Writing daily diaries and letters
7. Interactive language laboratory experiments.

Reference Book: Norman Lewis: Word Power Made Easy
Website: http://www.teachingenglish.org.uk

6KE01 OPERATING SYSTEMS

Unit-I : Introduction: Operating System(OS) definition, OS Evolution, OS Components, OS Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Inter-process Communication, Threads: Multithreading Models, Threading Issues, Java Threads. **08 Hrs**

Unit-II: CPU Scheduling: Concepts, Scheduling Criteria, Scheduling Algorithms, Process Synchronization: The Critical Section Problem, Synchronization Hardware, Semaphores, Monitors. Deadlocks: Definition & Characterization, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from Deadlock. **08 Hrs**

Unit-III: Memory Management: Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging. Virtual Memory: Background, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing. **08 Hrs**

Unit-IV: File-System Interface: Directory Structure, File-System Mounting, File Sharing, Protection. File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, File Recovery. **08 Hrs**

Unit-V : I/O Systems: Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations. Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure. **08 Hrs**

Unit-VI: The Linux System: History, Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File systems, Input and Output, Inter process Communication, Network Structure & Security in Linux. **08Hrs**

Text Book:
Avi Silberschatz ,P.B.Galvin, G.Gagne: “Operating System Concepts” (6/e) John-Wiley & Sons.

Reference Books:
1. A.S Tanenbaum “Modern Operating Systems” Pearson Education.
2. William Stallings “Operating Systems” Prentice-Hall.
3. D M Dhamdhere “Operating Systems” Tata McGraw-Hill.
4. P.Balkrishna Prasad: “Operating Systems” Scitech Pubications(I) Pvt. Ltd.

6KE02 DATABASE SYSTEMS

Unit-I : Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, Transaction Management, Database System Structure, Application architectures, History of Database Systems. Entity- Relationship Model, Basic Concepts, Constraints, Keys, Design Issues, Entity-Relationship Diagram, Weak Entity Sets, Extended E-R Features, Design of an E-R Database Schema, Reduction of an E-R Schema to Tables. **08Hrs**

Unit-II: Relational Model: Structure of Relational Databases, The Relational Algebra, Extended Relational-Algebra Operations, Modification of the Database, Views, The Tuple Relational Calculus, The Domain Relational Calculus, SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Views. **08Hrs**

Unit-III: Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL, Encryption and Authentication, Relational-Database Design:, First Normal Form, Pitfalls in Relational-Database, Design, Functional Dependencies, Decomposition, BCNF, Third, Fourth and more Normal Forms, Overall Database Design Process. **08 Hrs**

Unit-IV: Query Processing: Overview, Measures of Query Cost, Selection Operation, Sorting, Join Operation, Other Operations, Evaluation of Expressions, Query Optimization: Overview, Estimating Statistics of Expression Results, Transformation of Relational Expressions, Choice of Evaluation Plans, Materialized Views. **08Hrs**

Unit-V : Transaction Management: Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability, Implementation of Isolation, Transaction Definition in SQL, Testing for Serializability. **08Hrs**

Unit-VI: Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularities, Multi-version Schemes, Deadlock Handling, Insert and Delete Operations Weak Levels of Consistency, Concurrency in Index Structures. Recovery System: issues & solutions. **08Hrs**

Text Book:

Silberschatz, Korth, Sudarshan: "Database System Concepts" , (5th Edition)McGraw Hill,

Reference Books:

1. Garcia-Molina, Ullman, Widom: Database System Implementation, Pearson education.
2. S. K. Singh: Database Systems, Concepts, Design and Applications, Pearson Education.
3. G.K. Gupta: Database Management Systems, McGraw Hill.
4. Toledo and Cushman: Database Management Systems, (Schaum's Outlines)

6KE03 COMPUTING RESOURCES MANAGEMENT

Unit-I : Systems Management: Definition, Building a Business Case for Systems Management, Organizing for Systems Management, Factors to Consider in Designing IT Organizations and Infrastructure. Staffing for Systems Management, IT as Service, and IT Service Management.

Unit-II : Availability, Methods for Measuring Availability, Seven ' Rs' of High Availability. Performance and Tuning, Definition and characteristics. Performance and Tuning Applied to the Five Major Resource Environments. Problem Management: Definition and scope. Key Steps to Developing a Problem Management Process.

Unit-III : Storage Management: Definition, Desired Traits, Capacity, Performance, Reliability, Recoverability.Network Management: Definition, Key Decisions about Network Management, Assessing, Measuring and Streamlining an Infrastructure's Network Management Process.

Unit-IV : Configuration Management, Definition, Practical Tips for Improving Configuration Management. Capacity Planning: Definition, reasons for poor Capacity Planning, Developing an Effective Capacity Planning Process, Benefits and hints for effective capacity planning.

Unit-V : Strategic Security: Definition, Developing a Strategic Security Process, Assessing, Measuring and Streamlining the Security Process. Facilities Management: Definition, Major Elements, Tips, Assessing, Measuring and Streamlining the Facilities Management Process.

Unit-VI: Developing Robust Processes: Features of World-Class Infrastructure. Characteristics of a Robust Process. Integrating Systems Management Processes. Client-Server Environment Issues. Web-Enabled Environment Issues.

Text Book:

Ritch Schiesser "IT Systems Management", 2nd Edition, Prentice Hall.

Reference Books :

1. Bill Holtsnider, Brian Jaffe, Brian D Jaffe "IT Managers Handbook" (2/e) Morgan Kaufmann.
2. Jan Van Bon,et.el.,"Foundation of IT Service Management Based on ITIL V3" Van Haren.
3. Harrise Kern, Rich Schiesser " IT Systems Management", 1st Edition, Prentice Hall.

6KE04 COMPUTER ARCHITECTURE

Unit I : Instruction Sets: Machine Instruction Characteristics, Types of Operands, Intel x86 and ARM Data Types, Types of Operations, Intel x86 and ARM Operation Types. **08 Hrs**

Unit II: Instruction Sets: Addressing, x86 and ARM Addressing modes, Instruction Formats, x86 and ARM Instruction Formats, Assembly language. **08Hrs**

Unit III : Processor Structure and Function: Processor Organization, Register Organization, The Instruction Cycle, Instruction Pipelining, The x86 Processor Family, The ARM Processor. **08 Hrs**

Unit IV: Reduced Instruction Set Computers (RISCs): Instruction Execution Characteristics, The Use of Large Register File, Compiler-Based Register Optimization, RISC Architecture, RISC Pipelining. RISC versus CISC. **08 Hrs**

Unit V : Control Unit Operation: Micro-operations, Control of the Processor, Hardwired Implementation, Microprogrammed control, Basic Concepts, Microinstruction Sequencing & Execution. **08Hrs**

Unit VI : Parallel Processing: The Use of Multiple Processors, Symmetric Multiprocessors, Multithreading and Chip Multiprocessors, Clusters, Multicore Organization, Intel x 86 Multi-Core Organization. **08 Hrs**

Text Book:
William Stallings: "Computer Organization and Architecture", (8/e) Pearson Education.

Reference Books:

1. Behrooz Parhami: "Computer Architecture", Oxford University Press.
2. J.P. Hayes: "Computer Architecture and Organization" ,McGraw Hill.
3. D.A. Patterson, J.L. Hennessy: "Computer Architecture" Morgan Kauffmann, 2002.
4. Hwang and Briggs: "Computer Architecture and Parallel Processing" McGraw-Hill.

FREE ELECTIVE-II
6FEKE05 (i) JAVA PROGRAMMING

Unit I: Java features, Program Structures. Fundamentals of Java Programming, Primitive data types and operations, Selection statements, loops, Methods and Arrays in Java.

Unit II: Classes & Objects in Java, Creating Objects, Methods, Constructors, Class Variable and Methods, this keyword, Arrays of objects, String class, Character class, StringBuffer class, Command Line Arguments. File class, Text I/O.

Unit III: Inheritance: Inheritance vs. Aggregation, super keyword, final keyword, Method Overriding & overloading. Object class, ArrayList class. Protected data & methods, Final classes, methods & variables. Abstract classes and Interfaces.

Unit IV: CUI programming: GUI components, Java GUI API, frames, layout managers, Color class, Font class, Panels, Swing GUI components, Image icons. Graphics class, Polygon class.

Unit V: Event-Driven programming: Event & Event sources, Event delegation Model, Event listeners, registration and handling. Adapter classes, Inner Classes. Mouse events, Key events. Creating user interfaces: Buttons, Checkboxes, Radio buttons, Labels, Text Fields, Combo Boxes, Lists, Scroll Bars, Sliders.

Unit VI: Applets: Applet class and JApplet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint(), update() and repaint(), More about applet tag, getDocumentBase() and getCodeBase() methods.

Text Book:
Liang Y Daniel: Introduction to Java Programming, (Pearson-PHI)
Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)
4. Sachin Malhotra & Saurabh Choudhary: Programming in Java, (OUP).

FREE ELECTIVE-II
6FEKE05 (ii) EXPERT SYSTEMS

Unit I: Introduction: Definitions & importance. DP, MIS & DSS. Artificial Intelligence: overview. Evolution of expert Systems. Early expert systems: their characteristics, features& applications. Recent Expert systems: future Expert systems.

Unit II: Components of knowledge is ES. Knowledge representation methods. Representation via Rule-based systems. Knowledge acquisition & domain expert. Example, Knowledge acquisition via Rule Introduction. Software rule introduction.

Unit III: Inference engine: Role, Search strategies, Forward chaining algorithm. Backward chaining algorithm. Max modes. ES Modularity. Enhancements: Uncertainty concepts& approaches to uncertainty. Bridges in ES Explanation.

Unit IV: Validation: ES justification, rule-based validation. Performance verification. Case study. Hybrid ES: Defination. Importance. Examples of Hybrid ES, an overview of permutation search.

Unit V: ES departments: overview, development Languages'. ES shells. ES environments.ES hardware. Implementations: Overview milestone chart, software & hardware considerations monitoring, Maintenance & documentation.

Unit VI: Staffing & training: Overview, essential & supplemental tools. Justifications, organizational considerations. Oversight & evolution. ES & Heuristic programming. Future trends in expert systems. ES development flow diagram.

TextBook:
Igniazio James P." Introduction to Expert Systems", (McGraw Hill)
Reference Books:

1. Rolston "Expert System Design", (Mc Grew Hill)
2. Hayes Roth "Expert System Design" , (Addison-Wesley)
3. Patterson "Artificial Intelligence & Expert Systems", (PHI)

6KE06 PROFESSIONAL ETHICS

Unit I : Introduction: Computers in a Social Context. Moral and Legal Issues. Computer Ethical Issues. Philosophical Ethics: Descriptive and Normative Claims, Ethical Relativism, Utilitarianism, Deontological Theories, Rights, Virtue Ethics, Individual and Social Policy Ethics. Professional Ethics: Characteristics and system of Professions, Computing as Profession, Professional Relationships, Conflicting Responsibilities, Code of Ethics and Professional Conduct, Collective Responsibility. **08 Hrs**

Unit II : Ethics and The Internet: Three Morally Significant Characteristics, Hacking and Hacker Ethics, New Species of Old Crime, Netiquette, And Policy Approaches. Computers and Privacy issues, Legislative Background, Global Perspective, Proposals for Better Privacy Protection. Property Rights in Computer Software: Definitions, Current Legal Protection, Philosophical basis and analysis of Property, Proprietary Software, and Software Copying. **08 Hrs**

Unit III : Accountability, Computer and Information Technology: Different Senses of Responsibility, Buying and Selling Software, Y2K Problem, Diffusion of Accountability, Internet Issues, ISP Liability, and Virtual Action. Technology and Social change, Embedded Values, Enhanced and Impeded Values, Democratic Values in the Internet, Internet as Democratic Technology, Access and the Digital Divide, Free Expression, Overarching and Future Issues. **08Hrs**

Text Book:

Deborah G. Johnson: "Computer Ethics" Pearson Education (Third Edition).

Reference Books:

1. George Reynolds: "Ethics in Information Technology" Cengage Learning.
2. Hester and Ford: "Computers and Ethics in the Cyberage.
3. Duncan Langford: "Internet Ethics"
4. Richard A. Spinello: "Case Studies in Information Technology Ethics" PHI.

6KE07 Operating Systems Lab.: Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

6KE08 Database Systems Lab.: Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus uniformly covering each of the units along with one mini project.

6KE09 Computer Lab-II (Hardware Lab): This lab is based on PC organization, troubleshooting & maintenance.

Student should perform practical on the following areas of PC:

1. PC models.
2. Inside the PC.
3. Preventive maintenance.
4. PC troubleshooting.
5. Semiconductor memories
6. Power supplies & power protection
7. Hard Disks: installing, configuring & maintenance
8. SCSI drives
9. Printers & their troubleshooting
10. Modems & serial interfaces, USB's and Devices.
11. Keyboard, Mice, Video adapters & displays
12. Sound boards, Video capture & CD ROMs.
13. Study of PC Ports & Interfacing Cards.

Books :

1. Mark Minasi : Complete PC upgrade & Maintenance Guide (BPB)
2. Scott Muller: Upgrading and Repairing PCs 12/e (Que)

B.E. / B.Text./ B.Tech. **Prospectus No.** 141712
Semester VII & VIII

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(Faculty of Engineering & Technology)

PROSPECTUS
Prescribed for
Four Year Degree Course
Bachelor of Engineering / Bachelor of Technology
Semester VII & VIII
(CREDIT GRADE SYSTEM)

BRANCHES

1) Production Engineering
2) Electronics & Telecommunication Engineering
3) Electronics Engineering
4) Instrumentation Engineering
5) Computer Science and Engineering
6) Computer Engineering.
7) Textile Engineering
8) Chemical Engineering
9) Polymer (Plastic) Technology
10) Food, Pulp & Paper, Oil & Paint and Petrochemical Technology

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SANT GADGE BABA AMRAVATI UNIVERSITY

SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.

Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.
Ordinance No. 6 of 2008	:	For improvement of Division/Grade.
Ordinance No.19/2001	:	An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Dineshkumar Joshi
Registrar
Sant Gadge Baba Amravati University

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM

The pattern of question paper as per unit system will be boradly based on the following pattern.

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60.

(5) Each short answer type question shall Contain 4 to 8 short sub question with no internal choice.

DIRECTION

No. 31/2011 Date : 10-06-2011

Subject :- Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology.

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No.39 accepted and recommended schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of semesters III to VIII/X as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Honôble Vice Chancellor u/s Section 14(7) of M.U.Act, 1994 on behalf on Academic Council on 9th April, 2011,

AND

Whereas these schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as pere Credit Grade System inthe faculty of Engineering & Technology are to be implemented fromthe academic session 2011-2012.

AND

Whereas syllabi of various branches in the faculty of Enginering & Technology are to be sent for printing,

Now, therefore, I,Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994 hereby direct as under :-

1) This Direction shall be called ñSchemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches inthe faculty of Enginering & Technology, Direction, 2011".
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH	**Appendix No.**

1)	Civil Engineering	A
2)	Mechanical Enginering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Enginering (Electrical & Power)	F
7)	Electrical Enginering	G
8)	Electronics & Telecommunications Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	TExtile Engineering	N
15)	Chemical Engineering	O
16)	Chenmical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology)	Q
18)	Information Technolog	R
19)	Biomedical Engineering	S

sd/-
Dr.Mohan K.Khedkar
Vice Chancellor

****

DIRECTION

No. : 31 /2012 Date : 19 /07/2012

Subject :- Corrigendum to Direction No.31 of 2011

Whereas,the Direction No.31 of 2011 in respect of the Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology is in existence**,**

AND

Whereas, the schemes of teaching and examinations of III to VIII/X Semesters as per Credit Grade System for the branches Civil Engineering, Mechanical Engineering, Production Engineering,Electrical Engineering(Electronics & Power), Electrical & Electronics Engineering, Electrical Engineering (Electrical & Power), Electrical Engineering, Electronics & Telecommunication Engineering, Electronics Engineering, Instrumentation Engineering, Computer Science & Engineering, Computer Engineering, Architecture, Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology), Information Technology, Biomedical Engineering were to be implemented from the session 2011-2012 in phase wise manner by the said Direction No. 31 of 2011 as per respective Appendices i.e. AppendixA,B, C,D, E, F, G, H, I,J, K, L,M, N, O, P, Q, R and S,

AND

Whereas, the Academic Council in its meeting held on 05/05/2012 vide Item No. 53 (1) A-R1, C-R-1,D-R1,E-R1,H-R1 and I-R1 has recommended the revised schemes of teaching and examinations of V to VIII/X Semesters as per Credit Grade System for the branches Production Engineering, Electronics & Telecommunications Engineering, Electronics Engineering, Computer Science & Engineering, Computer Engineering,Textile Engineering, Chemical Engineering, Chemical Technology(Polymer)(Plastic) Technology, Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical Technology),

AND

Whereas, the revised Schemes of examinations as per Credit Grade System for the above mentioned branches in the faculty of Engineering & Technology are to be implemented from the academic session 2012-2013 in phase wise manner ,

AND

Whereas, the Schcmes of teaching and examinations of above mentioned branches as per Credit System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas, the process of making the Regulation is likely to take some time,

AND

Whereas, the syllabi of above mentioned branches along with the revised schemes of examinations in the faculty of Engineering & Technology are to be made available for the students admitted during the Session 2012-2013,

Now, therefore , I, Dr.Mohan K.Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University,Amravati in exercise of powers conferred upon me under sub section (8) of Section 14 of the Maharashtra Universities Act,1994, do hereby direct as under : -

1) This Direction shall be called ñCorrigendum to Direction No. 31 of 2011ò,
2) This Direction shall come into force from the date of its issuance.
3) Revised schemes of teaching and examinatiions of V to VIII/X Semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH		**Appendix No.**
1)	Production Engineering	A
2)	Electronics & Telecommunications Engineering	B
3)	Electronics Engineering	C
4)	Computer Science & Engineering	D
5)	Computer Engineering	E
6)	Textile Engineering	F
7)	Chemical Engineering	G
8)	Chemical Technology(Polymer)(Plastic)Technology	H
9)	Chemical Technology (Food, Pulp & Paper,Oil & Paint and Petrochemical Technology)	I

sd/-

Date :- 19 /07/2012 (Mohan K.Khedkar)
Vice Chancellor

****

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - PRODUCTION ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - A

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hrs.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7PE01	PRODUCTION PLANNING & CONTROL	3	1	0	4	4	3	80	20	100	40	_	_	_	_
02	7PE02	COMPUTER AIDED DESIGN & MANUFACTURING	3	1	0	4	4	3	80	20	100	40	_	_	_	_
03	7PE03	INDUSTRIAL MANAGEMENT AND COSTING	3	1	0	4	4	3	80	20	100	40	_	_	_	_
04	7PE04	PROFESSIONAL ELECTIVE - I	3	0	0	3	3	3	80	20	100	40	_	_	_	_
05	7PE05	PROFESSIONAL ELECTIVE - II	3	0	0	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7PE06	COMP. AIDED DESIGN & MANUFAC.- LAB.	0	0	2	2	1						25	25	50	25
07	7PE07	PROFESSIONAL ELECTIVE - I - Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
08	7PE08	PROFESSIONAL ELECTIVE - II - Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
09	7PE09	INDUSTRIAL TRAINING	0	0	0	0	2	_	_	_	_	_	_	50	50	25
10	7PE10	PROJECT & SEMINAR	0	0	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	15	3	8	26	27				500				250	
														TOTAL		750

	ELECTIVE – I			ELECTIVE - II		
01	MECHTRONICS	03	FLEXIBLE MANUFACTURING SYSTEM	01	LOW COST AUTOMATION	03	ADVANCED WELDING TECHNOLOGY
02	INDUSTRIAL ROBOTICS	04	ARTIFICIAL INTELIGENCE AND EXPERT SYSTEM	02	ADVANCE TOOL AND DIE DESIGN	04	FINITE ELEMENT ANALYSIS

SEMESTER : EIGHTH

THEORY																
01	8PE01	PROFESSIONAL ELECTIVE - III	3	0	0	3	3	3	80	20	100	40	_	_	_	_
02	8PE02	PROCESS ENGINEERING	3	0	0	3	3	3	80	20	100	40	_	_	_	_
03	8PE03	PROFESSIONAL ELECTIVE - IV	3	0	0	3	3	3	80	20	100	40	_	_	_	_
04	8PE04	OPERATION RESEARCH TECHNIQUE	3	1	0	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8PE05	PROCESS ENGINEERING - Lab.	0	0	2	2	1	_	_	_	_	_	25	25	50	25
06	8PE06	PROFESSIONAL ELECTIVE- IV LAB	0	0	2	2	1	--	--	--	--	--	25	25	50	25
07	8PE07	OPERATION RESEARCH TECHNIQUE - Lab.	0	0	2	2	1						25	25	50	25
08	8PE08	*PROJECT & SEMINAR	0	0	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	12	1	12	24	27				400				300	
															TOTAL	700

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRONICS & TELICOMMUNICATION ENGINEERING -SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - B

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code		Lecture	Tutorial	P/D	Total HOURS/WEE	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMEN	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7XT1	Data Communication Network	4	-	-	4	4	3	80	20	100	40	_	_	_	_
02	7X12	Microcontroller and Applications	4	1	-	5	5	3	80	20	100	40	_	_	_	_
03	7XT3	Digital Signal Processing	4	1	-	5	5	3	80	20	100	40	_	_	_	_
04	7XT4	Professional Elective-I	4	-	-	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	7XT5	Microcontroller and Applications Lab	-	-	2	2	1	_	_	_	_	_	25	25	50	25
06	7XT6	Digital Signal Processing Lab	-	-	2	2	1	_	_	_	_	_	25	25	50	25
07	7XT7	Simulation Lab			2	2	1	_	_	_	_	_	25	25	50	25
08	7XT8	Project and Seminar	-	-		2	4					_	_	50	50	25
		TOTAL	16	2	6	26	25				400				200	
														TOTAL	600	

Professional Elective-I: 1. VLSI Design 2. Computer Organization 3. Artificial Intelligence 4. Satellite & Optical Fibre communication 5. Audio & Video Engineering

Semester : Eighth

THEORY																
01	8XT1	UHF and Microwaves	4	1	-	5	5	3	80	20	100	40	_	_	_	_
02	8XT2	Electronics Circuit Design	4	1	-	5	5	3	80	20	100	40	_	_	_	_
03	8XT3	Wireless Communication	4	-	-	4	4	3	80	20	100	40	_	_	_	_
04	8XT4	Professional Elective-II	4	-	-	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8XT5	UHF & Microwaves Lab	-	-	2	2	1	_	_	_	_	_	25	25	50	25
06	8XT6	Electronics Circuit Design Lab	-	-	2	2	1	_	_	_	_	_	25	25	50	25
07	8XT7	Project and Seminar	-	-	-	6	12	-	-	-	-	-	75	75	150	75
		TOTAL	16	2	4	28	32	-	-	-	400	-	-	-	250	
														TOTAL	**650**	

Professioal Elective-II: 1. Biomedical Engineering 2. Digital Image Processing 3.. ARM system development and design 4. Embedded and Real time system 5.Smart sensors

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - ELECTRONICS ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - C

SEMESTER - SEVENTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code		Lecture	Tutorial	P/D	Total HOURS/WEE	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMEN	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXNERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7XN1	Computer Organization	4			4	4	3	80	20	100	40	_	_	_	_
02	7XN2	Microcontroller and Applications	4	1		5	5	3	80	20	100	40	_	_	_	_
03	7XN3	Digital Signal Processing	4	1		5	5	3	80	20	100	40	_	_	_	_
04	7XN4	Professional Elective-I	4			4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	7XN5	Microcontroller and Applications Lab			2	2	1	_	_	_	_	_	25	25	50	25
06	7XN6	Digital Signal Processing Lab			2	2	1	_	_	_	_	_	25	25	50	25
07	7XN7	Simulation Lab			2	2	1	_	_	_	_	_	25	25	50	25
08	7XN8	Project and Seminar				2	4					_	_	50	50	25
		TOTAL	16	2	6	26	25				400				200	

Professional Elective-I: 1. Nanoelectronics 2. Mechatronics 3. Digital Instrumentation 4. Integrated Optics & Photonic Systems 5. Wireless Communication 6. Speech Processing — TOTAL 600

Semester : Eighth

THEORY																
01	8XN1	UHF and Microwaves	4	1		5	5	3	80	20	100	40	_	_	_	_
02	8XN2	Electronics Circuit Design	4	1		5	5	3	80	20	100	40	_	_	_	_
03	8XN3	VLSI Design	4			4	4	3	80	20	100	40	_	_	_	_
04	8XN4	Professional Elective-II	4			4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8XN5	UHF & Microwaves Lab			2	2	1	_	_	_	_	_	25	25	50	25
06	8XN6	Electronics Circuit Design and VLSI Design Lab			2	2	1	_	_	_	_	_	25	25	50	25
07	8XN7	Project and Seminar				6	12						75	75	150	75
		TOTAL	16	2	4	28	32				400				250	

Professioal Elective-II: 1. System on Chip 2. Digital Signal Processors 3.. Artificial Intelligence & Robotics 4. Digital Image Processing 5. Digital Communication 6. Smart Sensors & Networks — **TOTAL 650**

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - INSTRUMENTATION ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

Appendix - D

SEMESTER - SEVENTH

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code		Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7IE01	PLC & SCADA Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7IE02	Computer Aided Control	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7IE03	Instrument & System Design	4	1	_	5	5	3	80	20	100	40	_	_	_	_
04	7IE04	Project Planning Estimation & Assessment	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7IE05	Professional Elective-I	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7IE06	PLC & SCADA Systems-Lab.			2	2	1						25	25	50	25
07	7IE07	Project Planning Estimation & Assessment-Lab.			2	2	1						25	25	50	25
08	7IE08	Project and Seminar	_	_	2	2	4					_	_	50	50	25
		TOTAL	20	1	6	27	27				500				150	
		Professional Elective-I: 1)Fuzzy Logic and Neural Network 2) Robotics & Automotion 3) Digital Signal Processing 4) Instrumentation for Agriculture and Food Processing												TOTAL	650	
Semester : Eighth																
THEORY																
01	8IE01	Process Modeling and Optimization	4	1	_	5	5	3	80	20	100	40	_	_	_	_
02	8IE02	Process Instrumentation	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8IE03	Professional Elective-II	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
04	8IE04	Process Modeling and Optimization-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
05	8IE05	Process Instrumentation-Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8IE06	Project and Seminar	_	_	6	6	12						75	75	150	75
		TOTAL	12	1	10	23	27				300				250	
		Professional Elective-II:1)Environmental Instrumentation, 2)Advance Biomedical Instrumentation, 3) Power Plant Instrumentation , 4) Opto Electronics Instrumentation												TOTAL	550	

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - COMPUTER SCIENCE & ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - E

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7KS01	Digital Signal Processing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
02	7KS02	Computer Networks	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7KS03	Design & Analysis of Algorithms	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7KS04	Object Oriented Analysis & Design	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7KS05	Professional Elective I*	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7KS06	Digital Signal Processing Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7KS07	Design & Analysis of Algorithms Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7KS08	Object Oriented Analysis & Design Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7KS09	Project & Seminar	_	_	2	2	4	_	_	_	_	_	_	50	50	25
		TOTAL	20	_	8	28	27				500				200	
														TOTAL	700	

Professional Elective I* (i) Computer Graphics (ii) Multimedia Technologies (iii) Web Engineering (iv) Human Computer Interface

Semester :EIGHTH																
THEORY																
01	8KS01	Artificial Intelligence	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8KS02	Embedded Systems	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	8KS03	Software Engineering	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8KS04	Professional Elective II*	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8KS05	Artificial Intelligence -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8KS06	Embedded Systems -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8KS07	Project & Seminar			6	6	12						75	75	150	75
		TOTAL	13	_	10	23	27				400				250	
														TOTAL	650	

Professional Elective II* (i)Distributed Computing (ii) Mobile Computing (iii) Soft Computing (iv) Network Security

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - COMPUTER ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - F

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7KE01	Signals & Systems	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	7KE02	Computer Network	4	_	_	4	4	3	80	20	100	40	_	_	_	_
03	7KE03	Microprocessors & Interfacing	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	7KE04	Mobile Computing	4	_	_	4	4	3	80	20	100	40	_	_	_	_
05	7KE05	Professional Elective I*	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7KE06	Computer Network- Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7KE07	Microprocessors & Interfacing Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7KE08	Mobile Computing -Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7KE09	Project & Seminar			2	2	4	_	_	_	_	_	_	50	50	_
		TOTAL	18	2	8	28	27				500				200	
														TOTAL	700	

Professional Elective I (i) Artificial Intelligence (ii) Computer Graphics (iii) Design & Analysis of Algorithms (iv) Human Computer Interaction*

Semester :EIGHTH																
THEORY																
01	8KE01	Digital Signal Processing	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8KE02	Embedded Systems	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8KE03	Software Engineering	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8KE04	Professional Elective II*	4	_	_	4	4	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8KE05	Digital Signal Processing Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8KE06	Embedded Systems Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	8KE07	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	13	_	10	23	27				400				250	
														TOTAL	650	

Professional Elective II* (i) Network Security (ii) Multimedia Technologies (iii) Expert System Design (iv) Soft Computing

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING
BRANCH - TEXTILE ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)
SEMESTER - SEVENTH

Appendix - G

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code		Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7 TX 01	Textile Mathematics	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	7 TX 02	Textile Testing-III	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	7 TX 03	Chemical Processing-I	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	7 TX 04	Textile Mill Management	3	1	_	4	4	3	80	20	100	40	_	_	_	_
05	7 TX 05	Professional Elective-I (*)	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7 TX 06	Project and Seminar	_	_	2	2	4	_	_	_	_	_	25	25	50	25
07	7 TX 07	Textile Testing-III- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7 TX 08	Chemical Processing-I- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
		TOTAL	15	4	6	25	25				500				150	
														TOTAL	650	

Professional Elective-I (*) : (i) Advanced Nonwoven Technology (ii) Advanced Knitting Technology

Semester : Eighth																
THEORY																
01	8 TX 01	Process Control in Textile Manufacturing	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8 TX 02	Advanced Fabric Manufacturing Technology	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	8 TX 03	Chemical Processing-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8 TX 04	Professional Elective-II (*)	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8 TX 06	Advanced Fabric Manufacturing Technology- Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8TX07	Chemical Processing – II Lab	--	--	2	2	1	--	--	--	--	--	25	25	50	25
07	8 TX 05	Project & Seminar	-	--	6	6	12	--	--	--	--	--	75	75	150	75
		TOTAL	12	1	10	23	27				400				250	
														TOTAL	650	

Professional Elective-II : (i) Technical Textiles (ii) New Fibre Science

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - CHEMICAL ENGINEERING - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - H

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS		TOTAL	MIN. PASSING MARKS
													EXTERNAL	INTERNAL		
THEORY																
01	7CH01	Chemical Engineering Operations-III (Mass Transfer-II)	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	7CH02	Chemical Reaction Engineering-I	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	7CH03	Process Dynamics & Control	3	1	_	4	4	3	80	20	100	40	_	_	_	_
04	7CH04	Professional Elective (*) -I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
05	7CH05	Plant Design & Project Engineering	3	_	_	3	3	3	80	20	100	40				
PRACTICALS / DRAWING / DESIGN																
06	7CH06	Chemical Engineering Operations-III (Mass Transfer-II)-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7CH07	Chemical Reaction Engineering-I-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7CH08	Process Dynamics & Control-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7CH09	Professional Elective I-lab	_	_	2	2	1						25	25	50	25
10	7CH10	Industrial Training	_	_	_	_	1						0	50	50	25
11	7CH11	Project & Seminar	_	_	2	2	4						0	50	50	25
		TOTAL	15	3	10	28	27				500				300	
														TOTAL		800

*Professional Elective * -I 1) Industrial Waste Treatment 2) New Separation Techniques 3) Optimisation of Chemical processes4) Polymer Science & Technology*

Semester : Eighth

THEORY																
01	8CH01	Transport Phenomena	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	8CH02	Chemical Reaction Engineering-II	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	8CH03	System Modelling	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8CH04	Professional Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8CH05	Professional Elective-II -Lab.	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8CH06	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	12	2	8	22	27				400				200	
														TOTAL	600	

Professional Elective-II 1) Petroleum Processing Technology 2) Corrosion Engineering 3) Biochemical Engineering 4) Petroleum Refinary Engineering 5)) Bio Fules 6) Industrial Piping 7) Wine Making 8) Petrochemical Technology 9) Energy Technology & Management 10) Energy & Environment

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - POLYMER (PLASTIC) TECHNOLOGY - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH

Appendix - I

			TEACHING SCHEME					EXAMINATION SCHEME								
			HOURS / WEEK					THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D	Total HOURS/WEEK	CREDITS	DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																
01	7PP01	Polymer Processing I	3	1	_	4	4	3	80	20	100	40	_	_	_	_
02	7PP02	Polymer Reaction Engineering	3	1	_	4	4	3	80	20	100	40	_	_	_	_
03	7PP03	Structure Property Relationship in Polymers	4	_	_	4	4	3	80	20	100	40	_	_	_	_
04	7PP04	Professional Elective-I	3	_	_	3	3	3	80	20	100	40	_	_	_	_
05	7PP05	Plant Design & Project Engineering	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
06	7PP06	Polymer Processing-I-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
07	7PP07	Polymer Reaction Engineering-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
08	7PP08	Professional Elective-I-Lab	_	_	2	2	1	_	_	_	_	_	25	25	50	25
09	7PP09	Industrial Training	_	_	_	_	2							50	50	25
10	7PP10	Project & Seminar	_	_	2	2	4							50	50	25
		TOTAL	16	2	8	26	27				500				250	
														TOTAL		750

Professional Elective-I 1) Polymer Blends & Composites 2) Packaging Technology

Semester : Eighth

THEORY																
01	8PP01	Polymer Processing II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
02	8PP02	Polymer Viscoelasticity & Rheology	3	_	_	3	3	3	80	20	100	40	_	_	_	_
03	8PP03	Professional Elective-II	3	_	_	3	3	3	80	20	100	40	_	_	_	_
04	8PP04	Mould Design for Plastics	3	_	_	3	3	3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																
05	8PP05	Polymer Processing II	_	_	2	2	1	_	_	_	_	_	25	25	50	25
06	8PP06	Professional Elective-II			2	2	1						25	25	50	25
07	8PP07	Mould Design for Plastics-Lab	_	_	2	2	1	_	_	_	_	_	--	50	50	25
08	8PP08	Project & Seminar	_	_	6	6	12	_	_	_	_	_	75	75	150	75
		TOTAL	12	_	12	24	27				400				300	
														TOTAL		700

Professional Elective-II 1) Testing & Product Design for Plastics 2)Surface Coating Tech.

FOUR YEAR DEGREE COURSE IN BACHELOR OF ENGINEERING

BRANCH - FOOD, PULP & PAPER, OIL & PAINT AND PETROCHEMICAL TECHNOLOGY - SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER - SEVENTH **Appendix -** **Appendix - J**

			TEACHING SCHEME						EXAMINATION SCHEME								
			HOURS / WEEK			Total HOURS/WEEK	CREDITS		THEORY					PRACTICAL			
Sr. No.	Subject Code	Subject	Lecture	Tutorial	P/D				DURATION OF PAPER (Hr.)	MAX. MARKS THEORY PAPER	MAX. MARKS COLLEGE ASSESMENT	TOTAL	MIN. PASSING MARKS	MAX. MARKS EXTERNAL	MAX. MARKS INTERNAL	TOTAL	MIN. PASSING MARKS
THEORY																	
01	7 CT 01	Mass Transfer	4	_	_	4	4		3	80	20	100	40	_	_	_	_
02	7 CT 02	Chemical Reaction Engineering -I	3	_	_	3	3		3	80	20	100	40	_	_	_	_
03	7 FT 03	Food Technology - IV	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	7 PT 03	Pulp & Paper Technology - IV	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	7 OT 03	Oil & Paint Technoloogy - IV	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	7 PC 03	Petrochemical Technology - IV	3	1	_	4	4		3	80	20	100	40	_	_	_	_
04	7 CT 04	Professional Elective – I (*)	3	_	_	3	3		3	80	20	100	40	_	_	_	_
05	7 FT 05	Food Technology -V	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	7 PT 05	Pulp & Paper Technology -V	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	7 OT 05	Oil & Paint Technoloogy -V	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	7 PC 05	Petrochemical Technology -V	3	1	_	4	4		3	80	20	100	40	_	_	_	_
PRACTICALS / DRAWING / DESIGN																	
06	7 CT 06	Mass Transfer -Lab	_	_	2	2	1		_	_	_	_	_	25	25	50	25
07	7 CT 07	Chemical Reaction Engineering I-Lab	_	_	2	2	1		_	_	_	_	_	25	25	50	25
08	7 FT 08	Food Technology - IV-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
	7 PT 08	Pulp & Paper Technology - IV-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
	7 OT 08	Oil & Paint Technoloogy - IV-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
	7 PC 08	Petrochemical Technology - IV-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
09	7 CT 09	Professional Elective - I-Lab	_	_	2	2	1							25	25	50	25
10	7 CT 10	Project & Seminar	_	_	2	2	4		_	_	_	_	_	0	50	50	25
		TOTAL	16	2	12	30	27					500				250	
															TOTAL		750
Professional Elective – I (*) : 1) Corrosion Engg. 2) Polymer Science & Engg. 3) Manmade Fibre Technology 4) Industrial Waste Treatment																	
Semester : Eighth																	
01	8 FT 01	Food Technology -VI	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	8 PT 01	Pulp & Paper Technology -VI	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	8 OT 01	Oil & Paint Technoloogy -VI	3	1	_	4	4		3	80	20	100	40	_	_	_	_
	8 PC 01	Petrochemical Technology -VI	3	1	_	4	4		3	80	20	100	40	_	_	_	_
02	8 CT 02	Chemical Reaction Engineering -II	3	_	_	3	3		3	80	20	100	40	_	_	_	_
03	8 CT 03	Plant Desgin & Project Engineering	3	_	_	3	3		3	80	20	100	40	_	_	_	_
04	8 CT 04	Professional Elective – II (*)	3	_	_	3	3		3	80	20	100	40	_	_	_	_

PRACTICALS / DRAWING / DESIGN																	
05	8 FT 05	Food Technology -VI-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
	8 PT 05	Pulp & Paper Technology -VI-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
	8 OT 05	Oil & Paint Technoloogy -VI-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
	8 PC 05	Petrochemical Technology-VI-Lab	_	_	4	4	2		_	_	_	_	_	25	25	50	25
06	8 CT 06	Project & Seminar	_	_	6	6	12		_	_	_	_	_	75	75	150	75
		TOTAL	12	1	10	23	27					400				200	
																TOTAL	600
Professional Elective – II (*) : 1) Biochemical Engg. 2) Petroleum Processing Engg. 3) Fuel Technology																	

SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
PRODUCTION ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7PE01 PRODUCTION PLANNING AND CONTROL

Lecture: 03 Hrs/ w
Tutorial: 01 Hrs/ w
Internal Assessments: 20
University Exam: 80
Credits: 04

Course Objectives:.

- Identify the need to learn about the various functions in production planning and control to better manage manufacturing and/or service systems.
- Providing men, machines, materials etc. of right quality, quantity and also providing them at the right time forms a very important factor.
- Show how qualitative and quantitative forecasting techniques can be used in short, medium, and long range forecasting.
- To Develop material requirements plans (MRP-I) and manufacturing resource plans (MRP-II) as part of resource requirements planning systems.
- Show how various heuristic decision rules can be used to make lot-sizing decisions.
- To Develop quantitative models to manage independent demand inventory systems.

SECTION-A

UNIT-I: **Introduction:** Objectives and advantages of PPC, production procedure, functions of PPC, production consumption cycle, centralised & decentralised PPC, Prerequisites of PPC, types of PPC systems.
Scheduling: Introduction, inputs of scheduling, loading and scheduling devices, factors influencing scheduling, procedure for scheduling, techniques of Scheduling. (7)

UNIT-II: **Production Forecasting :** Introduction, definition, importance of forecasts, qualitative model ; Delphi Technique, quantitative models : simple moving average, weighted moving average, simple exponential smoothing. Forecasting error MAD, MSB, BIAS, Tracking signal, Deviation and selection of forecasting model. Types of Forecasts: constant, linear, cyclic forecasts.
Verification and Controlling : The moving range chart, average MR, out of control condition. (7)

UNIT-III: **Production Planning :** The production order, procedure for formulating order production order, Master Programmer, Basic problems in production planning, quantities in batch production, criteria for batch size determination, minimum cost batch size, production Range, maximum profit batch size, maximum return, maximum rate of return, economic batch size. (7)

SECTION-B

UNIT-IV: **Machine Output :** Machine output, multimachine supervision by one operator, machine interference, Ashcroft tables, average number of consecutive servicing task, the Ashcroft Number. (7)

UNIT-V: **Analytical Structure of Inventory :** Definition of inventory, types of inventory and its classification, structure of inventory problems and its analysis, the Relevant cost, objectives of carrying inventories, selective inventory analysis. (ABC analysis)
Deterministic Model: Elementary model [Wilson, Harris model], Shortage Modes of inventory & production models (7)

UNIT-VI: **i) Probabilistic inventory Model :** Static inventory model .Safety stock determination, estimation of safety stock requirements .Purchase inventory model -basic cost equation, purchase inventory model with price breaks. óPôsystem and óQôsystem.
iii) Material Requirement Planning (MRP) : Introduction to MRP, manufacturing resource planning (MRP-II), just in time, Pull system & Push system, Kanban, recent trends in MRP & MRP-II. (7)

TEXT BOOKS :

1. Elements of Production Planning and Control by Simuel Eilon Macmillon.
2. Production Planning and Control and Management - K.C.Jain & L.N.Agrawal
3. Production Systems Planning and Analysis & Control ï James L.Riggs.

REFERENCE BOOKS

1. Production Control - John E Biegal - Prentice Hall
2. Production Management- Hedge - John Wiley.
3. Inventory Control, Theory & Practice - Starr & Miller.
4. Scientific Inventory Management - Buchan & Kenigshery ï Prentice Hall.
5. Production and Operations Management - Chunawala & Patel, Himalaya PUblication House.
6. Production and Operations Mgt. - E.E.Adam, Jr.R.J.Ebert ï Prentice Hall of India.

7. Production Planning and Inventory Control - S.L.Narasimhan, D.W.Mcleavey, P.J.Billingten - PHI
8. Operation Research by Prem Kumar Gupta and D S Hiraò

7PE02 COMPUTERAIDED DESIGN AND MANUFACTURING

Lecture: 03 Hrs/ w
Tutorial: 01 Hrs/ w
Internal Assessments: 20
University Exam: 80
Credits: 04

Course Objectives:

- To become aware of application of computers in development of geometric models using Computer Aided
- Design and use of these models for Design and Analysis, Planning and Organizing Manufacturing Activity and the Control of Machines for manufacturing the product.
- To understand and relate the product design cycle to product manufacturing through experiential learning;
- To introduce concepts in Planning and Organizing Manufacturing Activity and the Control of Machines.
- To use design optimization methods effectively and variety of manufacturing processes, including NC machining, FMS, CIM, PLM and PDM

SECTION-A

UNIT-I : Introduction to CAD/CAM: Definition, applications, types of CAD systems, benefits of CAD, design process, application of computer for design, creating the manufacturing data base, hardware in CAD.

Computer graphics software and data base, graphics system and functions of graphics package, Interactive computer graphics for CAD/CAM applications, configuration of graphic work station, techniques of image generation and types of graphics terminals, colour monitors, input/output devices (07)

UNIT-II: Transformations: Introduction, Formulation, Translation, Rotation, Scaling, Reflections, Homogeneous Representation and Concatenation. Mapping of Geometric Models.

Constructing the geometry, database structure and content, wire frame, surface and solid modeling.

Computer aided drafting and documentation, principles and concepts of automated drafting, drafting packages, animation concept in graphics, concept of virtual manufacturing and virtual reality.

Introduction to PC based and high end packages like AutoCAD / Pro E and their applications. (07)

UNIT-III: Graphics Standards: Introduction, standards for graphics programming GKS, data exchange formats, general file structure, IGES, DXF.

Finite element Modeling and Analysis: Introduction, General steps involved in FEA, Types of analysis, degree of freedom, Elements and structure stiffness equations for Spring, Spar & Beam. Plane stress / Plane stain FEA, Assembly of elements, Introduction to FEA packages, General structure of FEA procedure. Architecture of FE software, Applications of FEA.ò (07)

SECTION-B

UNIT-IV: **NC Machines :** Introduction, components of NC system, NC procedure, NC co-ordinate system, NC motion control system, MCU & other components of NC system, M/C tool application & other applications, economics of NC. NC part programming : punched tape & tape formats, methods of NC part programming, Computer assisted part programming, language, MACROS. (07)

UNIT-V: Manual data input, DNC, CNC Part programming & adaptive control.

Robot technology : Robot physical configuration, basic robot motions, technical features, elements of robotic system, types of industrial robots, robot application.

Flexible manufacturing system : Types of FMS, components & FMS, production equipment, support system, material handling system, Automated Guided Vehicles, automated storage & retrieval system, FMS application & benefits (07)

UNIT-VI: Computer integrated manufacturing : Introduction, major elements of CIM, development of CIM, design aspects of CIM,CIM planning & implementation process.

Concurrent Engineering: Introduction, concept, principles, traditional verses concurrent approach, schemes and tools of concurrent Engg., application of computers in practice of concurrent Engg., approach in manufacturing systems. (07)

TEXT BOOKS :

1) CAD/CAM Principles and Applications by Dr. P. N. óRao, Tata Mcgraw-Hill.
2) MASTERING CAD CAM By Ibrahim Zeid, 2005, TMH, ISBN 0-07-059411-2
3) CAD/CAM by Mickel Groover, PHI

REFERENCE BOOKS

1) Computer Integrated Design & Manufacturing by David Bedworth, McGraw Hill.

2) CAD/CAM/CIM by P.Radhakrishan, S.Subramanyam, New Age Int. Pub.

3) Automation, Production System and Computer Integrated Manufacturing by M.P.Groover, PHI

4) Finite Element Methods vs. Classical Methods by New Age Publishers, India.

5) Introduction to the Finite Element Method by C. S. Desai & J. F. Abel, CBC Pub.

6) Concept And Applications of FEA by Robert D. Cook, John Wiley &Sons.

7) CAD/CAM Theory and Practice bylbrahimZeid,TataMc,Graw-Hill, New Delhi.

7PE03 INDUSTRIAL MANAGEMENT & COSTING

Lecture: 03 Hrs/ w
Tutorial: 01 Hrs/ w
Internal Assessments: 20
University Exam: 80
Credits: 04

Course Objectives:

- To develop a student's skills in supervision of any activity.
- To equip the student with skills necessary for effective communication.
- To enable a student use the available resources to achieve the desired goal in a more efficient and effective way.
- To study concept of cost accounting terminology, job costing, process costing, activity-based costing, activitybased management, standard costing, variance analysis, and decision making.
- Estimation of machining time, estimation of fabrication cost, forging cost, etc.

SECTION-A

UNIT-I : Business Management: Meaning of business, Business system, Business organization, Forms of Business organization, Concept of management science, Evolution of management thought, Scientific management (Taylorism), Modern management (Fayolism), Principles of management, Administration Vs. Organisation, Functions of management, Planning & Decision making, Organisation structure & relationships, Delegation, Decentralization, Communication, Direction, Coordination, Motivation and Control. (8)

UNIT-II: Marketing and Sales Management: Marketing strategy, Market research, Buying motives, Types of markets, New product development, Product life cycle, Product presentation & its effect on consumer, Sales organisation, Advertising, Method of selling, Sales performance objectives.

International Marketing: Introduction to international marketing, International Marketing decisions, Practices & Problems of international marketing, Import & Export procedure. (7)

UNIT-III: I) Personnel Management: Human resource planning, personnel research, Recruitment, training and development workers participation in management, joint consultation, collective bargaining.

II) Materials Management: Classes of materials, scope of material control, scope and function of purchasing department, purchasing procedure, inventory control, ordering procedure, material identification, store function. (7)

SECTION-B

UNIT-IV: Estimation : Objectives, functions, principle factors, miscellaneous and estimating procedure. Estimation of weights and materials, Estimation of machining time, estimation of fabrication cost, forging cost, foundry cost. (7)

UNIT-V: Introduction to costing and costing Techniques:- Definitions, objectives, elements of costs, components of cost, job costing, simple process costing, normal and abnormal losses in process, waste, scrap. (7)

UNIT-VI: i) Financial Statement: Profit and loss statement , balance sheet.

ii) Financing of business: Basis of business finance, need of finance, Kinds of capital, sources of fixed & Working capital.

iii) Depreciation Analysis: Causes & significance, method of calculation of depreciation. (7)

TEXT BOOKS:

1. Industrial Engineering & Management - O.P.Khanna.
2. Business & Ind. Organisation and Marketing Management- S.A.Sherlekar & V.S.Sherlekar.
3. Estimating & Costing -T.R.Banga & S.C.Sharma.

REFERENCE BOOKS

1. Principles on Marketing Management- Philip Kotler.
2. Personnel Mqs & Ind. Relations - C.B.Mammoria.
3. Business Orgnisation - N.C.Shukla
4. Principles & Practice of Cost Accounting - N.N.Prasad.
5. Cost Accounting - Bhar.
6. Estimating and Costing - TTTI Madras.

7PE04 PROFESSIONAL ELECTIVE – I
(01) MECHATRONICS

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objectives:

- Understand the importance of the integration of modeling and controls in the design of mechatronic systems.
- Understand industrial motion control: types of controllers, tuning of controllers, and position/velocity control loops with encoders/ resolvers.
- Understand the characteristics and models of various electromechanical actuators (brushed dc
- Motor, brushless dc motor, and stepper motor) and MEMS.

SECTION-A

UNIT-I : Introduction to Mechatronics Scope of Mechatronics, Basics of sensors and transducers, Selection, Contact and non Contact, Optical types, performance, examples. Actuators and Drives used in Robots. (6)

UNIT-II: Computer Process Control Computer process interface, interface hardware. Direct Digital control, Supervisory Computer Control. (6)

UNIT-III: Design of Mechatronic elements Measuring System, Control Software and user interface, Gauging, Tool Monitoring System, Spindle drives, feed drives, Servo principles, Configuration CNC System, Interfacing, Monitoring, Dignostics. (6)

SECTION-B

UNIT-IV: Automatic loading & unloading devices, their purpose, Magazines, Bunkers, Orientation, Mechanism Unit Heads, Automatic production lines. (6)

UNIT-V: MICRO-ELECTRO-MECHANICAL SYSTEMS (MEMS): Introduction to MEMS, Manufacturing processes of MEMS- Photolithography, Surface Micromachining, and Bulk Micromachining. MEMS
Applications- Micro sensors and its applications, accelerati sensors, microscopic actuators, printer head^ micro-Fluidic MEMS, Ine, MEMS, Fluidics MEMS, Optical MEMS, RF MEMS. Advantages of MEMS and Trends and scope in MEMS. (6)

UNIT-VI: Digital Electronics: Introduction, LOGICAL Gates, Arithmetic circuits: Adder, Substractors Encoders and Decoders ,Flip-lops,

Registers, counters Memories ð Magnetic, Optical disc memories and semiconductor Memories. Microcontrollers. (6)

TEXT BOOKS:

1) Mechatronics by HMT, Tata McGraw Hill.
2) Introduction to Mechatronics & Measurement System by M B. Histand & David G.Aiciatore McGraw Hill.
3) Mechatronics by M.D.Singh&J.QJoshi, Prentice-Hall of India.

REFERENCES BOOKS:

1) Automation, Production System and CIM by M.P.Groover, PHI
2) Automation by Maleev, MIR Publication.
3) Industrial Automation by Turgam, MIR Publication.
4) Pneumatics & Hydraulics by Steward.
5) CMTI Handbook by CMTI.
6) MEMS: Advanced materials and fabrication methods - National Research Council (NRC) committee report, 1997
7) Nano- and Microelectromechanical Systems: Fundamentals of Nano- and Micro engineering - S. E. Lyshevski
8) Principles of micro fabrication-Marc Madou.
9) Micro sensors-J.W. Gardner.
10) Mechatronics by R.K.Rajput, S.Chad and Co.Ltd.ò

7PE04 PROFESSIONAL ELECTIVE – I
(02) INDUSTRIAL ROBOTICS

Lecture: 03 Hrs/ w
Tutorial: ___
Internal Assessments: 20
University Exam: 80
Credits: 03

COURSE OBJECTIVES:

- Introduction to Robotics & Automation and applications
- Classify industrial robots by kinematic structure, work envelope, control system and actuation
- Understand the difference in construction & application of various sensors used in robotic & automation systems
- Examine common robotic and automated systems components such as actuators, power transmission systems and grippers
- Mathematically analyse planar & simple spatial robotic systems for position control

SECTION - A

Unit 1: Introduction to Robotics: Automation and robotics, robot anatomy, Development of industrial Robots and manipulators, basic structure of robots, resolution, accuracy and repeatability. Classification, Configuration of robots, arm and body motions, wrist motions, mechanical, hydraulic and pneumatic Manipulators. (7)

Unit II: **Kinematics and Dynamics of Robot Arms:** The direct kinematics problem, the inverse kinematic solution, Homogeneous transformation. Dennavit - Hartenbergôs convention for dynamic analysis of Joints, Global & Local Coordinates for analysis. Advanced synthesis of planar mechanisms for ISP, MSP and FSP, Burmester theories and analytical techniques, Applications, Lagrange-Euler formation, generalized DôAlembert equations of motion, Spatial mechanisms. Axodes, kinematics of open and closed loop mechanisms. (7)

Unit III: **Robot Grippers:** Classification, Design consideration, Materials for hostile operation. cylindrical Cam type; Grippers using pneumatic, hydraulic and electrical motor for transmission; Vacuum Grippers, ultrasonic grippers. (7)

SECTION - B

Unit IV: **Sensors in Robotics:** Sensors - functioning, types, analysis and fields of applications. Tactile sensors, temperature sensors, Variable Pressure Light Converting Sensor, High Resolution Pneumatic tactile Sensor, Slip type Sensors, Piezo electric Contact Sensors. Remote Sensor Compliance, Range & Proximity Sensors, Electro- optical Sensors.
Vision system: Median filtering, thresholding, discretisation, Smoothening of binary image. Recognition Procedure. CCD Camera. (7)

Unit V : **Robot Drives, Control and Robot Programming:** Hydraulic systems, DC servo motors, basic control systems concepts and models, control system analysis, robot activation and feed back components. Positional and velocity actuators. Power transmission systems, robot joint control design. Methods of Programming the robot, Languages, Robographics, Introduction to Artificial Intelligence (7)

Unit VI: **Advanced Applications of Robots and Robot Interfacing:** Pick and place Robot, Arc Welding Robots, Assembly and mega-assembly Robots, Walking Robots, Climbing Robots, Machine mounted Robots. Interfacing Robots with computers. Obstacle Avoidance: Leeôs Algorithm; Counter Path Defining using óviaô point, blending technique. (7)

TEXT BOOKS:

1. Deb S.R., ñ*Robotics",* Tata McGraw Hill Publications, New Delhi.
2. **ROBOTICS AND CONTROL, By R Mittle, I Nagrath,** 2003 , McGraw-Hill Education India Pvt. Ltd. INDIA, ISBN: 9780070482937

3. Groover M.P., Weiss M., Nagel R.N., Odrey N.G., ñ*Industrial Robotics Technology* - Programming *and Applications*ò, McGraw Hill Book Co.

REFERENCE BOOKS

1. Fu K.S., Gonzalex R.C., Lee C.S.G., ñ*Robotics Control Sensing, Vision and intelligence*ò, McGraw Hill Book Co.
2. Yoram Koren, ñ*Robotics for Engineers*ò, McGraw Hill Book Co.
3. Hartenberg and Denavit, ñ*Kinematics and Synthesis of Linkages*ò, McGraw Hill Book Co.
4. Hirchhorn J., ñ*Kinematics and Dynamics of Machinery*ò, McGraw Hill Book Co.
5. Paul R., ñ*Robots - Manipulators, Mathematics, Programming and Control"*, MIT Press.
6. Janakiraman P.A., ñ*Robotics and Image Processing"*, Tata McGraw Hill 1995.

7PE04 **PROFESSIONAL ELECTIVE – I**
(03) FLEXIBLE MANUFACTURING SYSTEMS

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objective

- To study fundamental concepts of Flexible Manufacturing Systems.
- To study Tooling and fixturing system in FMS
- To study different Material handling systems in FMS

SECTION – A

UNIT–I: **Introduction:** Flexible and rigid manufacturing, Concept of F.M. Cell and F.M. System, Functions of a manufacturing cell, Types and components of FMS, Tests of flexibility, Group Technology and FMS, Optimization of FMS, Tasks in selection of FMS
Control structure of FMS: Architecture of typical FMS, Automated work piece flow in FMS, Hierarchical control system architecture of FMS ï Factory level, Cell level and Equipment level; Factory networks, Distributed Numerical Control (DNC), unmanned operation, FMS Diagnostics (7)

UNIT–II: Production Scheduling in FMS: Shop Floor Control system, phases in SFC, Variable route part programming system in FMS, dynamic scheduling in FMS, procedure, Performance analysis of FMS ï measures, Deadlocks in automated manufacturing systems- handling deadlocks (6)

UNIT–III: Tooling in FMS: Tool holders for CNC machines, modular tooling, tool monitoring; preset, offset and wear compensation values, robotized tool assembly, tool database, tool management system, tool flow control in FMS

Fixturing in FMS: Palletizing of parts, pallet pool, flexible fixturing ï principles and methodologies, standard fixtures, modular fixturing system ï T-slot based and dowel pin based and their components; Computer aided fixture design ï approaches, use of GT in fixture design ï fixture design process, fixturing structure and fixturing information tree, fixture database (8)

SECTION – B

UNIT–IV: Database Management Systems in FMS: Conceptual DBMS, types of data structures and their applications in FMS, Integrated DBMS in FMS and its implementation

Material Handling in FMS: Functions of an integrated material handling system in FMS, Flexibilities in material handling, Layouts in FMS, Industrial robots for load / unload applications, Robotic cell layouts;

Automatically Guided Vehicles (AGVs) ï types, Control of AGVs- Wire guided, optically guided, dead reckoning, free ranging AGVs, Scheduling of AGV, Storage and retrieval machines in AS/RS, (7)

UNIT–V: Automated Inspection Systems: In-process gauging, Coordinate Measuring Machines ï applications, Probes ï various shapes, types and applications, programming of CMMs, Types of CMM software, Inspection routines / cycles on CMM for various measurements ï manual and programmed, CNC machines as CMM

Designing FMS: Simulation – Need, techniques, inputs, procedure, performance analysis (7)

UNIT–VI: Flexible Assembly Systems: Basic concepts, classification, planning and scheduling in FAS, loading and scheduling in F.A. cells

Reconfigurable Manufacturing Systems: Definition, goals, elements, rationale, characteristics, principles, RMS and FMS (7)

TEXT BOOKS :

1. Ranky, Dr. Paul, (1984), ñThe Design & Operation of FMSò,
2. Groover, Mikell P., 3/e, ñAutomation, Production Systems & Computer Integrated Manufacturingò, Pearson Education or PHI
3. Shivanand H K , M M Benal. & V Koti., ñFlexible Manufacturing Systemsò 2006, NEW AGE INTERNATIONAL (P) Ltd, New Delhi. **978-81-224-2559-8**

REFERENCE BOOKS :

1. Pinedo, Michael & Chao, Xiuly (1999), ñOperations Scheduling with Applications in Manufacturing & Servicesò, McGraw Hill International Editions (with LEKIN Scheduling Software, also available on INTERNET)
2. CAD/CAM/CIM, 3/e ï Radhakrishnan, Subramanayam & Raju (New Age International)
3. Computer Aided Manufacturing - Chang, Wysk & Wong (Prentice Hall of India)
4. Computer Integrated Manufacturing- A. Alavudeen & N.Venkateshwaran, 2008, (PHI), ISBN-978-81-203-3345-1
5. Planning and Scheduling in Manufacturing and Services- Pinedo, Michael, (2005), Springer, ISBN 0-387-22198-0
6. CAD/CAM ï Concepts & Applications, - Channakesava R. Alavala, (2008), (PHI) ISBN-978-81-203-3340-6

7PE04 PROFESSIONAL ELECTIVE – I

(04) ARTIFICIAL INTELIGENCE AND EXPERT SYSTEM

Lecture: 03 Hrs/ w **Internal Assessments**: 20
Tutorial: ____ **University Exam**: 80
Credits: 03

SECTION-A

UNIT-I : Introduction to Artificial Intelligence (AI) - Overview of AI, definition and importance of knowledge, knowledge based systems, representation of knowledge, knowledge organization, knowledge manipulation, acquisition of knowledge. (6)

UNIT-II: Introduction to Expert Systems - Features of expert systems, knowledge engineering, basic expert system terminology, human experts and artificial experts, algorithmic and heuristic methods, difference between conventional programs and expert systems. Architecture of expert systems (8)

UNIT-III: Knowledge Representation - Rule based methods, rule execution, forward chaining and backward chaining, knowledge representation using semantic nets, structure of semantic nets, Frame-based methods (8)

SECTION-B

UNIT-IV: Expert System Tools - Types of tools for expert system building, system building aids, support facilities, debugging aids, I/O facilities, explanation facilities, knowledge base editors, stages in the development of expert system tools, procedure oriented

methods, object-oriented methods, logic-based methods, access-oriented methods (7)

UNIT-V : Building an Expert System - Development phases in expert system building, development constraints, reliability, maintainability, examples of expert systems, difficulties in development of expert systems (7)

UNIT-VI: Fuzzy Engineering - Fuzzy logic, fuzzy expert systems, fuzzy sets, membership functions, fuzzy rules for approximate reasoning, fuzzy inference generation, defuzzification, development of rule matrix, applications of fuzzy expert systems for design of industrial controllers. (8)

TEXT BOOKS:

1) A Guide to Expert Systems By Donald A. Waterman, Pearson
2) Introduction to Artificial Intelligence & Expert Systems By Dan W. Patterson, PHI
3) Fuzzy Logic By John Yen, Reza Langari, Pearson

REFERENCE BOOKS:

1) Expert Systems - Theory & Practice, By Ermine, Jean Louis, PHI
2) Expert System in Engineering, By D. T. Priam, JFS Pub.
3) Expert System Applications By Sumit Vadera, Sigma Press
4) Artificial Intelligence By Winston P.H., Pearson

7PE05 PROFESSIONAL ELECTIVE-II
(01) LOW COST AUTOMATION

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objectives:

On the completion of the course student should be able to:

- Å Develop a PLC program for an automatic control system of a medium degree of complexity.
- Å Select the right hardware for a given application.
- Å Connect the field devices to the PLC to create a complete control system.
- Å Consider such aspects of the automation system as network communication, human machine interface, safety and protection against interference.

SECTION-A

UNIT-I: Pneumatic and electropneumatic components and symbol compressed air physical properties, generation, preparation and distribution, compressed air drying, areas of application control

element description - directional control valves, flow control valves, OR, AND, quick exhaust, adjustable pressure sequence rotary actuator, linear actuator, two pressure valve, Exhausted valve, NRV, check valve, vaccume cup etc. (7)

UNIT-II: Design method considerations for sequential circuits, pneumatic and electropneumatic sequential logic circuit design with Karnaugh Veich mapping method. Design of circuit by cascade method. Step counter method, and design of compound circuit. (7)

UNIT-III: Pneumatic sensors, electrical sensors, Switenes practical application of switches in industries, proportional and servo valves. Sizing of components of pneumatic and hydraulic system like cylinder, valve, tubing, compressor, air receiver, sump etc. (7)

SECTION-B

UNIT-IV: Hydraulic components and symbols. Description of control elements; hydraulic fluid - their properties and selection criteria. Areas of application. Hydraulic power pack pump, pipings, valves, filters. Hydraulic accomolators etc. (7)

UNIT-V: Design and analysis of fully hydraulic, electro hydraulic, pneumo hydraulic circuits for sequencies, synchronizing, interlocking etc. Design of circuit for pneumatic control for hydraulic sequential power system. (7)

UNIT-VI: Programmable logic controller(PLC): Its role in low cent automation, Types of PLCs, Parts of PLC, Building blocks of typical PLC, Man Machine Interfile, Type of display required for operator, Communication options in PLC, Programming techniques for PLC- programing & programmability, Programming ways, Processing ways, PLC Programming Steps, ladder diagrams, Control system flow chart, Ladder programming, PLC programming through computer, PLC selection criteria & its modules, Selection criteria for type of isolation, basic electrical and electronic components used in automation, Advantages of PLC, Application of PLC. (7)

TEXT BOOKS :-

1) Pneumatics and hydraulics by Stewart.
2) Pneumatic Control for Industrial Automation by Peter Rohner and Garden Smith, John Wiley and Sons.
3) Hydraulic and Pneumatic Power Control by Franklin P. Yeaple.

REFERENCE BOOKS :-

1) Fluid Power Logic Circuit by Peter Rohner, The McMillan Press Ltd.

2) Hydraulic System Analysis by John Stringer, The McMillan Press Ltd.
3) Fluidics by Foster K. Parber, Wiley Eastern.
4) Introduction to Fluid Power Circuits and System by Russel W. Henke, Addision Wiley.
5) Pneumatic Application by Depper and Stoll, Vogel Verlag,

7PE05 PROFESSIONAL ELECTIVE – II
(02) ADVANCE TOOL AND DIE DESIGN

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objective

To study principles of designing fixtures and dies for industrial applications.

SECTION – A

UNIT-I: **Introduction:** Jigs and Fixtures, Flexible Fixturing, Materials for Tools, Fixture and Dies.
Modular Fixture Systems: Development of modular fixtures, T-slot based and Dowel pin based Modular Fixture systems, Interactive Computer Aided Fixture Design (I-CAFD) Structure, Locating / clamping Model Analysis and classification, Fixture Component Selection, Fixture component Assembly Manipulation. (8)

UNIT-II: **Group Technology based Computer Aided Fixture Design:** Fixture Design process analysis, Fixture Structure Analysis, Fixture Feature Analysis, Fixture Design Similarity Analysis, Representation of Fixturing Feature information, Automated Fixture configuration Design (6)

UNIT-III: **Geometric and Accuracy Analysis:** Geometric constraint conditions, Assembly Analysis, 3-D Fixture configurations, Locating Accuracy and Error analysis, clamp planning, Machining accuracy analysis. (7)

SECTION – B

UNIT-IV: **Basic Principles of Metal Forming:** Flow conditions and flow curve, Deformation and material flow, force and work, Formability.
Die Design for Deep Drawing and Stretch Drawing: design considerations, die materials, efforts of friction, wear and lubrication, Die handling, Die clamping, dies for hydro mechanical deep drawing. (8)

UNIT-V: **Die Design for Hydro Forming:** Process Technology, Die design considerations, die layout, die clamping, lubricants. (6)

UNIT-VI: **Extrusion Dies:** Die Design for metal and plastic extrusion, die materials, die clamping, die handling, Dies for Solid Sections, Dies for hollow section. (7)

TEXT BOOKS:

1) Rong, Yeming; ñComputer Aided Fixture Designò, Marcel Dekker, ISBN 0-8247-9961-5
2) Metal Forming Handbook ï Schuler, Springer- Verlag Berlin.
3) Dies for Plastic Extrusion ï M.V. Joshi ï Mc Millan.

REFERENCE BOOKS:

1) Tool Design ï C. Donaldson, LeCain & Goold (TMH)
2) Tool Design ï H.W. Pollack (Taraporwalla)
3) ASM Handbook ï Forming ï ASME
4) Handbook of Die Design, 2/e ï Suchy, I (McGraw Hill), 2006.
5) Design of Jigs and Fixtures ï Hoffman (Pearson)
6) An Introduction to Jig & Tool Design, M.H.A. Kempster, (ELBS)
7) Jigs and Fixture Design Manual, Henrikson (Industrial Press, NY)
8) Die Design Fundamentals, J. R. Paquin, R. E. Crowley, Industrial Press Inc.
9) Jigs & Fixtures; Design Manual ï (2/e), P.H. Joshi, (TMH) (2003).

7PE05 PROFESSIONAL ELECTIVE – II
(03) ADVANCED WELDING TECHNOLOGY

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objectives:

- This course introduces students to various welding techniques.
- The course will include instruction in arc, oxy-acetylene, metal inert gas, tungsten inert gas welding and cutting methods.
- This course provides the exploration, study and hands on exploration of metal working and joining.

SECTION – A

UNIT-I: Types of weld joints, edge preparation, cleaning of edge, welding fixtures, track welding, arc welding, welding electrode, types of coverings, welding technique for manual welding (in MAW) Gravity welding, power supply for arc welding, arc cutting submerged arc welding, TIG and MIG arc welding CO2 welding and plasma arc welding. (8)

UNIT-II: Gas welding processes, equipments, filler metals, fuel gases, torches, filler metal, fluxes, Back hand, fore hand welding, welding rods, specification. Atomic hydrogen welding and thermal welding. Thermal cutting of metals : Oxygen cutting flame,

cutability of metals, effect of cutting on structure and property of steel, oxygen lancing, machine cutting.
Welding of carbon steel and a alloy steel, C.I. welding, welding of non ferrous metals and its alloys, Copper, Aluminum, Brass, Magnesium, Nickel and their alloys. (8)

UNIT-III: **Soldering and brazing :** capillary and wetting action, temprage, filler metals and fluxes, process and applications, design and strength of weld joint.
Resistance welding : spot welding, electrode magnet, size, resistance and force, current and time. Types of equipments : Rocker arm press, multiple welding gun and portable welders, applications, seam welding projection welding, flash welding, applications. (8)

SECTION - B

UNIT-IV: **Solid phase welding :** cold pressure welding, weld formation, techniques for lop and butt welding, application, diffusion joining, friction welding, process, variables, applications force welding, Ultrasonic welding. Nature of bond, velocity of impact, angle of contact and application. (8)

UNIT-V: **Radiation Welding :** Laser welding, electron beam welding, types of electron gun, spot size, beam power, operation voltage, pulse techniques, deep penetration and application.
Weldability : Design process and metallurgical considerations, testing and improvement of weldability. Welding defects and remedies. Heat treat of welds, flame hardening procedure and applications. (8)

UNIT-VI: **Inspection and testing of welds :** destructive and non destructive test for welds tension, bend, hardness, fatigue controlled. Thermal severity test. Liquid penetrant test fluorescent penetrant test, magnetic particle inspection, Eddy current testing. Ultrasonic and radiology. (7)

TEXT BOOKS :

1) A Text Book of Welding Tech. : O.P.Khanna.
2) Welding and Welding Tech. : Richard L.Little.
3) Welding Science & Technology, By Md. Ibrahim Khan, New Age Int. ISBN: 81-224-2073-7

REFERENCE BOOK :

1) Welding Hand Book : A.W.S.

7PE05 **PROFESSIONAL ELECTIVE – II**
(04) FINITE ELEMENT ANALYSIS

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objective

- Introduce students to basic concepts in FEM, various elements used and steps in FEM
- Make students to understand problem formulation and solution by FEM for Single degree, Double degree of freedom problem and Axi-symmetric field problems
- Make students to understand mathematical computation when using higher order elements
- Introduce the students to few case studies for FEM analysis.

SECTION – A

UNIT I: **Introduction :** Introduction, One Dimensional Problem, Finite Element modeling, Coordinate and Shape function, Derivation of stiffness matrix and Load Vector using Potential Energy approach , Properties of Stiffness Matrix, Assembly of Global Stiffness Matrix and Load Vector, Elimination and penalty approach, shape function, Quadratic Shape Function. (7)

UNIT II : **Trusses :** Introduction, Plane trusses, Assembly of global Stiffness Matrix for Banded Skyline solutions. (7)

UNIT III: **Two-Dimensional Problem Using Constant Strain Triangles:** Introduction, finite element formulation, load considerations and boundary conditions, problem modeling, member end forces, plane frame. (7)

SECTION – B

UNIT IV: A**xi-symmetric solids subjected to axi-symmetric loading:** Introduction, axi-symmetric formulation, finite element modeling of triangular element
Two dimensional iso-parametric elements : Introduction, four node quadrilateral, introduction to higher order elements. (7)

UNIT V: **Finite element analysis of heat transfer :** Introduction, steady state heat transfer - 1D and 2D heat conduction and convection, governing differential equation, boundary conditions, formulation of element. (7)

UNIT VI: Softwarebased FEA : Mesh generation, meshing techniques, meshing in critical areas, type and size of element, mapped elements, quality checks-[aspect ratio, warp angle, skew,

Jacobean, distortion, stretch, included angle, taper], boundary conditions, interpretation of results and design modification (7)

TEXT BOOKS:

1. Chandrupatla T.R. and Belegunda A.D., Introduction to Finite Elements in Engineering, Prentice Hallof India.
2. Reddy J.N, ñIntroduction to Finite Element Methodsò Mc Graw Hill Publications,

REFERENCE BOOKS:

1. DarylLogan, First Course in the Finite Element Method, Cengage Learning India Pvt. Ltd.
2. David V. Hutton, Fundamentals of Fi ni t e Element Analysis, Tata McGraw-Hill Education Pvt. Ltd.
3. Zienkiewicz. C., Taylor, R. I., The Finite Element Method, Butterworth-Heinemann, 5th Edition, 2000.
4. Akin J.E., Finite Element Analysis with Error Estimators, Elsevier, 2005.
5. Cook R. D., Finite Element Modeling for Stress Analysis, John Wiley & Sons Inc, 1995.
6. Liu G.R. and Quek S.S., The Finite Element Method - A Practical Course, Butterworth-Heinemann, 2003.
7. Kwon Y. W., and Bang H., Finite Element Method using MATLAB, CRC Press, 1997.
8. Asghar Bhatti, Fundamental Finite Element Analysis and Applications, John Wiley & Sons Inc, 2005 .

7PE06 COMPUTER AIDED DESIGN AND MANUFACTURING– LAB

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

Course Objectives:

Upon completing the course, the student will be able to:

- Describe CAD/CAM. List the stages of part design and manufacturing. Identify the types of three dimensional modeling schemes and appropriately select the type for designing a part.
- Describe the documentation resulting from the CAD process. Describe CAD design and engineering analysis activities.
- Produce a solid model drawing and transfer geometry to another software
- Translate geometry into programming code suitable for machining.Produce a CNC machined part from a solid model drawing. Describe manual part programming methods. Describe the CAD/ CAM part programming process. Describe post processing.

List of Practical":- Minimum 04 Practical on Section A and 04 on Section B should be performed from the following:

1. Modeling of 3D Machine Element Assembly like Coupling, Joint, etc.
2. Study of finite element analysis package to solve ID problem.
3. Preparing and executing all phases of the design of a mechanical assembly using a major commercial CAD/CAM software system.
4. Generation of Gear or Cam Profile in a graphics package.
5. Volumetric Analysis of Solid Model and assembly
6. Mass property and CG of Part and Assembly
7. Study Practical on latest 2 / 3 Axes NC/CNC machines.
8. Study Practical on latest Multi Axes, Multi spindle or SPM CNC machines.
9. Study Practical on CNC Tooling and Cutting Process Parameter Selection.
10. Preparing and executing NC part programming for any two component on CNC Turning m/c.
11. Preparing and executing NC part programming on CNC milling.
12. Preparing and executing APT part programming on CNC Turning / Milling operation.
13. Preparing and executing Robot programming for simple operation
14. Study practical of FMS.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE07 PROFESSIONAL ELECTIVE – I – LAB
(01) MECHATRONICS – LAB

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

PRACTICALS :

ñAtleast five practicals should be performed from the following:-

i) Practical based on MEMS.
ii) Ruining of automation system through PLC.
iii) Experiments based on PLC controlled ROBOT,
iv) Study of Disc pocket type orientation mechanism,
v) Experimentation on control system for DC servomotor,
vi) Experimentation on control system for Non Servo AC motor (Synchronous).
vii) Experiments on linear conveyor system with Sensor Kit.
viii) Experiments on rotary table motion and position control with sensor Kit
ix) Experiments on X-Y motion and position controlò A journal should be

prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE07 PROFESSIONAL ELECTIVE – I – LAB.
(02) INDUSTRIAL ROBOTICS – LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

Objective:

- The student will be introduced to the concepts of robotics as it applies to production plants and assembly processes.
- Sensors, controllers, actuators, materials, power-transmission systems,
- Basic principles of robotics in Industrial Automation.

Term Work

The term work shall be based on the following assignments:

1. Study of configuration of robots and motion of robot manipulator
2. Study of direct kinematics and inverse kinematic solutions (Numerical Problems)
3. Study of robot grippers (includes the problems based on gripper force)
4. Study of machine vision system
5. Study of robot drives and control
6. Study of robot interfacing with PC
7. Study on advanced industrial applications of robots
8. Programming the robot for pick and place operation
9. Robot structure and types of Robot.
10. Solution to direct kinematics problems on computer.
11. Solution to inverse kinematics problems on computer.
12. Establishing accuracy & repeatability of Robot
13. Robot programming for simple task such as pick-n-place using languages like VAL, WALLI etc.
14. Demonstration of Robot application.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE07 PROFESSIONAL ELECTIVE – I – LAB.
(03) FLEXIBLE MANUFACTURING SYSTEMS – LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

TERM WORK

Minimum eight assignments based on the following.

1. Exercise on scheduling using various dispatching rules, heuristics or

local search techniques for the following cases, using scheduling software package (like LEKIN Scheduling System / MS Project), involving schedule generation, preparation of Gantt's Chart and comparison of alternative schedules on the basis of various parameters with the output printouts.

a) Single machine / parallel machines
b) Flow shop
c) Job shop
d) Flexible Job shop
e) Flexible Flow shop

2. Simulation of FMS shop, using Simulation software package (like ARENA or FLEXSIM) including various modules like Arrive, Server, Depart, Simulate modules, Creating models of FMS shops and simulating the performance to obtain output results

3. Exercises on assessment of performance of batch production systems for the following measures

a) Manufacturing lead time,
b) Work - in ï process
c) Machine utilization

4. Development of a simple manufacturing or tool or fixture database using a suitable software like MS Access or similar.

5. Industrial visit to study components of FMS and submission of visit report (At least one visit is compulsory.)

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE07 PROFESSIONAL ELECTIVE – I – LAB.
(04) ARTIFICIAL INTELIGENCE AND EXPERT SYSTEM – LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

TERM WORK

- Practical: The students are expected to perform five practical based on the above syllabus.
- A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE08 PROFESSIONAL ELECTIVE-II
(01) LOW COST AUTOMATION - LAB

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

PRACTICALS :

1. Design, analysis and performance of any one circuit for particular application of fully pneumatic system by using Karnaugh Veich mapping method. (Atleast for two cylinder sequencing.)

2. Design and analysis of circuit for particular specific material handling application of Electropneumatic system by using Karnaugh Veich map method.

3. Design and analysis of pneumatic and electropneumatic circuit for any particular application by using :
   i) Cascade method
   ii) Step Counter method
   iii) Combination circuit.

4. Laboratory performance of pneumatics, electropneumatics, hydraulic sequential circuit for One, Two and Three cylinder problem.

5. Design of pneumatic and hydraulic circuit for plastic molding machineries.

6. Design and computer simulation of pneumatic and electropneumatic circuit for automating m/c operator. e.g. automating drilling m/c operation, automatic key way milling m/c etc.

7. Experiment on Automation of Electro Pneumatic / Electro Hydraulic Circuit through PLC

Practical examination consists of performance of any circuit by the batch of five students and viva-voce on the circuit and above term work.

7PE08 PROFESSIONAL ELECTIVE – II – LAB.
(02) ADVANCE TOOL AND DIE DESIGN – LAB.

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

PRACTICAL TERM WORK :

1) Case Study of T- Slot based Modular Fixturing system.
2) Case Study of Dowel pin based Modular Fixturing system.
3) Computer Aided Fixture Design for Simple Component.
4) Die Design for stretch drawing operation for a component.
5) Extrusion die design for solid section in plastic.
6) Study of die clamping systems for various processes.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE08 PROFESSIONAL ELECTIVE – II – LAB.
(03) ADVANCED WELDING TECHNOLOGY – LAB.

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

Course Objectives:

- This course introduces students to various welding techniques. The course is especially designed for students who have a career interest in the welding field. The course will include classroom and practical instruction in arc, oxy-acetylene, metal inert gas, tungsten inert gas welding and cutting methods.
- This course provides the exploration, study and hands on exploration of metal working and joining.

PRACTICAL TERM WORK :

1) Design and Drawing of welding fixtures - 03 Job.
2) Seminar on any one of the topics from syllabus.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination

7PE08 PROFESSIONAL ELECTIVE – II – LAB.
(04) FINITE ELEMENT ANALYSIS – LAB.

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

Term Work:

The term work shall consist of record of any three from 1 to 4 (C/ MATLAB programs) and any three from 5 to 8 assignments of the problems based on following topics:

1. Computer program for axial bar subjected to axial forces.
2. Computer program for truss subjected to plane forces.
3. Computer program for beams subjected to transverse forces and moments.
4. Computer program for frames subjected to transverse forces and moments.
5. Stress and deflection analysis of two dimensional truss using FEA software.
6. Stress and deflection analysis of any machine component consisting of 2-D elements using FEA software.
7. Stress and deflection analysis of any machine component consisting of 3-D elements using FEA software.
8. Modal analysis of any machine components.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

7PE09 **INDUSTRIAL TRAINING**

Max Marks: 50 **Credits**: 02

INDUSTRIAL VISIT / TRAINING:

During the course of study from III to VII semester each student is expected to undertake a minimum of two weeks of industrial training. In addition student should visit at least one industrial exhibition.

The students are expected to submit a report and diary, which will be evaluated by an internal assessment committee at the end of seventh semester for **50 marks.**

The industrial training shall be taken by students strictly during vacation and on their own risk and cost. An undertaking in this regards signed by student and Parents shall be submitted before proceeding for training to the concerned Head of Department/ Head of Institution. Institutes shall help students to organise industrial exhibition.

7PE10 **PROJECT & SEMINAR**

Project : 02Hrs/ w **Project Term Work:** 50

Tutorial: ___ **Project / Oral Exam:** __

Credits: 04

SEMINAR:

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/ survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for **50 marks.** The Seminar Report will be evaluated by external examiner appointed by the University along with the Project - Viva Voce examination at the end of **VIII Semester.**

PROJECT:

The objective of the project is to enable the students to work in groups of not more than five members in each group on a project involving analytical, experimental , design or combination of these in the area of **Production Engineering**. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. On completion of the work, a project report should be prepared and submitted to the department.

The evaluation is based on continuous internal assessment by an internal assessment committee for **75 marks** by way of oral

presentations. The university examination, which carries a total of **75 marks**, will be a Viva Voce examination at the end of **VIII Semester,** conducted by a committee of one external examiner appointed by the University and one internal examiner/Guide.

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EIGHTH SEMESTER

8PE01 **PROFESSIONAL ELECTIVE - III**

(01) ADVANCED PRODUCTIVITY TECHNIQUES

Lecture: 03 Hrs/ w **Internal Assessments**: 20

Tutorial: ____ **University Exam**: 80

Credits: 03

Course Objective

Based on the course description, at the conclusion of the semester the student should be able to:

- Understand the role of design and lead-in time production of quality products and services
- Understand the functions and techniques of successful project management
- Understand the role of the TQM, VE & GT in performance of an organization

SECTION-A

UNIT-I: Production and Production systems, production functions, system performance, system synthesis, importance of productivity, productivity ratio, total productivity index, productivity measurement. (7)

UNIT-II: **Production System Models :** Development, types, basic approach to model development, models of machine breakdown, models of task time variability. Codification - 7- digit coding, 9-digit coding. (7)

UNIT-III: **Product development & Design :** Company policy, effect of competition on design, long range planning, selecting the right product analysis, make & buy decision, standardisation, simplification, modification, line balancing models, diversification. (7)

SECTION-B

UNIT-IV: **TQM, ISO 9000 & Product patenting:** Historical perspective of quality concepts.

TQM : Introduction, definition, implementation and benefits, concepts of TQM by Deming, Cross by & Juran.
ISO 9000 : Objectives, models, major steps to get ISO 9000 Patenting of Products. (7)

UNIT-V: Value Engineering : Concept, advantages, role of creativity in value engineering, application, types of values, types of phases, function analysis system technique. (7)

UNIT-VI: Group Technology : Introduction, definition, benefits, fields of application, forming part families & group, group scheduling, desirable characteristics of group cellular manufacturing-concept. (7)

TEXT BOOKS :-

1. Production System - James L.Riggs
2. Production Hand Book - John A.White
3. Production Engineering Science - R.C.Pandey & C.K.Singh

REFERENCE BOOKS :

1. Production Planning & Control - Samuel Eilon
2. Production Planning & Control - Jain and Agrawal
3. Techniques of Valve Analysis and Engg.:-Miles(McGraw Hill)
4. Valve Engineering in Manufacturing :-ASTEM (Prentice Hall)
5. Valve Engineering for Management - Glauson, Auerbach
6. Total Quality Management - Sundara Raju (Tata McGraw Hill)
7. Getting More at Less Cost - Jagannathan (Tata McGraw Hill)
8. Automation, Production Systems and Computer Integrated Manufacturing - Mickell Groover (PHI)

8PE01 PROFESSIONAL ELECTIVE - III
(02) FINANCIAL MANAGEMENT AND COST CONTROL

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

SECTION – A

UNIT-I: Financial Management: Financial Function, Scope, goals and tools. Sources of finance, corporate planning and financial management. Ratio Analysis: Classification, Ratio Analysis and its limitations. Operating and Financial Leverage. (7)

UNIT-II: **Capital Budgeting:** Control of Capital Expenditure, Evaluation Process-Payback approach, Accounting of Rate of Return, Present Value Method Vs Internal Rate of Return. Replacement cost and discounted cash flow. (7)

UNIT-III: A) **Working Capital Management :** Concept and design of Working Capital, types of working capital, sources of working capital, time value of money, cost and capital, cost of capital.

B) **Funds Flow Analysis:** Concepts, Objectives, and Techniques of Funds Flow Statement. (8)

SECTION-B

UNIT-IV: A) Costing: Methods of costing and elements of cost. Material Cost: Different methods of pricing of issue of materials. Material losses - Wastage and its consideration.

B) Labour Cost: Different methods wages and incentive plans. Principles of good remunerating system, labour turnover and its methods.

C) Overheads: Classification, collection of overheads, Primary and Secondary apportionment of overheads, absorption of overheads. Machine hour and labour hour rate. Under and over absorption of overheads. Estimation of overheads. (8)

UNIT-IV: A) Budgetary control and variance Analysis: Material, Labour, Overhead, Sales. Profit, Productmix and Yield Variance.

B) **Cost control:** Capital cost control-the nature of control, elements of cost control programme, project planning and scheduling, cost reporting and corrective action. Capital cost control repetitive operating cost, standard costs, cost reporting and corrective action. (7)

UNIT-VI: Types of Costing Methods : Concept, development & use of standard costing, Marginal Costing: Use of Marginal Costing in decision-making Activity based costing: Concept, cost drives, applications.
Process costing: Concept, transfer cost, concept of by products, joint costing, scrap, waste, losses, cost of quality. (7)

TEXT BOOKS:

1. N. K. Prasad, ñ*Principles and Practice of Cost Accounting*ò, Syndicate Pvt. Ltd., Calcutta
2. I. M. Pandy, ñ*Financial Management*ò, New Delhi Vikas Publication House Pvt. Ltd., ISBN : 81- 259-0638-X
3. M. Y. Khan, P. K. Jain, ñ*Financial Management*ò, Tata McGraw Hill Publishing Ltd.
4. B. K. Bhar, ñ*Cost Accounting Methods and Problems*ò, Academic Publishers, Calcutta

REFERENCE BOOKS:

1. Henry M. Steiner, *"Engineering Economics Principles",* McGraw Hill Publication.
2. C.B. Gupta, *"Fundamentals of Business",* Sultan Chand & Co.,
3. P. A. Samualson, *"Economics",* McGraw Hill International.
4. K. K. Dewett, *"Modem Economic Theory",* Sultan Chand & Co., ISBN 81-219-0331-1
5. Colin Drury, ñ*Management and Cost Accounting*ò, English Language Book Society, Chapman & Hall London.

8PE01 PROFESSIONAL ELECTIVE - III
(03) MATERIALS AND LOGISTIC MANAGEMENT

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

SECTION - A

Unit I: **Materials Management :** Introduction to Material Management functions, scope, objectives, tools and techniques. Make or buy decision, Material Requirement Planning (MRP1).
Value analysis: Value analysis / Value analysis engineering, concepts, advantages, applications, problem recognition, role of creativity, analysis of functions, use, esteem and exchange values elimination of unnecessary costs, value engineering techniques. (7)

Unit II: **Purchase Management :** Objectives, functions, purchase cycle, documents in purchasing, purchasing with 5 RôS (Quality, Quantity, Time, Supplier, Price), vendor rating and vendor development.
Import and Import Substitution: Factors affecting National and International markets, Import procedure and documents (Bill of lading, letter of credit etc.) (7)

Unit III: **Stores Management** Functions of stores, types of stores, stores identification, receipt-issue, recording system, stock taking system.
Waste Management: Importance of waste management and techniques. waste management system, Disposal of surplus and obsolete items. Mechanical and thermal disposal system. (7)

SECTION - B

Unit IV: **Logistic Management** Operating Responsibility, Logistical performance Cycle, Work of Logistics, Functional areas of logistics

Warehouse Management: Nature and importance of warehousing, warehouse location, warehousing operations and Facility development. Economic and service benefits of warehouse.
Transportation Management: Transport planning parameters, Basic Economics & pricing factors affecting transportation cost. (7)

Unit V: **Supply Chain Management :**Introduction, Types of supply chain, Components, Drivers, Role of supply chain in manufacturing, Supply chain performance and its measurement, Planning, Demand and supply in supply chain, Risk in supply chain and managing the risk, Coordination in supply chain (7)

UnitVI: **Inventory control of finished goods** Economic manufacturing quantity (EMQ), Fixed order quantity and fixed order interval system, Probabilistic models, Safety stocks, service levels, inventory control of finished goods, single order inventory policies. Inventory models under risk and under uncertainty. (7)

TEXT BOOKS:

1. Dobler and Lee, ñ*Purchasing and Material Management*ò, Tata McGraw Hill, New Delhi
2. Jhamb, L.C., ñ*Inventory Management*ò, Everest Publications,
3. Menon, K.S., ñ*Purchasing and Inventory Control*ò, Wheeler Publication, New Delhi
4. Chopra Sunil and Peter Meindl., ñSupply Chain Management: Strategy, Planning and Operationò,3rd Edition, Prentice Hall, 2006.

REFERENCE BOOKS:

1. Miles L.D., ñ*Techniques of Value Analysis and Engineering*ò, McGraw Hill Book Company.
2. Simchi-Levi, Kaminsky, ñ*Designing and Managing the Supply Chain, Concepts Strategies and*

8PE01 PROFESSIONAL ELECTIVE - III
(04) MARKETING AND SALES MANAGEMENT

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

SECTION – A

UNIT-I : **Market Management :** marketing concept, market segmentation, characteristics, affecting consumer behavior, marketing decision related to product, pricing policies. Marketing control ñRatio analysis, Profitvolume relationship. (8)

UNIT-II: **Marketing Research**: importance and scope, the marketing research process, sources of information, Techniques of marketing.

Motivation Research: the nature & importance of motivation research, techniques of motivation research. (7)

UNIT-III: Export Marketing: composition of Indian exports, exports promotion agencies in India, exports procedure, export strategy for the future.

Rural Marketing: the profile of rural market of India, channel management, sales force management and marketing communication in rural markets. (8)

SECTION-B

UNIT-IV: Sales Management and Sales Personnel : sales organisation, setting salesforce objectives, selection, training and motivation of sales personnel. methods of salesforce control. (8)

UNIT-V : Advertising and Sales Promotion : advertising message creation, media selection, advertising budget, advertising evaluation, Importance of sales promotion, sales promotion techniques. (8)

UNIT-VI: Sales Forecast : importance, methods of sales forecasting, types of forecast, factors affecting sales forecast, relation between national income and sales forecast. channels of distribution : channel design decisions, factors affecting selection of channel, Relatiling and wholesaling. (8)

TEXT BOOKS :

1. Marketing Management - An analysis, Planning and Control By Philip Kotler.
2. Principles of Marketing - By Philip Kotler.
3. Modern Marketing Management - By R.S. Dawar.

REFERENCE BOOKS :

1. Fundamentals of Marketing - By W.J.Stamtion.
2. Marketing Management - By S. Namakumari.
3. Marketing & Higher Management - By Esmond Pearce.

8PE02 PROCESS ENGINEERING

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objective

The students will learn to:

Å Explain basic concepts of process engineering and process planning, part print analysis.

Å Understand and implement use of dimensional analysis , tolerance chars.

Å Classify operations, process sequence and process pictures.

SECTION-A

UNIT-I: **Process Engineering / Process Planning :** Introduction, importance, scope, product engineering, functions, process engineering functions, role, processes approaches to process planning, preliminary partprint analysis, partprint interpretation, problems & remedies, establishment of general characteristics of workpiece from part print, identification of critical areas, specifications relating w/p characteristics, with nature of work to be performed. Finishing & identifying operations. (7)

UNIT-II: **Dimensional Analysis :** Angular & rectangular dimensioning systems. Geometry of form, limit stacks & tolerance stacks, cost of arbitrary tolerance selection.

Tolerance Chart : functions, terms, & symbols, procedure of tolerance chart. W/p control, equilibrium theories, & concept of location, geometric control, dimensional control, mechanical control, alternate location theory, gauging. (7)

UNIT-III: Classifying operations, selection & planning of manufacturing processes, function, economy, aesthetics, rules & approach of process planning, influence of product design and processing, eliminating, operations tooling selection, terminating process. (7)

SECTION-B

UNIT-IV: Manufacturing sequence, major process sequence, factors affecting operation sequence, case studies on operation sequences planning. Selection of equipment, special purpose machines, general purpose machines, factors in machine selection, leasing, review of standard special equipments, tooling classification. (7)

UNIT-V&VI: Process picture & operation routing process picture symbols, sheet, processing dimension. Operation routing uses, sheet. Tool layout of turret or capstan lathe. (14)

REFERENCE BOOK :-

1] Process Engineering for Manufacturing, Donald F.Eary & Gerald E.Johnson, Prentice Hall, Inc. Englewoodd Cliffs, N.J.

8PE03 PROFESSIONAL ELECTIVE - IV
(01) COMPUTER INTEGRATED MANUFACTURING

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objective

The students will learn to:

Å Explain basic concepts of CIM systems. Develop control systems for manufacturing cells, Design CIM systems to fulfill certain requirements . Identify and solve problems in the operations of CIM systems, Enhance performance of manufacturing systems by applying different CIM concepts and tools

SECTION – A

UNIT I : INTRODUCTION TO CIM : The meaning and origin of CIM- the changing manufacturing and management scene External communication, islands of automation and software-dedicated and open systems-manufacturing automation protocol, product related activities of a company, marketing engineering, production planning ,plant operations, physical distribution, business and financial management. (7)

UNIT II : GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING: History of group technology, role of G.T. in CAD/ CAM integration, part families, classification and coding, DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. - benefits of G.T. , cellular manufacturing.

Process planning: Role of process planning in CAD/CAM integration - approaches to computer aided process planning - variant approach and generative approaches - CAPP and CMPP process planning systems. (7)

UNIT III: SHOP FLOOR CONTROL AND INTRODUCTION OF FMS: Shop floor control, phases, factory data collection system, automatic identification methods, Bar code technology, automated data collection system.

FMS: Components of FMS**,** Types of FMS, FMS workstation, material handling and storage systems, FMS layout ,computer control systems ,application and benefits. Conceptual understanding of Lean manufacturing , Agile manufacturing (8)

SECTION – B

Unit IV : COMPUTER COMMUNICATIONS : Principles of networking, Techniques, components of networking and wiring methods , Network interface cards , Network standards, examples

,Operating system , Security, Managing remote systems , Design activity in a networked environment. Case Study on Networking in manufacturing company. (7)

UNIT V: CIM and company strategy, system modeling tools, IDEF models, activity cycle diagram CIM open system architecture (CIMOSA), manufacturing enterprise wheel-CIM architecture.

COMPUTER AIDED QUALITY CONTROL: The computer in Q.C, automated inspection principles and methods, Contact inspection methods, non-contact inspection methods, machine vision system, optical inspection method, sensors, coordinate, measuring machine, Computer-Aided testing, Integration of CAQL with CAD/CAM. (8)

UNIT VI: DETROIT TYPE OF AUTOMATION: Flow lines, Transfer Mechanisms, work pattern transfer, Different methods, & Problems.

ANALYSIS OF AUTOMATED FLOW LINES: Analysis of transfer lines without storage with storage buffer single stage, Double stage, Multistage with problems, Automated assembly systems, Design for automated assembly, parts feeding devices, analysis of Multi station assembly machine, Analysis of Single stage assembly machine, (7)

TEXT BOOKS:

1. Mikell.P.Groover ñAutomation, Production Systems and computer integrated manufacturingò, Pearson Education 2001.
2. Radhakrishnan P, Subramanyan S.and Raju V., ñCAD/CAM/CIMò, 2nd Edition New Age International (P) Ltd., New Delhi, 2000.
3. Kant Vajpayee S, ñPrinciples of Computer Integrated Manufacturingò, Prentice Hall India, 2003

REFERENCES BOOKS:

1. Yorem koren, ñComputer Integrated Manufacturing Systemò, McGraw-Hill, 1983.
2. Ranky, Paul G., ñComputer Integrated Manufacturingò, Prentice Hall International, 1986.
3. David D.Bedworth, Mark R.Hendersan, Phillip M.Wolfe ñComputer Integrated Design and Manufacturingò, McGraw-Hill Inc.
4. Roger Hanman ñComputer Intergrated Manufacturingò, Addison ï Wesley.
5. Mikell.P.Groover and Emory Zimmers Jr., ñCAD/CAMò, Prentice Hall of India Pvt. Ltd., New Delhi-1.

8PE03 PROFESSIONAL ELECTIVE - IV
(02) PRODUCT DESIGN FOR MANUFACTURING & ASSEMBLY

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

Course Objective

As a result of this course student will:

- Understand the basic principles of design for manufacturing design for assembly
- Develop a deep understanding of major manufacturing processes Describe the types, principles, and uses of various production techniques
- Obtain competitive experience in real world work through class projects Demonstrate the ability to apply mathematic and scientific principles in design for manufacturing and assembly technique.

SECTION - A

UNIT-I: Introduction to product design : definition of product design, Asimoôs model for product design, design by evolution and innovation, essential factor of PD, itôs chronological structure, product analysis, product parameters, product life cycle & its characteristics, Decay curve of new product ideas, production consumption cycle & its value addition, primary design phases product development process. (7)

UNIT-II: Role of allowance, process capability & tolerance in design & assembly. Design practice in industry product strategies, analysis of product, product characteristics, designer & role of designer, industrial design organisation, procedures, & models used by industrial designers, three Sôs interchangeability of product modular design of products, functional design practices, designing for comfort & aesthetics. (7)

UNIT-III: Design Optimisation: introduction Siddalôs classification, value engineering. Product design, design for reliability. (7)

SECTION - B

UNIT-IV: Strength consideration & material selection for products, design for stiffness & rigidity, introduction to FEA method. (7)

UNIT-V: Design for manufacturability: design of product to suit for various manufacturing processes such as casting forging, press working, rolling, machining etc., design of plastic & other non-metal products. (7)

UNIT-VI: Use of Computer in product design & development, new approaches to product design & development - concurrent engineering, Quality Function Development, (QFD), 3D modeling, manufacturing during design ï Rapid Prototyping Techniques, product designs compatible to JIT manufacturing. (7)

TEXT BOOK:

1. **"**Product Design for Manufacturing & Assemblyò, by Geoffrey Boothroyd et al., publisher: CRC, 2nd ed., 2001, ISBN-10: 082470584X or ISBN-13: 978-0824705848

RECOMMENDED REFERENCES:

1. ñDesign for Manufacturing Handbookò, by James G. Bralla, publisher: McGraw Hill Professional, 2nd Ed., 1998, ISBN-10: 007007139X or ISBN-13: 978-0070071391
2. ñProduct Design and Developmentò, by Karl Ulrich and Steven Eppinger, publisher: McGraw-Hill/Irwin, 4th ed., 2007, ISBN-10: 0073101427 or ISBN-13: 978-0073101422

8PE03 PROFESSIONAL ELECTIVE - IV
(03) PRODUCT LIFECYCLE MANAGEMENT

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

SECTION – A

UNIT-I: Introduction to PLM: Need for PLM, opportunities and benefits of PLM, different views of PLM, components of PLM, phases of PLM, PLM feasibility study, PLM visioning. (7)

UNIT-II: PLM Strategies : Industrial strategies, strategy elements, its identification, selection and implementation, change management for PLM. (7)

UNIT-III: Product Design: Engineering design, organization and decomposition in product design, product design process, methodical evolution in product design, concurrent engineering, design for óXô and design central development model. Strategies for recovery at end of life, recycling, human factors in product design. Modeling and simulation in product design. (7)

SECTION – B

UNIT-IV: Product Data Management (PDM): PDM systems and importance, reason for implementing a PDM system, financial justification of PDM, barriers to PDM implementation. (7)

UNIT-V: **New Product Development:** Structuring new product development, building decision support system, Estimating market opportunities for new product, new product financial control, implementing new product development, market entry decision, launching and tracking new product program. Concept of redesign of product. (7)

UNIT-VI: **Technology Forecasting:** Future mapping, invocating rates of technological change, methods of technology forecasting such as relevance trees, morphological methods and mission flow diagram, combining forecast of different technologies, uses in manufacture alternative. (7)

TEXT BOOK:

1. Kevin Otto & Kristin Woob, ñPRODUCT DESIGNò 2004, Pearsion India New Delhi, ISBN 81-297-0271-1

REFERENCE BOOKS:

1. Fabio Giudice, Guido La Rosa, Product Design for the environment-A life cycle approach, Taylor & Francis 2006.
2. Robert J. Thomas, NPD: Managing & forecasting for strategic processes.
3. Martins Joseph, Technological Forecasting for decision Making, 2nd edition, North Holland.

8PE03 **PROFESSIONAL ELECTIVE - IV**
(04) ERGONOMICS IN PRODUCT DESIGN & MANUFACTURING

Lecture: 03 Hrs/ w
Tutorial: ____
Internal Assessments: 20
University Exam: 80
Credits: 03

SECTION - A

Unit I: **Introduction to Human Factors :** Human criteriaôs, human physical activities, features of the human body, Measures of physiological functions such as: energy expenditure, gross body activity, local muscular activity, work load, work efficiency, work and rest. Type of movements of body members. Performance criteria for physical activity such as: Strength & endurance speed of movements, accuracy of movements, manual material handling (MMH). (7)

Unit II: **Applied Anthropometry and Work Space** Introduction to anthropometry, use & principles of anthropometry data, work spaces, work space envelopes for seated persons, design of work spaces such as: work surface height, seated & standing, principles of seat design, workplace design. Physical space &

arrangement, principles of arrangement of component, (7)

Unit III: **Design of Displays and Controls** Information input & processing, visual displays of static & dynamic information. Auditory, textual & olfactory displays, general location of controls & displays within workspace, concept of visibility. Functions of controls, types of controls, factors in control design, design of specific hand operated controls, foot controls and special control devices. (7)

SECTION - B

Unit IV: **Working Conditions** Illumination: Color systems, energy consideration, effect of lighting on performance. Atmospheric conditions: Measurement of thermal variables, wet-bulb globe temperature, Botsball, heat stress index, heat index, wind chill index, physiological effect of heat & cold on performance. Noise: Physiological effect of noise on performance, noise exposure limits, noise controls. (7)

Unit V: **Energy Expenditure** Muscle mechanism, BMR, Heart Rate variations, Oxygen consumption, Rest allowances, Rate of energy expenditure, Manual Material Handling Capacity determination, Effect of environmental conditions and work design on Energy Expenditure. (7)

Unit VI: **Ergonomics and Work Organization** Human factors and ergonomics standards, Human factors applications in system design, characteristics of system design, human factors data for interface design, ergonomic safety and health management, case studies of ergonomically designed product. (7)

TEXT BOOKS:

1. Sanders M. S. and McCormick E. J., ñ*Human Factors in Engineering and Design*ò, McGraw- Hill International Editions,
2. Bridger R. S., ñ*Introduction to Ergonomics*ò, McGraw-Hill International Editions

REFERENCES:

1. Gavriel Salvendy (Ed.)., *'Handbook of human factors and ergonomics"*, 3rd Edition, John- Wiley and Sons

8PE04 **OPERATIONS RESEARCH TECHNIQUES**

Lecture: 03 Hrs/ w
Tutorial: 01 Hrs/ w
Internal Assessments: 20
University Exam: 80
Credits: 04

Course Objective

This course is intended to provide students with a knowledge that can make them appreciate the use of various research operations tools

in decision making in organizations. At the end of the Course participants are expected to demonstrate a working knowledge of the various OR tools in making decisions as well as being able to formulate organizational problems into OR models for seeking optimal solutions.

SECTION-A

UNIT-I: Operations Research - introduction, characteristics, phases, limitations; model building and classification of O.R.Models.
Linear Programming: formulation, simplex methods, primal dual relationship. (7)

UNIT-II: **Transportation problems :** introduction, methods, LP formulation of transportation problems, methods for finding initial solution, MODI method.
Assignment Problems : introduction, mathematical statement and solution methods of assignment problems,variations of assignment problems. (7)

UNIT-III: **Network Models :** Network models ï Network construction, PERT analysis, CPM analysis, cost analysis, updating, resource smoothening and leveling. (7)

SECTION-B

UNIT-IV: **Waiting line models :** introduction classification of waiting line models, analysis of M/M/1 and M/M/S models, application of simulation to waiting line model and Monte- Carlo technique. Sequencing-Processing of n jobs through 2 machines, n jobs through 3 machines, 3 jobs through n machines, n jobs through n machines. (7)

UNIT-V: **Replacement Models** -individual and group replacement policies.
Simulation: Introduction, basic nature of simulation, when to simulate, advantages and limitations, role of random numbers in simulations, generation of random numbers. (7)

UNIT-VI: **Dynamic Programming** -introduction, characteristics, development of an optimum decision policy, dynamic programming under certainty, application of dynamic programming to linear programming. (7)

TEXT BOOKS:

1. Operations Research - Hira & Gupta
2. Operations Research - J.C.Pant
3. Operations Research - Kanti Swarup
4. Operations Research - S.D.Sharma

REFERENCE BOOKS:

1. Operations Research - C.R.Kothari
2. Operations Research - A.S.Phillipose
3. Operations Research - R.C.Patel
4. O.R. and Mathematical Models - A.S.Sharma, Tata McGraw Hill
5. Operations Research - H.Taha
6. Operations Research - Kapoor
7. Operations Research - Askhedkar-Kulkarni

8PE05 PROCESS ENGINEERING – LAB.

Practical: 02 Hrs/ w
Tutorial: ___
Practical Term Work: 25
Practical / Oral Exam: 25
Credits: 01

Term Work: Students are expected to do at least six practical out of the following :

1. Preliminary part print analysis for components.
2. Preparation of tolerance chart for two components.
3. Drawing of arrangement of locators, for standard shaped components like rectangular prism, pyramids, cylinder, tube, cones and any one non standard component for good geometric control.
4. Drawing of arrangement of locators for good mechanical control of any two components.
5. Illustration of centre line control in circular components for 30, 90, 120.
6. Sketching of two practical arrangements of alternate locators in tool Design.
7. Listing & classification of operations, for any two given engine parts
8. Study of considerations in the Operation sequence with respect to any one part.
9. Preparation of process picture sheet for any two parts.
10. Preparation of operation routing sheet for any two parts.
11. Study considerations of tool layout for turret & or capstan lathe for any two component.

PRACTICAL :- Shall consists of oral based on above term work.

REFERENCE BOOK :-

1] Process Engineering for Manufacturing, Donald F.Eary & Gerald E.Johnson, Prentice Hall, Inc. Englewoodd Cliffs, N.J.

8PE06 PROFESSIONAL ELECTIVE – IV – LAB.
(01) COMPUTER INTEGRETED MANUFACTURING – LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

TERM WORK

Practical: The students are expected to perform Six practical based on the above syllabus.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

8PE06 PROFESSIONAL ELECTIVE – IV – LAB.
(02) PRODUCT DESIGN FOR MANUFACTURING & ASSEMBLY – LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

TERM WORK:

Practical: The students are expected to perform Six practical based on the above syllabus.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

8PE06 PROFESSIONAL ELECTIVE – IV – LAB.
(03) PRODUCT LIFECYCLE MANAGEMENT– LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

TERM WORK:

Practical: The students are expected to perform Six practical based on the above syllabus.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

8PE06 PROFESSIONAL ELECTIVE – IV – LAB.
(04) ERGONOMICS IN PRODUCT DESIGN & MANUFACTURING– LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

TERM WORK:

Practical: The students are expected to perform Six practical based on the above syllabus.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

8PE07 OPERATIONS RESEARCH TECHNIQUES – LAB.

Practical: 02 Hrs/ w — **Practical Term Work:** 25
Tutorial: ___ — **Practical / Oral Exam:** 25
Credits: 01

Course Objectives:

Upon completion of this course, student will be able to:

- Formulate a real-world problem as a mathematical programming model
- Understand the theoretical workings of the simplex method for linear programming
- Understand the relationship between a linear program and its dual, including strong duality .
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path problems

List of Practicals :- Atleast 6 practicals from following. ;-

1. Computer programme for PERT CPM analysis.
2. Computer programme for LPP.
3. Case study on PERT/CPM network
4. Formulation of LPP from real life situation.
5. Study of dynamic programming problems.
6. Case Study on transportation problems.
7. Case study on assignment problems.
8. Case study on sequencing problems.

A journal should be prepared and submitted on above term work. The practical examination shall based upon the term work and viva examination.

8PE08 PROJECT & SEMINAR

Project : 06 Hrs/ w — **Project Term Work:** 75
Tutorial: ___ — **Project / Oral Exam:** 75
Credits: 12

SEMINAR:

The Seminar Report submitted by the student at the end of **VII Semester** will be evaluated by external examiner appointed by the University along with the Project - Viva Voce examination at the end of **VIII Semester.**

PROJECT:

The objective of the project is to enable the students to work in

groups of not more than five members in each group on a project involving analytical, experimental , design or combination of these in the area of **Production Engineering**.

Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. On completion of the work, a project report should be prepared and submitted to the department.

The evaluation is based on continuous internal assessment by an internal assessment committee for **75 marks** by way of oral presentations. The university examination, which carries a total of **75 marks**, will be a Viva Voce examination at the end of **VIII Semester,** conducted by a committee of one external examiner appointed by the University and one internal examiner/Guide.

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SYLLABUS PRESCRIBED FOR BACHELOR OF ENGINEERING
ELECTRONICS & TELECOMMUNICATION ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7XT1 DATA COMMUNICATION NETWORK

SECTION-A

Unit I: - Introduction to Communication Network
Network Functions; Network Topology; Types of network: LAN, MAN, WAN, Basics of Circuit switching, packet switching, message switching and cell switching, Layered Architecture: Need for Protocol; Protocol & Protocol architecture model; OSI Reference model; Overview of TCP/IP architecture (6)

Unit II: - Peer to Peer Protocols and Data Link control, Point to Point Protocol and service models; End to End requirements and Adaptation Function; End to End versus Hop by Hop
Flow Control: Need for flow control; Stop and Wait Flow Control; Sliding Window Flow Control; Stop and wait ARQ; Go-Back-N ARQ; Selective Repeat ARQ; Transmission efficiency of ARQ protocols; HDLC Protocol (8)

Unit III: - Local Area Networks and Access Control Protocols, LAN Architecture; Medium Access Control (MAC) and Logical Link Control (LLC) for LAN; Contention Techniques: CSMA, CSMA/CD (IEEE 802.3)
Control Access Techniques: Token Bus (IEEE 802.4); Token Ring (IEEE 802.5); Polling; FDDI, Random Access Techniques: ALOHA; Slotted ALOHA; (10)

SECTION-B

Unit IV: - Networking Devices, Routing Techniques and Traffic Control Protocols: Hubs; Switches; Bridges; Routers; Gateways; Routing Switches **Routing Algorithms:** Alternate routing in circuit switched network; Fixed Routing, Flooding, and Random Routing in Packet Switched networks **Least Cost Algorithms:** Dijkstraôs Algorithm (Problems expected); Bellman Ford Algorithm (Problems expected) Traffic Control: Leaky Bucket algorithm; Token Bucket Algorithm (8)

Unit V: - Asynchronous Transfer Mode (ATM), Frame Relay and ISDN
ATM: - ATM Protocol Architecture; Concept of Virtual channel and Virtual path; ATM Cell; ATM Services
Frame Relay: - Protocol architecture

ISDN: -Principles of ISDN; ISDN Architecture; ISDN Channels; Broadband ISDN Functional Architecture (7)

Unit VI: - TCP/IP Protocol
Overview of TCP/IP; IP Services; Internet Protocol (IPv4); Classfull and Classless IP Addressing; Internet Control Message Protocol (ICMP); IP Address Resolution protocol; Reverse Address Resolution Protocol; IPv4 versus IPv6; IP Datagram; Datagram Forwarding; TCP (Frame Format); UDP (Frame Format) (7)

TEXT BOOKS :

1. W. Stallings : ñData and Computer Communicationsò, (Maxwell Macmillan)
2. Behrouz A Forouzan : ñData Communication and Networkingò , (TMH)

REFERENCE BOOKS :

1. D Bertsekas and R.G. Gallager: ñData Networksò, (2 e) , Pearson Ed., (PHI)
2. A. S. Tanenbaum : ñComputer Networksò, PHI
3. Uyless Black : ñComputer Networksò, (PHI)
4. Douglas E. Comer : ñComputer Networks and Internetsò, (Pearson Education)
5. Gerd Kaiser, ñ Local area networkò, (TMH) 2nd Edition
6. Leon Garcia, ñ Communication Network.

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7XT2 MICROCONTROLLER & APPLICATIONS

SECTION-A

UNIT-I : An Introduction to uC 8051:Architecture of 8051, Signal description of 8051, Register set of 8051, Timer structure and their mode and I/O port structure.
Bus standards : Serial RS 232, Parallel IEE-488 (8 Lectures)

UNIT-II: Instruction set of 8051, Addressing modes of 8051, Memory and I/O addressing by 8051, Assembly Language Programming using 8051. (8 Lectures)

UNIT-III: Study of ADC 0809, DAC 0808 and its interfacing with 8051, Interfacing of Sensors, Measurement of Temperature, Speed and Resistance. (8 Lectures)

SECTION-B

UNIT-IV: Interfacing LCD & Keyboard with 8051., Relays and Optoisolators, Stepper Motor interfacing, DC motor interfacing and PWM with 8051.

UNIT-V : Serial port programming in assembly: Basics of serial communication, 8051 connection to RS232C, 8051 Serial port programming in assembly. RTC interfacing and Programming : DS 12887 RTC interfacing, Programming, Alarm, SQW, and IRQ features of DS 12887 Chip. (10)

UNIT-VI : 8051 programming in C : Data types and time delay in 8051 C, IO programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C, Data serialization using 8051 C.

TEXT BOOKS :

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinley : ñThe 8051 Microcontroller and Embedded Systems using Assembly and Cò, Pearson Education (2nd Ed.)
2. K. J. Ayala : ñThe 8051 Microcontrollerò, Penram Int. Pubs., 1996

REFERENCE BOOKS :

1. Using the MCS-51 Microcontroller by Han- Way Huang, Oxford University Press
2. National Semiconductor : Data Acquisition Linear Devices Data Book.
3. Embedded Microcontrollers and Processors:-Volume-I-Intel
4. Intel Peripheral Devices Data Book.

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7XT3 DIGITAL SIGNAL PROCESSING

SECTION-A

UNIT-I : Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems: Linearity, causal, Time invariant system, Stability criteria, Convolution unit sample response. (10)

UNIT-II: Z- transform: complex Z-plane, ROC determination of filter coefficients and its properties, Solution of difference equations using Z-transform, inverse Z-transform. (12)

UNIT-III: Introduction to Fourier transform of discrete time signal and its properties. Inverse Fourier transforms DFT and its properties, Circular convolution, linear convolution from DFT, FFT: Decimation in time and frequency radix 2 algorithm. (10)

SECTION-B

UNIT-IV: Filter Structures: Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures

for F.I.R. filter. FIR filter design: Design by Pole Zero Placements and Windowing method: Rectangular, Triangular, Blackman window and Kaiser window. (8)

UNIT-V: Methods to convert analog filter into IIR digital: Mapping of differential equation, Impulse invariant, bilinear transformation, and Matched Z transformation. Design of Analog filter: Specification and formulae to decide to filter order cut of frequency and transfer function of Butterworth filter and Chebyshev filter. (8)

UNIT-VI: Multi rate DSP, Introductory concept of multi rate signal processing, Design of Practical sampler, Rate converters, Decimators and Interpolator, Filter Bank application and examples. Overview and architecture of DSP processor TMS320C54XX. (8)

TEXT BOOKS :

1. Oppenheim & Schafer: Discrete time Processing (PHI)
2. Proakis & Manolakis D.G. : Digital Signal Processing (PHI)
3. Mitra S.K. : Digital Signal Processing (TMH)

REFERENCE BOOKS :

1. Roman Kuc : Digital Signal Processing (MGH)
2. Ifeacher E.C., Jervis B. W. : Digital Signal Processing (Addison Wesley)
3. P. P. Vaidyanathan : DSP and Multirate Systems (PHI)
4. Rabiner and Chrocherie : Multirate DSP (PHI)
5. Avtar Singh, S Shrinivasan : DSP implementation using DSP microprocessor with example From TMS320C54XX. Brooks cole publisher 2003.

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PROFESSIONAL ELECTIVE -I

7XT4 (1) VLSI DESIGN

SECTION-A

Unit I : Digital Design Fundamentals: Review of techniques of using a truth table, canonical forms to develop the AND/OR or OR/ AND combinational circuit models, minimization techniques, Hazards and Hazard free circuits. Difference between combinational and sequential circuits. General model of sequential machine, timing and triggering considerations.

Unit II : Basic HDL Constructs: VLSI Design flow, Overview of different modeling styles in VHDL, Data types and data objects in VHDL, Dataflow Modeling, Behavioral Modeling, using VHDL for combinational Circuits and sequential Circuits.

Unit III : Hardware Description Language: Structural Modeling, Subprograms, Packages and Libraries, Generics, Configurations, attributes. Comparison of various Hardware Description Languages.

SECTION-B

Unit IV : Programmable Logic Devices: Introduction to CPLDs: Function block architecture, input/output block, switch matrix, Study of architecture of CPLDs of Altera /Xilinx. Introduction to FPGAs: Configurable logic block, input/output block and interconnect, Study of architecture of FPGAs of Xilinx /Altera.

Unit V: CMOS Circuits: Different logic families, MOS Transistor, CMOS as an inverter, propagation delay, power consumption/ dissipation issues, simple circuits using CMOS.

Unit VI: CMOS Processing & Digital Circuit Verification: CMOS Fabrication: Different steps of fabrication, CMOS p-well, n-Well and twin tub processes, CMOS Layout and Design rules. Simple Test Bench, Simulation and Synthesis issues, case study of ALU/ Sequence Detector.

TEXT BOOKS:

1) Neil H.Weste and Kamran Eshraghian, ñPrinciples of CMOS VLSI designò. Pearson
2) J Bhasker,ò VHDL Primerò. Addison Wesley
3) Douglas Perry,ò VHDLò Tata McGraw HILL
4) William I. Fletcher ñAn Engineering approach to Digital Designò, Prentice Hall India.

REFERENCE BOOKS:

1) Stephen Brown and Zvonko Vranesic, ñFundamentals of Digital Logic with VHDL Designò. Tata McGRAW HILL
2) Wayne Wolf: ñVLSI Technologyò
3) VLSI Test Principles and Architectures by Laung Terng Wang, Elsevier

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PROFESSIONAL ELECTIVE -I

7XT4 (2) COMPUTER ORGANIZATION

SECTION-A

UNIT I : Organization and architecture, structure and function, Computer evolution and performance: Brief history of computer, designing for performance , computer components, computer function , bus interconnection, PCI

UNIT II : External devices, I/O modules, I/O Channels and IOPs, SCSI and firewire interfaces, operating system overview, memory management, swapping, partitioning , paging , virtual memory.

UNIT III : ALU: Machine instruction characteristics , operand types, operation types, Addressing modes, instruction formats, CPU structure, processor organization register organization, instruction cycle, instruction pipelining.

SECTION-B

UNIT IV : RISC machine, instruction execution characteristics, register file concept, compiler based register optimization , RISC architecture, RISC pipelining, RISC vs CISC, case study of power PC 620.

UNIT V : Control unit operation: Micro operation, control of processor Hardwired implementation, micro program control : Concepts, microinstructions sequencing and execution, application of microprogramming.

UNIT VI : Multiple processor organizations, symmetric multiprocessors, Mainframe SMP, Cache coherence and MESI protocol, clusters. Non uniform memory access. Vector computation

TEXT BOOKS:

1) William Stallings ñComputer organization and architectureò. 6/e (Pearson education)

2) A.S. Tanenbaum ñ Structured computer organizationò 4/e McGraw Hill (ISE)

REFERENCE BOOKS:

1) C. Hamacher, R. Zaky Computer Organization. 5/e McGraw Hill (ISE)

2) J.P. Hayes Computer architecture and organization. 4/e McGraw Hill (ISE)

3) M. Mano & Kime Logic & Computer design fundamentals, 2/e (Pearson education)

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PROFESSIONAL ELECTIVE -I

7XT4 (3) ARTIFICIAL INTELLIGENCE

SECTION-A

Unit I: Artificial Intelligence: History and Applications, definitions, fundamental issues, challenges, growth of AI, current trends in applied AI

Unit II: Knowledge Representation: Reasoning, Issues, and Acquisition, propositional calculus, predicate calculus, rule-based knowledge representation, basic knowledge representation issues

Unit III: Heuristic Search, search as a problem-solving technique, techniques for heuristic search, hill climbing heuristic, best-first search, evaluation of heuristic functions, State space search, strategies, implementation of graph search, depth-first search, breadth first search, representation of reasoning with predicate calculus using state space, application of search technique in game playing and planning

SECTION-B

Unit IV: Expert Systems, features, characteristics, development of ES technology, architecture, goals, basic activities, advantages, difference between ES and conventional methods, stages in the development of ES, ES tools, difficulties in developing ES, applications of expert systems

Unit V: Artificial Neural Networks, introduction, supervised learning, feed-forward neural networks, recurrent neural networks, Elman backpropagation neural network, Hopfield neural network, features of artificial neural networks, functional link neural network, Fuzzy systems, foundations, crisp set to fuzzy set, representing fuzzy elements, basic terms and operations, properties of fuzzy sets, fuzzy measures, measures of fuzziness, fuzzification, fuzziness and probability theory, membership function shape analysis, defuzzification methods, fuzzy logic in control and decision making applications, hardware realization of the analog fuzzy controller

Unit VI: Genetic Algorithms, procedures of GA, representations, initialization and selection, genetic operators, mutation, natural inheritance operators, logic behind GA, GA applications, applicability of Gas, evolutionary programming, working of evolutionary programming, swarm intelligent systems, background of ant intelligent systems, ant colony paradigm, applications of ant colony intelligence in static and dynamic combinatorial optimization problems, particle swarm intelligent systems, engineering applications of particle swarm intelligent systems

TEXT BOOK:

Artificial Intelligence and Intelligent Systems, Padhy, Oxford Univ Press

REFERENCE BOOK:

Artificial Intelligence by Rich and Knight, McGraw-Hill

PROFESSIONAL ELECTIVE - I

7XT4(4) SATELLITE AND OPTICAL FIBER COMMUNICATION

SECTION-A

UNIT I:- INTRODUCTION

Satellite frequency bands, Satellite types-LEO, MEO, GEO, HEO, Keplerôs laws, Satellite orbits, Geo-stationary Satellite. Orbital Aspects of Satellite Communication: Orbital period and velocity, Effect of orbital inclination, Azimuth and Elevation, Converge angle and Slant range, Orbit determination, Orbital effect in communication system performance.

UNIT II:- SATELLITE CHANNELS

Electromagnetic field Propagation, Antennas, Atmospheric losses, Receiver noise, Carrier to noise ratio, Satellite system link model: Uplink, Downlink, Cross link, Transponder, Satellite system parameters, Satellite link analysis, Frequency reuse and depolarization.

UNIT III:- SATELLITE SERVICES

Very Small Aperture Satellite (VSAT): Overview of VSAT system, Network architecture, Access control protocols, Signal format , Modulation coding and interference issues, VSAT antennas, Transmitter and Receiver, Link analysis for VSAT network.

Satellite Navigation and Global Positioning System (GPS): Radio and Satellite navigation, Position, Location in GPS, GPS receivers and codes, GPS navigation message and signal levels, Timing accuracy, GPS receiver operation, Differential GPS .

SECTION-B

UNIT IV: OPTICAL FIBER WAVEGUIDE AND TRANSMISSION CHARACTRISTICS

Ray Theory of Optical Fiber, Total internal reflection, Snellôs law, Acceptance Angles, Numerical Aperture (NA), Theory of Circular Waveguide, Modes in Optical Fiber, Single mode and Multimode Optical Fiber, Power flow.

Transmission Characteristics of Optical Fiber: Attenuation, Absorption losses, Scattering losses, Bending losses, Dispersion, Intermodal and Intramodal Dispersion.

UNIT V:- OPTICAL SOURCES AND DETECTORS

Optical Sources: Optical Emission from Semiconductor, LED, Power, Efficiency, Double heterojunction LED, Basic concept of LASER, Semiconductor injection LASER,

Optical Detectors: Optical detection principle, Absorption quantum efficiency, Responsivity, PIN Photodiode, Avalanche Photodiode, Phototransistor and Photoconductive Detector.

UNIT VI:- OPTICAL ELECTRONIC SYSTEM

Optical Transmitter, Receiver, Digital system planning consideration, Power budgeting, Coherent and Non-coherent system, Modulation and Demodulation schemes, Wavelength multiplexing, Optical switches,

TEXT BOOKS:-

1) Gagliardi Robert M.: ñSatellite Communicationò, CBS Publication and Distributers, New Delhi
2) Senior J.M.: ñOptical Fiber communication and Applicationò, Prentice Hall of India Pvt. Ltd, New Delhi.

REFERNCE BOOKS:-

1) Gowar: ñOptical Communication Systemò, Prentice Hall.
2) R. P. Khare: ñFiber Optics and Opto Electronicsò, Oxford University Press, First Edition.
3) G. Keiser: ñOptical Fiber Communicationò, McGraw Hill International Book Co. New York.
4) Pratt Timothy and Bostian W. Charles: ñSatellite Communicationò, Willey International Publication, New York.

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PROFESSIONAL ELECTIVE – I

7XT4(5) AUDIO & VIDEO ENGINEERING

SECTION-A

Unit I : Principle of disc recording, principle of disc reproduction, Block diagram of disc reproduction system, Coarse-grooves and micro grooves, construction of cutter stylus, Play back needles, cartridges of pick up units, principle of magnetic recording and reproduction, Recorded wavelength, Gap-width and tape speed, need for biasing DC And & AC biasing, Parts of tape recorder, tape transport mechanism advantages and disadvantages of tape recording, Block diagram tape recording and reproducing system Wow and flutter distortions, Rumble, Hissing noise, Types of optical recording of sound, methods of optical recording of sound on films

Unit II : Multimedia Definition, Elements of multimedia system, need of multimedia audio application, audio capture, compression, standards Video applications, video capture Television, compression, standards, proprietary compression, Introduction to video system, sound and picture transmission, scanning process, camera pickup devices, camcorder, video signal, aspect

ratio, horizontal and vertical resolution, video bandwidth and interlaced scanning composite video signal for monochrome TV video signal standards, sound and video modulation, VSB transmission and reception (CCIR ï B standards), composite color signals, compatibility TV transmitter block diagrams.

Unit III: Television: Scanning, Blanking and synchronisation, Picture signal - composite video signal-Vestigial sideband transmission-Principle of CCD Camera - Monochrome picture tube-Monochrome TV receivers- RF tuner ,VHF tuner- Video amplifier, IF section, Vestigial sideband correction- Video detectors

SECTION-B

Unit IV : Sound signal separation, AGC, sync separation, horizontal and vertical deflection circuits, EHT generation. Colour TV system: Principle of colour signal transmission and reception, PAL, NTSC, SECAM (block schematic description), Picture tube ï delta gun.

Unit V : Digital TV: Digitized Video, Source coding of Digitized Video ï Compression of Frames ï DCT based ï (JPEG), Compression of Moving Pictures (MPEG). Basic blocks of MPEG2 and MPEG4. Digital Video Broadcasting (DVB) ï Modulation: QAM ï (DVB-S, DVB-C)

Unit VI: OFDM for Terrestrial Digital TV (DVB ï T). Reception of Digital TV Signals (Cable, Satellite and terrestrial). Digital TV over IP, Digital terrestrial TV for mobile. Display Technologies ï basic working of Plasma, LCD and LED Displays.

TEXT BOOKS :

1. Herve Benoit, Digital Television Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework, 3/e, Focal Press, Elsevier, 2008
2. Shlomo Ovadia: Broadband Cable TV Access Networks, PH-PTR, 2001
3. Mark E Long: ¯The Digital Satellite TV Hand Book, Butterworth-Heinemann.
4. K.R.Rao, J.O.Hwang, Techniques and standards for Image, Video and Audio coding, Prentice Hall,1996
5. John Arnold, Michael Frater, Mark Pickering, Digital Television Technology and Standards, John Wiley & Sons, Inc, 2007
6. Robert L. Hartwig, Basic TV Technology: Digital and Analog, 4/e, Focal Press, Elsevier, 2005

REFERENCE BOOKS :

1. Multimedia in Practice Technology and Applications By Judith Jeffcoate (PHI)

2. Audio-Video Engineering By Gupta
3. Television and Video Engineering By A.M.Dhake
4. R.R. Gulati: Monochrome and Colour Television. New Age international, 2008.
5. Basic Television and Video Systems By Bernord Grob
6. Communication Electronics By Frenzel
7. Electronic Communication Systems By George Kennedy

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7XT5: MICROCONTROLLER AND APPLICATIONS - LAB

Minimum 8 experiments uniformly distributed based on the syllabus of 7XT2 (Microcontroller and Applications)

7XT6: DIGITAL SIGNAL PROCESSING - LAB

Minimum 8 experiments uniformly distributed based on the syllabus of 7XT3 (Digital Signal Processing)

7XT7: SIMULATION - LAB

Minimum 8 experiments based on MATLAB /P-SPICE

7XT8: PROJECT AND SEMINAR

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SEMESTER EIGHT

8XT1 UHF & MICROWAVES

SECTION-A

Unit I: **MICROWAVE TUBES**
Limitation of Conventional devices at high frequency, Microwave Tubes: Two cavity, Multicavity klystron, and reflex klystron, Cylindrical Cavity Magnetron, TWT & Backward Wave Oscillator (8)

Unit II: **Semiconductor microwave Devices:**
Gunn diode: RWH theory, Gunn domain, modes of Gunn oscillation, Negative resistance amplifier, Parametric amplifiers: operation & types, Principle of operation of IMPATT, TRAPATT diodes, & MASER. (8)

Unit III: **Transmission of Microwaves:**
Waveguides: Rectangular Wave guide, Circular Waveguide, Introduction to Parallel Microstriplines: Microstrip line characteristics impedance & losses (10)

SECTION-B

Unit IV: **Microwave Resonator:**
Basic Resonant circuits RLC, transmission line resonators, Cavity resonators: rectangular and circular cavities, resonant frequency, and quality factor of resonators. (8)

Unit V: **Microwave Components**:
Microwave passive components, terminator, Attenuator, phase shifter, Scattering matrix formulation, Two hole directional coupler, E-plane tee, H-plane tee, Magic tee. Microwave propagation in ferrites, devices employing Faraday rotation: Isolator, Gyrator & Circulator. (8)

Unit VI: **Microwave Measurements:**
Frequency Measurements, Power Measurements, Attenuation Measurements, VSWR Measurements, Impedance Measurements, insertion Loss Measurements, Dielectric constant Measurements. (8)

TEXT BOOKS :

1. Liao, Samuel Y. : ñMicrowave devices & circuitsò, Tata Mc-Graw Hill Co. Ltd., New Delhi
2. Collin, Robert E. : ñFoundations for Microwave Engineeringò, Mc-Graw Hill, New York.

REFERENCE BOOKS :-

1. Kennedy G. :òElectronics Communication Systemsò, Tata Mc-Graw Hill Book Co., New Delhi..
2. K.C. Gupta : ñMicrowave Engineeringò, (New Age)
3. Reich, Scolnik, Ordung, Krangs : ñMicrowave Principlesò, PHI
5. M.L. Sisodiya and G.S. Raghuwanshi : ñMicrowave Circuits and Passive devicesò, (WEL)
6. Mathew M. Radmanesh : RF and Microwave Electronics ï Illustrated.

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8XT2 ELECTRONIC CIRCUIT DESIGN

SECTION-A

UNIT-I : Design of regulated power supply using transistor, design of DC amplifier, comparator, window detectors, scaling and summing amplifier using IC 741 / IC 324 or equivalent.

UNIT-II : Design of waveform generator using IC 741, IC 8038, IC 566. Design of sweep generator, voltage controlled oscillator. Design of first and second order filters, design of notch filter.

UNIT-III : Design of instrumentation amplifier, Temperature controller / indicator using thermocouple, resistance thermal detector , thermo sensors AD590, LM35

SECTION-B

UNIT-IV : Introduction to CMOS / VLSI circuits, MOS Transistor switch, Realization of universal gates and compound gates using MOS transistors, basic physical design of simple logic gates.

UNIT-V : VHDL : Design flow, EDA tools, code structures, data types, operators and attributes. Signals & Variables, concurrent code, sequential code, packages and components, configuration, Introduction to VERILOG.

UNIT-VI: Design of combinational blocks such as multi-bit adders, ALU, MUX, DEMUX , encoders, decoders, Design of sequential circuits, asynchronous and synchronous design issues, state machine modeling (Moore and Mealy machines).

TEXT BOOKS :

1. R.A. Gayakwad : ñOP-AMP and Linear Integrated Circuitsò
2. Volnei Pedroni, ñ Circuit Design with VHDLò, PHI , 2005 edition

REFERENCE BOOKS:

1. Sergio Franco : Design with Linear Integrated Circuits & Opamps.
2. Douglas L. Perry : VHDL (3rd Ed.) , McGraw Hill.
3. Brown & Vranesic : ñDigital Logic Design using VHDLò, TMH
4. Paul Horowitz-W.Hill:òThe art of Electronicsò (Cambridge publications)
5. Neil Weste- K. Eshraghian :Principles of CMOS/VLSI design (Pearson Education)
6. J. Bhaskar ñVHDL Primerò (Pearson Education)

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8XT3 WIRELESS COMMUNICATION

SECTION-A

Unit-I : **CELLULAR FUNDAMENTALS**
Evolution of cellular mobile system (1G, 2G, 3G) A basic cellular system, cell shape, concept of frequency reuse, cellular system architecture, , operation of cellular systems, Mobility Management: Hand off techniques , Types of hand off, Radio link transfer ,roaming management. (8)

Unit II : CELLULAR RADIO SYSTEM DESIGN FUNDAMENTALS

Frequency managements: Cellular system spectrum, frequency assignment, channel assignment strategies, co-channel and non-co-channel interference, cellular system capacity, improving coverage and capacity in cellular system. (9)

Unit III : MOBILE RADIO PROPAGATION MECHANISM

Radio propagation mechanism, multipath propagation, fading, doppler shift, fast and slow fading, control of fading in mobile systems. (8)

SECTION-B

Unit IV : GSM SYSTEM

GSM system architecture, radio subsystem, channel types, frame structure, GSM Signaling Protocols, call processing in GSM, handovers in GSM, signal processing in GSM, data oriented CDPD network, Specification of HCSD,GPRS, EDGE. (9)

Unit V : CDMA SYSTEM

Frequency and channel specification, physical and logical channels of IS-95,call processing in IS-95, soft hand off and power control in CDMA. Cell loading, cell radius, Reverse & Forward link cell size. (9)

Unit VI : MOBILE ADHOC NETWORKS,WLAN & WMAN

Bluetooth: Bluetooth enable devices network, Bluetooth protocol, layers, Zigbee Architecture. Specifications Wireless LAN: Wi-Fi architecture and protocol, Wireless MAN: Wi-MAX architecture and protocol. (9)

TEXT BOOKS :

1) Theodore S. Rappaport : ñWireless Communications : Principles & Practiceò, Second edition, Pearson Education (2002)
2) Vijay K. Garg :òWireless network Evolution 2G to 3Gò , Pearson Education.
3) K. Pahlavan and P. Krishnamurthy : ñPrinciples of Wireless Networksò, Pearson Education Asia Publication (2002)

REFERENCE BOOKS :

1) William Stallings : ñWireless Communications and Networksò Pearson Education Asia Publication (2002)
2) Jochen Schiller : ñMobile Communicationsò, Pearson Education Asia Publication (2002)
3) Andy Dornam : ñThe Essential Guide to Wireless Communication Applicationsò, Pearson Education Asia Publication.
4) Upena Dalal ñWireless communicationò, Oxford University Press
5) William CY Lee : ñMobile Cellular Telecommunicationsò(second edition) McGraw Hill Inc.

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PROFESSIONAL ELECTIVE - II

8XT4(1) BIOMEDICAL ENGINEERING

SECTION-A

UNIT-I: INTRODUCTION TO BIOMEDICAL ENGINEERING

Physiological system of heart, Man instrument system, Sources of bioelectric potentials, Different bioelectric signals like ECG, EMG and EEG, Biopotential Electrode theory, Basic electrode, Electrodes for EEG, ECG, EMG, Biochemical electrodes. Skin contact Theory : skin contact impedance measurement of skin contact impedance, motion artifacts, nearest equation Nernst Equation . (9)

UNIT-II : BIOMEDICAL RECORDER AND MEASUREMENT

Biomedical recorders for EEG, ECG, EMG, Blood pressure variation as a function of time, relationship of heart sounds to a function of the cardio vascular system, Measurement of Blood Pressure (Direct & Indirect), Blood flow, Heart sound. (8)

UNIT-III : MEDICAL IMAGING SYSTEM

Instrumentation for diagnostics X-ray , X- ray basics properties , X-ray machine , Special imaging technique.

Ultrasonic imaging system: Physics of Ultrasound, Biological effect of ultrasound. Ultrasonic A-scan, M-scan, B-scan, Real-time ultrasonic imaging systems. (8)

SECTION-B

UNIT-IV : THERAPEUTIC EQUIPMENTS

Need of Physiological and electrotherapy equipments. Cardiac pacemaker machine, Cardiac Defibrillators, Nerve and Muscle stimulators. Diathermy : short wave, microwave, ultrasonic. (8)

UNIT-V : PATIENT CARE AND MONITORING AND SAFETY

System concepts, Bedside patient monitors, central monitors, Average reading heart monitor, Intensive care monitoring, Ambulatory monitoring. **Biotelemetry:** Single channel and Multichannel bio-telemetry, telephonic data transmission.

PATIENT SAFETY: Electric shock hazards, leakage current. Types of Leakage current, measurement of leakage current, methods of reducing leakage current, precautions to minimize electric shock hazards. Telemedicine. (9)

UNIT-VI : COMPUTERS IN BIOMEDICAL ENGINEERING

Computerized Axial Tomography (CAT) Computerized Aided ECG analysis Computerized patient monitoring system. Computerized Catheterization. (8)

TEXT BOOKS:

1. Khandpur R.S. : ñHandbook of Biomedical Instrumentationò, Tata Mc-Graw Hill, New Delhi.
2. Cromwell L. & Weibell F.J. : ñBiomedical Instrumentation and Measurementò, Prentice Hall of India.

REFERENCE BOOKS:

1. Dr. Lele R.D. : ñComputer Applications of Medicineò, Tata Mc- Graw Hill, New Delhi.
2. Webstar J.G. : ñMedical Instrumentationò, IIIed., John Wiley & Sons.
3. Carr and Brown : Biomedical Equipment Technology.

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PROFESSIONAL ELECTIVE - II

8XT4(2) DIGITAL IMAGE PROCESSING

SECTION-A

UNIT-I : Introduction to digital image processing, Digital Image Fundamental, Elements of Visual Perception, Simple Image Model, Sampling and Quantization, Basic Relationships between Pixel Imaging Geometry, Gray scale image representation. (8)

UNIT-II : Image Transforms: Introduction to the Fourier Transform, DFT, Properties of Two Dimensional Fourier Transform, FFT, Hadamard, Harr, DCT, Slant Transform. (8)

UNIT-III : Image Enhancement : Basic Techniques, Enhancement by point processing, Spatial Filtering, Enhancement in Frequency domain, histogram based processing, homomorphic filtering. (8)

SECTION-B

UNIT-IV : Image Restoration: Degradation model, Diagonalisation concept, Algebraic approach to Restoration. Inverse filtering, Weiner (CNS) filtering Restoration in Spatial domain, Basic morphological concept, morphological principles, binary morphology, Basic concepts of erosion and dilation. (9)

UNIT-V : Image Compression: Fundamentals, Image compression models, Elements of Information theory, Lossy and predictive methods, vector quantization, runlength coding, Hauff coding, and lossless compression, compression standards. (9)

UNIT-VI : Image Segmentation : Detection of discontinuities, Edge Linking and boundary detection, Thresholding, Regional oriented Segmentation. (8)

TEXT BOOKS :

1) Gonzalez and Woods: ñDigital Image Processingò, Addison / Wesley.
2) Milan Sonka, Vaclav Hlavac, Roger Boyle : Image processing Analysis and Machine Visionò , Book / Cole 2nd Edition.

REFERENCE BOOKS:

1) A. K. Jain : ñDigital Image Processingò, PHI
2) William K. Pratt : ñDigital Image Processingò, 3rd ed. , John Wiley and Sons Publications.

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PROFESSIONAL ELECTIVE - II

8XT4 (3) ARM SYSTEM DEVELOPMENT AND DESIGN

SECTION-A

Unit I: Introduction to Processor Design: Processor architecture and organization Abstraction in hardware design MUO, a simple processor Instruction set design, Processor design trade-offs, The Reduced Instruction Set, Computer Design for low power consumption.

Unit II: The ARM Architecture: The Acorn RISC Machine Architectural inheritance The ARM programmerôs model ARM development tools.

Unit III: ARM Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions, writing simple assembly language programs.

SECTION-B

Unit IV: ARM Organization and Implementation:3-stage pipeline ARM organization, 5-stage pipeline ARM organization , ARM instruction execution, ARM implementation ,The ARM coprocessor interface.

Unit V : The ARM Instruction Set -1:Introduction, Exceptions, Conditional execution Branch and Branch with Link (B, BL) Branch, Branch with Link and exchange (BX, BLX) Software Interrupt (SWI) Data processing instructions, multiply instructions, Count leading zeros (CLZ - architecture v5T only) Single word and unsigned byte data transfer instructions ,Half-word and signed byte data transfer instructions.

Unit VI : The ARM Instruction Set -2:Multiple register transfer instructions, Swap memory and register instructions (SWP), Status register to general register transfer instructions, General

register to status register transfer instructions, Coprocessor instructions, Coprocessor data operations, Coprocessor data transfers, Coprocessor register transfers, Breakpoint instruction (BRK - architecture V5T only) ,Unused instruction, space Memory faults ,ARM architecture variants.

TEXT BOOK:

ARM SYSTEM ON-CHIP ARCHITECTURE, Steve Furber, Second Edition, Pearson

REFERENCE BOOKS:

1. ARM System Developerôs Guide, Elsevier
2. Co-Verification of Hardware and Software for ARM SoC Design by Jason Andrews. Elsevier

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PROFESSIONAL ELECTIVE -II

8XT4 (4) EMBEDDED AND REAL TIME SYSTEM

SECTION-A

Unit I : Introduction to an embedded systems design: Introduction to Embedded system, Embedded System Project Management, ESD and Co-design issues in System development Process, Design cycle in the development phase for an embedded system, Use of target system or its emulator and In-circuit emulator, Use of software tools for development of an ES.

Unit II : RTOS & its overview 1: Real Time Operating System: Task and Task States, tasks and data, semaphores and shared Data Operating system Unit III : RTOS & its overview 2: Services-Message queues-Timer Function-Events-Memory Management, Interrupt Routines in an RTOS environment, basic design Using RTOS

SECTION-B

Unit IV: Microcontroller: Role of processor selection in Embedded System (Microprocessor V/s Micro-controller), ARM Microcontroller, Instruction set architecture, THUMB instructions, Exceptions in ARM, Programming examples, PIC Microcontroller: Architecture, basic assembly language programming concepts, Instruction set

Unit V : Embedded system development: Embedded system evolution trends Round - Robin, robin with Interrupts, function-One Scheduling Architecture, Algorithms Introduction to assembler,

compiler-cross compilers, Integrated Development Environment (IDE), Object Oriented Interfacing, Recursion, Debugging strategies, Simulators

Unit VI : Networks for Embedded Systems: The I2C Bus, The CAN bus, SHARC link Ports, Ethernet, Myrinet, Internet, and Introduction to Bluetooth: Specification, Core Protocol, and Cable replacement protocol, IEEE 11491 (JTAG) Testability: Boundary Scan Architecture

TEXT BOOKS:

1. Embedded System Design by Santanu Chattopadhyay, pHI
2. Embedded Systems by Raj Kamal, TMH
3 J B Peatman, Design with PIC Microcontrollers, Prentice Hall

REFERENCE BOOKS:

1. Embedded Systems Architecture by Tammy Noergaard, Elsevier
2. Embedded System Design by Frank Vahid, Tony Givargis,ò, John Wiley & Sons, Inc
3. Real-time systems & software by Alan C Shaw, John Wiley & sons, Inc
4. Embedded System Design by Peter Marwedel, Kluwer Academic Pub

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PROFESSIONAL ELECTIVE - II

8XT4(5) SMART SENSORS

SECTION-A

Unit I: Smart Sensor and the Nature of Semiconductor Sensor Output: Mechanical-Electronic Transitions in Sensing, Nature of Sensors, Integration of Micromachining and Microelectronics, Sensor Output Characteristics, Wheatstone bridge, Piezoresistivity in Silicon, Semiconductor Sensor Definitions, Static versus Dynamic Operation, Noise/Interference Aspects.

Unit II: Sensing Technologies: Capacitive Sensing, Piezoelectric Sensing, Hall Effect, Chemical sensors, Improving Sensor Characteristics, Digital Output Sensors, Incremental Optical Encoders, Digital Techniques, Low-Power, Low-Voltage Sensors, combined Solution: Micromachining and Microelectronics.

Unit III: Getting Sensor Information into the MCU : Amplification and Signal Conditioning, Instrumentation Amplifiers, Switched-Capacitor Amplifier , Barometer Application Circuit , 4- to 20-mA Signal Transmitter , Inherent Power-Supply Rejection, Separate Versus Integrated Signal Conditioning , Integrated Passive

Elements , Integrated Active Elements , Digital Conversion , A/ D Converters , Performance of A/D Converters , Implications of A/D Accuracy and Errors.

SECTION-B

Unit IV: MCUs/DSPs to Increase Sensor IQ : MCU Control , MCUs for Sensor Interface Peripherals ,Memory , Input/Output , Onboard A/D Conversion , Power-Saving Capability , Local Voltage or Current Regulation , Modular MCU Design , DSP Control , Algorithms Versus Lookup Tables , Techniques and Systems Considerations , Linearization , PWM Control , Autozero and Autorange, Diagnostics , Reducing Electromagnetic Compatibility and Radio Frequency Interference , Indirect (Computed, Not Sensed) Versus Direct Sensing , Software, Tools, and Support , Sensor Integration .

Unit V: Control Techniques : Programmable Logic Controllers , Open Versus Closed-Loop Systems, PID Control , State Machines, Fuzzy Logic , Neural Networks , Combined Fuzzy Logic and Neural Networks ,Adaptive Control ,Observers for Sensing, Other Control Areas , RISC Versus CISC , Combined CISC, RISC, and DSP , The Impact of Artificial Intelligence .

Unit VI: Transceivers, Transponders, and Telemetry : The RF Spectrum, Spread Spectrum, Wireless Data and Communications, Wireless Local Area Networks, FAX/ Modems, Wireless Zone Sensing, Optical Signal Transmission, RF Sensing Surface Acoustical Wave Devices, Radar, Global Positioning System, Remote Emissions Sensing, Remote Keyless Entry, Intelligent Transportation System, RF-ID , Other Remote Sensing Measuring RF Signal Strength, Telemetry, RF MEMS.

TEXTBOOK:

Understanding Smart Sensors, Randy Frank, 2e, Artech House

8XT5: UHF & MICROWAVES - LAB

Minimum 8 experiments uniformly distributed based on the syllabus of **8XT1 (UHF and Microwaves)**

8XT6: ELECTRONIC CIRCUIT DESIGN - LAB

Minimum 8 experiments uniformly distributed based on the syllabus of **8XT2 (Electronic Circuit Design)**

8XT7: PROJECT AND SEMINAR

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SYLLABUS PRESCRIBED FOR BACHELOR OF ENGINEERING
ELECTRONICS ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7XN1 COMPUTER ORGANIZATION

SECTION-A

UNIT I : Organization and architecture, structure and function, Computer evolution and performance: Brief history of computer, designing for performance , computer components, computer function , bus interconnection, PCI

UNIT II : External devices, I/O modules, I/O Channels and IOPs, SCSI and firewire interfaces, operating system overview, memory management, swapping, partitioning , paging , virtual memory.

UNIT III : ALU: Machine instruction characteristics , operand types, operation types, Addressing modes, instruction formats, CPU structure, processor organization register organization, instruction cycle, instruction pipelining.

SECTION-B

UNIT IV : RISC machine, instruction execution characteristics, register file concept, compiler based register optimization , RISC architecture, RISC pipelining, RISC vs CISC, case study of power PC 620.

UNIT V : Control unit operation: Micro operation, control of processor Hardwired implementation, micro program control : Concepts, microinstructions sequencing and execution, application of microprogramming.

UNIT VI : Multiple processor organizations, symmetric multiprocessors, Mainframe SMP, Cache coherence and MESI protocol, clusters. Non uniform memory access. Vector computation.

TEXT BOOKS:

1) William Stallings ñ Computer organization and architectureò. 6/e (Pearson education)
2) A.S. Tanenbaumò Structured computer organizationò 4/e McGraw Hill (ISE)

REFERENCE BOOKS:

1) C. Hamacher, R. Zaky Computer Organization. 5/e McGraw Hill (ISE)
2) J.P. Hayes Computer architecture and organization. 4/e McGraw Hill (ISE)
3) M. Mano & Kime Logic & Computer design fundamentals, 2/e (Pearson education)

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7XN2 MICROCONTROLLER & APPLICATIONS

SECTION-A

UNIT-I : An Introduction to uC 8051:Architecture of 8051, Signal description of 8051, Register set of 8051, Timer structure and their mode and I/O port structure.
Bus standards : Serial RS 232, Parallel IEE-488

UNIT-II : Instruction set of 8051, Addressing modes of 8051, Memory and I/O addressing by 8051, Assembly Language Programming using 8051

.UNIT-III : Study of ADC 0809, DAC 0808 and its interfacing with 8051, Interfacing of Sensors, Measurement of Temperature, Speed and Resistance.

SECTION-B

UNIT-IV : Interfacing LCD & Keyboard with 8051., Relays and Opto-isolators, Stepper Motor interfacing, DC motor interfacing and PWM with 8051.

UNIT-V : Serial port programming in assembly: Basics of serial communication, 8051 connection to RS232C, 8051 Serial port programming in assembly. RTC interfacing and Programming : DS 12887 RTC interfacing, Programming, Alarm, SQW, and IRQ features of DS 12887 Chip.

UNIT-VI: 8051 programming in C : Data types and time delay in 8051 C, IO programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C, Data serialization using 8051 C.

TEXT BOOKS :

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinlay : ñThe 8051 Microcontroller and Embedded Systems using Assembly and Cò, Pearson Education (2nd Ed.)
2. K.J.Ayala : ñThe 8051 Microcontrollerò, Penram Int. Pubs., 1996

REFERENCE BOOKS :

1. Using the MCS-51 Microcontroller by Han- Way Huang, Oxford University Press
2. National Semiconductor : Data Acquisition Linear Devices Data Book.
3. Embedded Microcontrollers and Processors:-Volume-I-Intel
4. Intel Peripheral Devices Data Book.

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7XN3 DIGITAL SIGNAL PROCESSING

SECTION-A

UNIT-I: Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems: Linearity, causal, Time invariant system, Stability criteria, Convolution unit sample response. (10)

UNIT-II: Z- transform: complex Z-plane, ROC determination of filter coefficients and its properties, Solution of difference equations using Z-transform, inverse Z-transform. (12)

UNIT-III: Introduction to Fourier transform of discrete time signal and its properties. Inverse Fourier transforms DFT and its properties, Circular convolution, linear convolution from DFT, FFT: Decimation in time and frequency radix 2 algorithm. (10)

SECTION-B

UNIT-IV: Filter Structures: Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter. FIR filter design: Design by Pole Zero Placements and Windowing method: Rectangular, Triangular, Blackman window and Kaiser window. (8)

UNIT-V: Methods to convert analog filter into IIR digital: Mapping of differential equation, Impulse invariant, bilinear transformation, and Matched Z transformation. Design of Analog filter: Specification and formulae to decide to filter order cut of frequency and transfer function of Butterworth filter and Chebyshev filter. (8)

UNIT-VI: Multi rate DSP, Introductory concept of multi rate signal processing, Design of Practical sampler, Rate converters, Decimators and Interpolator, Filter Bank application and examples. Overview and architecture of DSP processor TMS320C54XX. (8)

TEXT BOOKS :

1. Oppenheim & Schafer: Discrete time Processing (PHI)
2. Proakis & Manolakis D.G. : Digital Signal Processing (PHI)
3. Mitra S.K. : Digital Signal Processing (TMH)

REFERENCE BOOKS :

1. Roman Kuc : Digital Signal Processing (MGH)
2. Ifeacher E.C., Jervis B. W. : Digital Signal Processing (Addison Wesley)
3. P. P. Vaidyanathan : DSP and Multirate Systems (PHI)

4. Rabiner and Chrocherie : Multirate DSP (PHI)
5. Avtar Singh, S Shrinivasan : DSP implementation using DSP microprocessor with example From TMS320C54XX. Brooks cole publisher 2003.

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PROFESSIONAL ELECTIVE -I

7XN4 (1) NANOELECTRONICS

SECTION A

Unit I: Introduction to nanotechnology and nanoelectronics, Impacts, Limitations of conventional microelectronics. Introduction to methods of fabrication of nanonaterials-different approaches. fabrication of nano-layers -Physical Vapor Deposition, Chemical Vapor Deposition, Epitaxy, Molecular Beam Epitaxy

Unit II: Ion Implantation, Formation of Silicon Dioxide. Fabrication of nanoparticle- grinding with iron balls, laser ablation, reduction methods, sol gel, self assembly, precipitation of quantum dots. Introduction to characterization tools of nano materials- - principle of operation of STM, AFM, SEM, TEM, XRD, PL & UV instruments.

Unit III: Mesoscopic Physics and Nanotechnologies - trends in Microelectronics and Optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence, Quantum wells ,wires and dots, Density of states and dimensionality The physics of low dimensional structures - basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, quantum wires and quantum dots Semiconductor quantum nanostructures and super lattices ï MOSFET structures, Heterojunctions.

SECTION B

Unit IV: Quantum wells, modulation doped quantum wells, multiple quantum wells The concept of super lattices Kronig - Penney model of super lattice. Transport of charge in Nanostructures under Electric field - parallel transport, perpendicular transport, quantum transport in nanostructures Transport of charge in magnetic field and quantum Hall effect - Effect of magnetic field on a crystal, the Aharonov-Bohm effect, the Shubnikov-de Hass effect, the quantum Hall effect.

Unit V: Nanoelectonic devices and systems - MODFETS, heterojunction bipolar transistors, resonant tunnel effect, RTD, RTT, hot

electron transistors, Coulomb blockade effect and single electron transistor, CNT transistors, heterostructure semiconductor laser,

Unit VI: quantum well laser, quantum dot LED, quantum dot laser, vertical cavity surface emitting laser, quantum well optical modulator, quantum well sub band photo detectors, Infrared detector, nanoswitches, principle of NEMS.

TEXT BOOKS :

1. J.M. Martinez-Duart, R. J. Martin Palma, F. Agulle Rueda Nanotechnology for Microelectronics and optoelectronics , Elsevier,2006.
2. W.R. Fahrner, Nanotechnology and Nanoelectronics, Springer, 2005

REFERENCES

1. K. Goser, P. Glosekotter, J. Dienstuhl, Nanoelectronics and nanosystems, Springer 2004.
2. Supriyo Dutta, Quantum Transport- Atom to transistor, Cambridge University Press, 2005.
3. T. Pradeep, Nano the Essentials, TMH, 2007.
4. Poole, Introduction to Nanotechnology ,John Wiley 2006
5. Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI 2009
6. Diwanand and Bharadwaj, Nanoelectronics, Pentagon Press Delhi 2006

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PROFESSIONAL ELECTIVE -I

7XN4(2) MECHATRONICS

SECTION-A

UNIT I : INTRODUCTION

Definition, Trends, Control Systems, Microprocessor/Micro controller based controllers, PC based controllers, proportional/ Integral/Differential controllers, PID Controllers, Digital Controllers, Adaptive Controller.

UNIT II : ELECTROMECHANICAL DRIVES

DC Servo motors, 4-quadrant servo drives, braking methods, Bipolar drives, MOSFET Drivers, SCR Drives, variable frequency drives.

UNIT III : PLC CONTRILLERS

Ladder diagram, FSD structured programming, Interfacing of Sensors and Actuators to PLC. Programmable Motion

Controllers: Interpolation: point-to-point, Linear Circular, B-S plane, Home, Record position.

SECTION- B

UNIT IV : PRECISION MECHANICAL ACTUATION

Pneumatic Actuators, Electro-pneumatic Actuators, hydraulic Actuators,

Electrohydraulic Actuators, Types of motions, Kinematics, Inverse Kinematics, Timing Belts, Ball Screw and Nut, Linear motion Guides, Linear Bearings, Harmonic Transmission, motor/ Drive selection.

UNIT V : MEMS

Overview of MEMS & Microsystems, Typical MEMS & Micro system, products and applications. Micro sensors and micro actuators: Phototransistors, pressure sensors, thermal sensors, micro grippers, micro motors, micro valves, Micro pumps. Micro Manufacturing: Bulk Manufacturing, Surface Manufacturing, LIGA Process.

UNIT VI : DESIGN OF MECHATRONIC SYSTEMS

The design process, traditional and Mechatronic designs. A few case studies like piece counting system pick and place manipulator, simple assembly involving a few parts, part loading. Unloading system, automatic tool and pallet changers etc.

TEXT BOOKS / REFERENCE BOOKS :

1. W.Bolton **"Mechatronics "**,Addison Wesley , IInd Edition
2. N.P. Mahalik,**" Mechatronics Principles, Concepts and Applications"** , Tata Mc-Graw Hill, New Delhi.
3. Dan Necsulescu, **" Mechatronics"**, Pearson Education.
4. Yoram Koren , **"Computer Control of Manufacturing systems"**, Mc-Graw Hill ,New Delhi
5. Tai Ran Hsu,**" MEMS and Microsystems Design and Manufacture"** Tata Mc-Graw Hill, New Delhi.
6. Grover, Weiss, Nagel, and Ordey, **" Industrial Robotics : Technology, Programming and Applications"**, Mc-Graw Hill publication
7. Fu, Gonzalez and Lee, **"Robotics : Controls, Sensing, Vision and Intelligence"**, Mc-Graw Hill publication
8. S. R. Deb, **"Robotics Technology and Flexible Automation",** Tata Mc-Graw Hill, Publication.

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PROFESSIONAL ELECTIVE -I

7XN4(3) DIGITAL INSTRUMENTATION

SECTION - A

Unit I: Digital instruments - the basics of digital instruments, digital measurement of time interval, phase, frequency, Digital LCR meter, voltmeter and multimeter. Working principle and applications of Wave form analyzer, harmonic distortion meter, harmonic analyser and Spectrum analyzer. Logic state analyser and its application.

Unit II: IEEE - 488 General Purpose Interface Bus (GPIB) Instruments with application. Telemetry- Basic scheme of telemetry, Sources of error, line or transmission error, DC voltage and current telemetry schemes, Radio telemetry, PWM and digital telemetry schemes.

Unit III: Virtual Instrumentation - Historical perspective, advantages, block diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI, Real-time systems.

SECTION - B

Unit IV: Embedded Controller, OPC, HMI / SCADA software, Active X programming. VI programming techniques - VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Unit V: Data acquisition basics - Introduction to data acquisition on PC, Sampling fundamentals, Input/Output techniques and buses. ADC, DAC, Digital I/O, counters and timers, DMA, Software and hardware installation, Calibration, Resolution,

Unit VI: Data acquisition interface requirements. VI Chassis requirements. Common Instrument Interfaces - Current loop, RS 232C/ RS485, GPIB. Bus Interfaces - USB, PCMCIA, VXI, SCSI, PCI, PXI, Firewire. PXI system controllers, Ethernet control of PXI.

TEXT BOOKS:

1. D.A.Bell, *Electronic Instrumentation and Measurements*, PHI, 2003.
2. Helfrick & Cooper, *Modern Electronic Instrumentation and Measurement Techniques*, PHI,2008.
3. Gary Johnson, *LabVIEW Graphical Programming*, **2/e**, McGraw Hill.
4. Kevin James, *PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control*, Newnes, 2000.

REFERENCE BOOKS:

1. S.Gupta and J.P.Gupta,*PC Interfacing for data acquisition and Process control*, Instrument Society of America.
2. National Instruments Inc.& Bishop,*Lab View 8 Student Edition*, Prentice all,2007.
3. Rangan C.S.,Sarma G.R. and Mani V.S.V., *Instrumentation Devices and Systems*, 2/e,TMH,2008.
4. Sanjay Gupta Joseph John,Virtual Instrumentation Using LabVIEW, TMH, 2006.
5. *LabVIEW Basics-I Manual*, National Instruments, 2005.

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PROFESSIONAL ELECTIVE -I

7XN4(4) INTEGRATED OPTICS AND PHOTONIC SYSTEMS

SECTION - A

Unit I: Introduction , advantages, comparison of optical IC with electrical IC, applications of integrated optics, substrate materials for optical IC. Optical wave guide mode, modes in a planar wave guide, ray optic approach to optical mode theory

Unit II: basic three layer waveguide, symmetric and asymmetric wave guide, rectangular channel and strip loaded wave guides. Wave guide fabrication technique, deposited thin film, substitution dopant atoms, carrier concentration reduction wave guide, epitaxial growth, electro optic wave guide.

Unit III: Polymer and fiber integrated optics, polymer processing, applications, polymer wave guide devices, optical fiber wave guide devices, fiber sensor, types, applications. Losses in optical wave guide, measurement of losses. Wave guide input and output couplers, types of couplers, coupling between wave guides, coupled mode theory

SECTION - B

Unit IV: wave guide modulator, electro optic modulator, single and dual channel electro optic modulator acousto optic modulator. Integrated semiconductor laser, integrated semiconductor optical amplifier, monolithical integrated direct modulator, direct modulation of QD laser, integrated optical detectors, structures, factors affecting the performance, principle of micro optical devices.

Unit V: Optical amplifiers, semiconductor laser amplifier, doped fiber amplifiers, Fiber Raman amplifier, fiber Brillouin amplifier, noise

characteristics ,crosstalk, system applications. Direct detection light wave system,

Unit VI: Digital optical receiver, direct detection with optical amplifiers, performance. Coherent detection light wave system, system configurations, performance. Soliton light wave system, soliton wave propagation, soliton amplification, system design.

TEXTBOOKS / REFERENCES :

1 Robert Hunsperger, *Integrated optics :Theory and technology* 6/e Springer, 2009
2. Keico Iizuka, *Elements of photonics*, John Wiley, 2002
3. Pappannareddy, *Introduction to light wave systems*,Artech House,1995 4. Lifante, *Integrated Photonics: Fundamentals* ,John Wiley 2003

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PROFESSIONAL ELECTIVE -I

7XN4 (5) WIRELESS COMMUNICATION

SECTION-A

Unit-I : CELLULAR FUNDAMENTALS

Evolution of cellular mobile system (1G, 2G, 3G) A basic cellular system, cell shape, concept of frequency reuse, cellular system architecture, operation of cellular systems, Mobility Management: Hand off techniques , Types of hand off, Radio link transfer ,roaming management. (8)

Unit II : CELLULAR RADIO SYSTEM DESIGN FUNDAMENTALS

Frequency managements: Cellular system spectrum, frequency assignment, channel assignment strategies, co-channel and non-co-channel interference, cellular system capacity, improving coverage and capacity in cellular system. (9)

Unit III : MOBILE RADIO PROPAGATION MECHANISM

Radio propagation mechanism, multipath propagation, fading, Doppler shift, fast and slow fading, control of fading in mobile systems. (8)

SECTION-B

Unit IV : GSM SYSTEM

GSM system architecture, radio subsystem, channel types, frame structure, GSM Signaling Protocols, call processing in GSM, handovers in GSM, signal processing in GSM, data oriented CDPD network, Specification of HCSD,GPRS, EDGE. (9)

Unit V : CDMA SYSTEM

Frequency and channel specification, physical and logical channels of IS-95,call processing in IS-95, soft hand off and power control in CDMA. Cell loading, cell radius, Reverse & Forward link cell size. (9)

Unit VI : MOBILE ADHOC NETWORKS,WLAN & WMAN

Bluetooth: Bluetooth enable devices network, Bluetooth protocol, layers, Zigbee Architecture. Specifications Wireless LAN: Wi-Fi architecture and protocol, Wireless MAN: Wi-MAX architecture and protocol. (9)

TEXT BOOKS :

1) Theodore S. Rappaport : ñWireless Communications : Principles & Practiceò, Second edition, Pearson Education (2002)
2) Vijay K.Garg :òWireless network Evolution 2G to 3Gò , Pearson Education.
3) K. Pahlavan and P. Krishnamurthy : ñPrinciples of Wireless Networksò, Pearson Education Asia Publication (2002)

REFERENCE BOOKS :

1) William Stallings : ñWireless Communications and Networksò Pearson Education Asia Publication (2002)
2) Jochen Schiller : ñMobile Communicationsò, Pearson Education Asia Publication (2002)
3) Andy Dornam : ñThe Essential Guide to Wireless Communication Applicationsò, Pearson Education Asia Publication.
4) Upena Dalal ñWireless communicationò, Oxford University Press
5) William CY Lee : ñMobile Cellular Telecommunicationsò(second edition) McGraw Hill Inc.

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PROFESSIONAL ELECTIVE -I

7XN4 (6) SPEECH PROCESSING

SECTION-A

Unit I: Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals, Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy & zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing.

Unit II: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Unit III: Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems. Homomorphic systems for convolution, complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.

SECTION-B

Unit IV: Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications.

Unit V: Spectral subtraction & filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation. Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis.

Unit VI: Speech Recognition - Speech recognition model, Distortion Measures for speech recognition : Log spectral Distance, Cepstral Distance and likelihood distance. Time alignment Normalization : Dynamic Time Warping. HMM based speech recognizer - Definition of HMM, Formulation of speech recognition process using HMM.

TEXT BOOKS:

1. L. R. Rabiner and R. W. Schafer, ñDigital Processing of Speech Signals,ò Pearson Education (Asia) Pte. Ltd., 2004.
2. D. OôShaughnessy, ñSpeech Communications: Human and Machine,ò Universities Press, 2001.
3. L. R. Rabiner and B. Juang, ñFundamentals of Speech Recognition,ò Pearson Education (Asia) Pte. Ltd., 2004.
4. Z. Li and M.S. Drew, ñFundamentals of Multimedia,ò Pearson Education (Asia) Pvt.Ltd., 2004.

REFERENCE BOOKS:

1. C Becchetti & L P Ricotti, ñSpeech Recognition Theory & C++ Implementationò John Wiley & Sons

2. D. OõShaughnessy, ñSpeech Communication Human & Machineò, Universities Press.
3. B. Gold & N. Morgan ñSpeech & Audio Signal Processingò, John Wiley & Sons.
4. Thomas F. Quatieri: Discrete Time Speech Signal Processing: Principles and Practice, Pearson Education Asia.
5. J R Deller Jr, et al: Discrete-Time Processing of Speech Signals, IEEE Press, 2000.

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7XN5: MICROCONTROLLER AND APPLICATIONS- LAB

Minimum 8 experiments uniformly distributed based on the syllabus of 7XN2 (Microcontroller and Applications)

7XN6: DIGITAL SIGNAL PROCESSING - LAB

Minimum 8 experiments uniformly distributed based on the syllabus of 7XN3 (Digital Signal Processing)

7XN7: SIMULATION - LAB

Minimum 8 experiments based on MATLAB /P-SPICE

7XN8: PROJECT AND SEMINAR

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SEMESTER : EIGHT

8XN1 UHF & MICROWAVES

SECTION-A

Unit I: **MICROWAVE TUBES**
Limitation of Conventional devices at high frequency, Microwave Tubes: Two cavity, Multicavity klystron, and reflex klystron, Cylindrical Cavity Magnetron, TWT & Backward Wave Oscillator (8)

Unit II: **Semiconductor microwave Devices:**
Gunn diode: RWH theory, Gunn domain, modes of Gunn oscillation, Negative resistance amplifier, Parametric amplifiers: operation & types, Principle of operation of IMPATT, TRAPATT diodes, & MASER. (8)

Unit III: **Transmission of Microwaves:**
Waveguides: Rectangular Wave guide, Circular Waveguide, Introduction to Parallel Microstriplines: Microstrip line characteristics impedance & losses (10)

SECTION-B

Unit IV: **Microwave Resonator:**
Basic Resonant circuits RLC, transmission line resonators, Cavity resonators: rectangular and circular cavities, resonant frequency, and quality factor of resonators. (8)

Unit V: **Microwave Components**:
Microwave passive components, terminator, Attenuator, phase shifter, Scattering matrix formulation, Two hole directional coupler, E-plane tee, H-plane tee, Magic tee. Microwave propagation in ferrites, devices employing Faraday rotation: Isolator, Gyrator & Circulator. (8)

Unit VI: **Microwave Measurements:**
Frequency Measurements, Power Measurements, Attenuation Measurements, VSWR Measurements, Impedance Measurements, insertion Loss Measurements, Dielectric constant Measurements. (8)

TEXT BOOKS :

1. Liao, Samual Y. : ñMicrowave devices & circuitsò, Tata Mc_Graw Hill Co. Ltd., New Delhi
2. Collin, Robert E. : ñFoundations for Microwave Engineeringò, Mc-Graw Hill, New York.

REFERENCE BOOKS :-

1. Kennedy G. :òElectronics Communication Systemsò, Tata Mc-Graw Hill Book Co., New Delhi..
2. K.C. Gupta : ñMicrowave Engg.ò, (New Age)
3. Reich, Scolnik, Ordung, Krangs : ñMicrowave Principlesò, PHI
5. M.L. Sisodiya and G.S. Raghuwanshi : ñMicrowave Circuits and Passive devicesò, (WEL)
6. Mathew M. Radmanesh : RF and Microwave Electronics ï Illustrated.

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8XN2 ELECTRONIC CIRCUIT DESIGN

SECTION-A

UNIT-I : Design of regulated power supply using transistor, design of DC amplifier, comparator, window detectors, scaling and summing amplifier using IC 741 / IC 324 or equivalent.

UNIT-II : Design of waveform generator using IC 741, IC 8038, IC 566. Design of sweep generator, voltage controlled oscillator. Design of first and second order filters, design of notch filter.

UNIT-III : Design of instrumentation amplifier, Temperature controller / indicator using thermocouple, resistance thermal detector , thermo sensors AD590, LM35

SECTION-B

UNIT-IV : Introduction to CMOS / VLSI circuits, MOS Transistor switch, Realization of universal gates and compound gates using MOS transistors, basic physical design of simple logic gates.

UNIT-V: VHDL : Design flow, EDA tools, code structures, data types, operators and attributes. Signals & Variables, concurrent code, sequential code, packages and components, configuration, Introduction to VERILOG.

UNIT-VI : Design of combinational blocks such as multi-bit adders, ALU, MUX, DEMUX , encoders, decoders, Design of sequential circuits, asynchronous and synchronous design issues, state machine modeling (Moore and Mealy machines).

TEXT BOOKS :

1. R.A. Gayakwad : ñOP-AMP and Linear Integrated Circuitsò
2. Volnei Pedroni, ñ Circuit Design with VHDLò, PHI , 2005 edition

REFERENCE BOOKS:

1. Sergio Franco : Design with Linear Integrated Circuits & Opamps.
2. Douglas L. Perry : VHDL (3rd Ed.) , McGraw Hill.
3. Brown & Vranesic : ñDigital Logic Design using VHDLò, TMH
4 .Paul Horowitz-W.Hill:òThe art of Electronicsò (Cambridge publications)
5. Neil Weste- K.Eshraghian :Principles of CMOS/VLSI design (Pearson Education)
6. J. Bhaskar ñVHDL Primerò (Pearson Education)

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8XN3 VLSI DESIGN

SECTION-A

Unit I : Digital Design Fundamentals: Review of techniques of using a truth table, canonical forms to develop the AND/OR or OR/ AND combinational circuit models, minimization techniques, Hazards and Hazard free circuits. Difference between combinational and sequential circuits. General model of sequential machine, timing and triggering considerations.

Unit II : Basic HDL Constructs: VLSI Design flow, Overview of different modeling styles in VHDL, Data types and data objects in VHDL, Dataflow Modeling, Behavioral Modeling, using VHDL for combinational Circuits and sequential Circuits.

Unit III : Hardware Description Language: Structural Modeling, Subprograms, Packages and Libraries, Generics, Configurations, attributes. Comparison of various Hardware Description Languages.

SECTION-B

Unit IV : Programmable Logic Devices: Introduction to CPLDs: Function block architecture, input/output block, switch matrix, Study of architecture of CPLDs of Altera /Xilinx. Introduction to FPGAs: Configurable logic block, input/output block and interconnect, Study of architecture of FPGAs of Xilinx /Altera.

Unit V: CMOS Circuits: Different logic families, MOS Transistor, CMOS as an inverter, propagation delay, power consumption/ dissipation issues, simple circuits using CMOS.

Unit VI: CMOS Processing & Digital Circuit Verification: CMOS Fabrication: Different steps of fabrication, CMOS p-well, nWell and twin tub processes, CMOS Layout and Design rules. Simple Test Bench, Simulation and Synthesis issues, case study of ALU/ Sequence Detector.

TEXT BOOKS:

1) Neil H. Weste and Kamran Eshraghian, ñPrinciples of CMOS VLSI designò.
2) J. Bhasker,ò VHDL Primerò. Addison Wesley
3) Douglas Perry,ò VHDLò Tata McGraw HILL
4) William I. Fletcher ñAn Engineering approach to Digital Designò, Prentice Hall India.

REFERENCE BOOKS:

1) Stephen Brown and Zvonko Vranesic, ñFundamentals of Digital Logic with VHDL Designò. Tata McGRAW HILL
2) Wayne Wolf: ñVLSI Technologyò
3) VLSI Test Principles and Architectures by Laung Terng Wang, Elsevier

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PROFESSIONAL ELECTIVE - II

8XN4(1) STSTEM ON CHIP

SECTION –A

UNIT I : SYSTEM DESIGN

Concept of system, importance of system architectures, introduction to SIMD, SISD,MIMD and MISD architectures, concept of pipelining and parallelism.

UNIT II : INTRODUCTION TO SOC

Typical SOC architecture, SOC design flow, Differences between Embedded systems and SOCs, Designing microprocessor / Microcontroller based system and embedded system. System design issues in SOCs

UNIT III : SOC PROCESSORS

Introduction to CISC , RISC, Von Neumann and Harvard Architecture, Concept of Soft processors , Study of IBMôs power PC, Spartan-III FPGA , Picoblaze processor, Microblaze processor

SECTION –B

UNIT IV : SYSTEM BUSES

Introduction to busses used in SOCs. Introduction to AMBA bus. Detailed study of IBMôs core connect bus, concept of PLB-processor local bus and OPB-on chip peripheral bus.

UNIT V : SOC IMPLEMENTATION

Study of features like embedded RAMs, multipliers, Digital clock management etc. Introduction to tools used for SOC design, Xilinx embedded development kit.

UNIT VI : SOC DEVELOPMENT TOOLS

Developing simple systems by interfacing simple peripherals to **Spartan III Tools :** Xilinx ISE and Xilinx EDK, Latest versions SOC system design, tutorial designing an image processing system with interface to host using either UART/PCI/USB bus.

REFERENCE BOOKS:

1. Wyne wolf ,**"FPGA based system design"** by Prentice Hall of India.
2. Giovanni De Micheli, Rolf Ernst and Wayne Wolf **"Readings in hardware/software co-design".** Morgan Kaufman publishers
3. ñ**Computers as components : principles of embedded computing system Design"** Morgan Kaufman publishers
4. Ahmed jerry, Wayne wolf ,**"Multiprocessors systems-on-chips"** Morgan Kaufman Publishers
5. Core connect architecture at http://www.chips.ibm.com/products/coreconnect
6. EDK power PC tutorial at http://www.xilinx.com/EDK
7. Spartan III handbook from Xilinx
8. Power PC info ttp://www.chips.ibm.com/productspowerPC/cores/405sde_pb.html
9. White papers form xilinx.com and http://www.chips .ibm.com

10. Arm processor details at WWW.arm.com
11. Amba bus architecture at http://www.arm.com/products/solutions/Ambahomepage.html

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PROFESSIONAL ELECTIVE- II

8XN4(2) DIGITAL SIGNAL PROCESSORS

SECTION-A

Unit I : INTRODUCTION TO DSP PROCESSORS

Advantages of DSP Processors, Characteristics of DSP Processors, Applications of DSP Processors, Types of Architectures: Von-Neumann Architecture, Harvard Architecture, Super Harvard Architecture, VLIW Architecture.

Unit II: ARCHITECTURE FOR PROGRAMMABLE DSP DEVICES

Basic Architectural features, DSP computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed issues Features for External interfacing.

Unit III: EXECUTION CONTROL AND PIPELINING

Hardware looping, Interrupts, Stacks, Relative Branch Support, Pipelining and performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, pipeline Programming models.

SECTION-B

Unit IV: PROGRAMMABLE DIGITAL SIGNAL PROCESSORS

Commercial Digital signal-processing Devices, Architecture of TMS320C67XX Processors, Data Addressing modes of TMS320C67XX Processors, Memory space of TMS320C67XXP rocessors, Program Control, TMS320C67XX instructions and Programming, On-Chip peripherals, Interrupts of TMS320C67XX processors, Pipeline Operation of TMS320C67XX Processors.

Unit V: Analog DSP Processor family

Analog 21061 series SHARC Processor block diagram, Interrupt Hardware, Memory quantization, Central arithmetic logic unit, system control etc.

Unit VI: IMPLEMENTATION OF BASIC DSP ALGORITHMS

FIR Filters, IIR Filters, interpolation Filters, Decimation filters, Adaptive Filters, 2-D Signal Processing.

TEXT BOOKS & REFERENCES :

1. Analog Devices & Texas Instruments Users Manuel of TMS320C67XX and ADSP21061.
2. Architectures for Digital Signal Processing- P. Pirsch, John Wiley
3. Digital Signal Processors- Kuo and Gan, Pearson Education
4. DSP Processor Fundamentals: architectures and Features, by Phil Lapsley, Wiley
5. DSP Applications using C and the TMS320C6x DSP

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PROFESSIONAL ELECTIVE -II

8XN4(3) ARTIFICIAL INTELLIGENCE & ROBOTICS

SECTION- A

Unit I: Fundamental Concepts - Agents, environments, general model; Problem solving techniques. Search Techniques - Uninformed search, heuristic search, adversarial search and game trees; Solution of constraint satisfaction problems using search.

Unit II: Knowledge Representation - Propositional and predicate calculus, semantics for predicate calculus, inference rules, unification, semantic networks, conceptual graphs, structured representation, frames, scripts.

Unit III: Prolog - Basic constructs, answer extraction. Bayesian Reasoning - Bayesian networks, dynamic Bayesian networks. Planning - State-space search, planning graphs. Learning -Inductive learning, decision tree learning.

SECTION - B

Unit IV: Robotics - Basic concepts, definition and origin of robotics, different types of robots, robot classification, applications, robot specifications. Introduction to automation - Components and subsystems, basic building block of automation, manipulator arms, wrists and end-effectors.

Unit V: Transmission elements - Hydraulic, pneumatic and electric drives. Gears, sensors, materials, user interface, machine vision, implications for robot design, controllers. Kinematics, dynamics and control - Object location,

Unit VI: three dimensional transformation matrices, inverse transformation, kinematics and path planning, Jacobian work envelope, manipulator dynamics, dynamic stabilization, position control and force control, present industrial robot control schemes.

TEXT BOOKS:

1. Russell, S., Norvig, P, *Artificial Intelligence: A Modern Approach*, Pearson Education, 2006.
2. Spong and Vidyasagar, *Robot Dynamics and Control*, John Wiley & Sons, 1990.
3. Rich, E., Knight, K., *Artificial Intelligence*, TMH, 2006. 4. Asfahl C.R, *Robots and Manufacturing Automation*, John Wiley & Sons, 1992.

REFERENCES:

1. Nilsson, N. J., *Artificial Intelligence: A New Synthesis*, Morgan Kaufmann.1998
2. Bratko, I., *Prolog Programming for Artificial Intelligence*, **3/e**,Pearson Education.2001.
3. Klafter, R.D., Chmielewski, T.A, Negin, M., *Robotic Engineering An Integrated Approach*, PHI,2007 4. Schilling, R. J., *Fundamental of Robotics: Analysis and Control*,PHI,2007.
5. Fu, K. S, Gonzalez, R.C, Lee, C.S.G., *Robotics, Control, Sensing, Vision and Intelligence*, McGraw- Hill,1987.

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PROFESSIONAL ELECTIVE -II

8XN4(4) DIGITAL IMAGE PROCESSING

SECTION-A

UNIT-I : Introduction to digital image processing, Digital Image Fundamental, Elements of Visual Perception, Simple Image Model, Sampling and Quantization, Basic Relationships between Pixel Imaging Geometry, Gray scale image representation. (8)

UNIT-II : Image Transforms: Introduction to the Fourier Transform, DFT, Properties of Two Dimensional Fourier Transform, FFT, Hadamard, Harr, DCT, Slant Transform. (8)

UNIT-III : Image Enhancement : Basic Techniques, Enhancement by point processing, Spatial Filtering, Enhancement in Frequency domain, histogram based processing, homomorphic filtering. (8)

SECTION-B

UNIT-IV : Image Restoration: Degradation model, Diagonalisation concept, Algebraic approach to Restoration. Inverse filtering, Weiner (CNS) filtering Restoration in Spatial domain, Basic morphological concept, morphological principles, binary morphology, Basic concepts of erosion and dilation. (9)

UNIT-V : Image Compression: Fundamentals, Image compression models, Elements of Information theory, Lossy and predictive methods, vector quantization, runlength coding, Hauff coding, and lossless compression, compression standards. (9)

UNIT-VI : Image Segmentation : Detection of discontinuities, Edge Linking and boundary detection, Thresholding, Regional oriented Segmentation. (8)

TEXT BOOKS :

1) Gonzalez and Woods: ñDigital Image Processingò, Addison / Wesley.
2) Milan Sonka, Vaclav Hlavac, Roger Boyle : Image processing Analysis and Machine Visionò , Book / Cole 2nd Edition.

REFERENCE BOOKS:

1) A. K. Jain : ñDigital Image Processingò, PHI
2) William K. Pratt : ñDigital Image Processingò, 3rd ed. , John Wiley and Sons Publications.

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PROFESSIONAL ELECTIVE -II
8XN4 (5) DIGITAL COMMUNICATION

SECTION-A

Unit I:- Introduction to Digital Communication System

Functional Blocks of Digital Communication System; Source Encoder and Decoder; Channel Encoder and Decoder; Modulator and Demodulator

Line Coding:- Need for Line coding; Properties of Line Coding; Unipolar RZ and NRZ; Polar RZ and NRZ; Bipolar NRZ (AMI); Split Phase Manchester Coding; Polar Quaternary NRZ Coding; HDB3 Coding Scrambler and Unscrambler (6)

Unit II :- Information Theory

Measure of Information; Entropy and Information Rate of Long independent and Dependent Sequences; Markoff Statistical Model for Information Sources; Entropy and Information rate of Markoff Sources

Source Encoding: - Huffman Encoding; Shannonôs Encoding Algorithm; Shannon-Fano Algorithm;

Discrete Communication Channel: - Noiseless Channel; Deterministic Channel; Binary Symmetric Channel; Rate of Information Transfer over Discrete Channel; Capacity of Discrete Memoryless Channel

Continuous Channel: Shannon Hartley Theorem for channel capacity; Signal to Noise Ratio ï Bandwidth Tradeoff (12)

Unit III:- Bandpass Modulation and Demodulation techniques

BPSK, BFSK, ASK and DPSK generation and reception; Signal space diagram, PSD and Bandwidth of BPSK and BFSK systems; QPSK and MSK Transmitter and Receiver; Signal space diagram, PSD and Bandwidth of QPSK and MSK; Probability of Error of ASK,BPSK and BFSK systems; Comparison of Digital modulation systems

Coherent Detection: - Integrate and Dump Filter (SNR and Probability of Error); Optimum Filter (Transfer function and Probability of Error); Matched Filter (Impulse response and Probability of Error) (10)

SECTION -B

Unit IV:- Base Band Transmission

Base Band Binary PAM systems, Inter Symbol Interference, Base Band Pulse Shaping and Nyquist Criterion; Eye Diagram

Correlative Coding: Duobinary Encoder with Pre-coder; Modified Duobinary Encoder; Modified Duobinary Encoder with Pre-coder

Equalization: Need for equalization; Transversal Equalizer (Problems Expected); Preset Equalizer; Adaptive Equalizer, Clock and Carrier Synchronization. (8)

Unit V:- Error Control Coding

Introduction to Error Control Coding; Types of Errors; Methods of Controlling Errors;

Linear Block Codes: Matrix Description of Linear Block codes, Hamming Distance; Hamming Weight; Minimum Hamming Distance; Hamming Codes; Encoder for Linear Block code; Syndrome Decoding; Syndrome Decoder for (n,k) Linear Block Code; Error Detection and Correction capability of Linear Block Codes (Derivation expected)

Cyclic Codes: Properties of Cyclic Codes; Systematic and Non-Systematic generator Matrix, Parity Check Matrices for Cyclic Codes; Encoders for Cyclic Codes; Syndrome Decoding for Cyclic Codes

Convolution Codes: Time Domain Approach and Transform domain approach for convolution code generation; Code Tree and Code Trellis for Convolution code (8)

Unit VI:- Multiple Access Schemes and Spread Spectrum Communication

Multiple Access schemes: Time Division Multiple Access, Frequency Division Multiple Access; Code Division Multiple Access; Space Division Multiple Access

Spread Spectrum Systems: Notion of Spread Spectrum; PN Sequence Generation (Problems Expected); Direct Sequence Spread Spectrum (DSSS); Jamming Margin; Processing Gain; E_b/N_o Ratio; Frequency Hopped Spread Spectrum; Slow and Fast frequency Hopping. (6)

TEXT BOOKS:

1. Shanmugam K.S. :òDigital & Analog Communication Systemsò, John Wiley & Sons, New York, 1996.
2. Lathi B. P. :òModern Digital and Communication Systemsò, Holt Rinchart and Winston Inc., New York, 1993.
3. Simon Haykin : ñDigital Communicationò , John Wiley and Sons, Pvt. Ltd., Singapore.

REFERENCE BOOKS :

1. Proakis J. K. :òDigital Communicationò, Mc-Graw Hill Book Co., London (Second Edition)
2. Taub, Herbert, Schilling D.L : ñPrinciples of Communication Systemsò, Mc-Graw Hill International Book Co., Tokiyo.
3. Wcy Lee : ñMobile Cellular Telecommunications Systemsò, Mc- Graw Hill International Editions, 1990
4. Glover and Grant : ñDigital Communicationò, Prentice Hall Publication .

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PROFESSIONAL ELECTIVE -II

8XN4 (6) SMART SENSORS & NETWORKS

SECTION-A

Unit I: Review: Sensor, actuator and transducer- Classification of sensors on the basis of energy source and type of output signals. Signal conditioning. Meaning and types of smart sensors. MEMS Sensors: Concept and methods of making MEMS devices, Sensors and Actuators, Examples.

Unit II: Smart Sensor Technologies: Thick-film, thin-film and monolithic IC technologies and their use in making smart sensors. Bulk and surface micromachining technologies, Wafer bonding, LIGA process, Plasma etching, and their use in making smart sensors.

Unit III: Intelligent and Network Sensors: Concept and architecture of intelligent sensors, Concept and architecture of network sensors. Sensor Networking: 7-Layer OSI model of communication system, device-level networks, introduction to protocols and technologies for wired and wireless LANs.

SECTION-B

Unit IV: Ethernet, RS-485 and Foundation Fieldbus protocols. Wi-Fi. Zigbee and Bluetooth protocols. Concept of adhoc networks. Smart Transducer Interface Standard IEEE 1451.

Unit V: Introduction to Sensor network computing: Applications, Constraints/Challenges, Wireless and wired networking issues for sensor nets.

Unit VI: Networking for sensor nets- Directed diffusion, Aggregation, Network discovery/initialization, Location/Time service, Routing, Large-scale analysis, Power-aware computing and Communication.

TEXT BOOKS:

1. Fraden J., Handbook of Modern Sensors: Physics, Design and Applications, AIP press, 2003.
2. Feng Z. and Leonidas G., Wireless Sensor Networks, Elsevier Eastern Limited, 2007.
3. Anna Hac, Wireless Sensor Network Design, John Wiley & Sons, Ltd, 2004.

REFERENCES:

1. Frank R., Understanding Smart Sensors, Artech House publishers. 2000.
2. Yamasaki H., Intelligent Sensors, Elsevier Eastern Limited. 1996.
3. Ramon P. A. and Webster J. G., Sensors and Signal Conditioning,2/e, John Wiley and Sons.
4. Elena Gaura, Robert Newman, Smart MEMS and Sensor systems, Imperial College Press, 2006.
5. Mohammad Ilyas, Sensor Network Applications, Architecture and Design, CRC Publishers, 2006.

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8XN5: UHF & MICROWAVES LAB

Minimum 8 experiments uniformly distributed based on the syllabus of **8XN1 (UHF and Microwaves)**

8XN6: ELECTRONIC CIRCUIT DESIGN AND VLSI DESIGN-LAB

Minimum 4 experiments uniformly distributed based on the syllabus of 8XN2 (Electronic Circuit Design) and minimum 4 experiments uniformly distributed based on the syllabus of 8XN3 (VLSI Design)

8XN7: PROJECT AND SEMINAR

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SYLLABUS PRESCRIBED FOR BACHELOR OF ENGINEERING
INSTRUMENTATION ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7IE 01 PLC & SCADA SYSTEMS

UNITE I: Introduction to PLC , Types of PLC , Block diagram, processor section , Specification of advance PLC, Input modules & output module (Analog , Digital , Discrete). Communication modules, limit switches, scan time.

UNIT II: Symbols of ladder diagram, Programming instruction (Input, output, timer, counter, bit, comparison, file move, data handling, branch instruction, skip & bypass IO).

UNITIII: Development of ladder diagrams: Various types for ladder programming, development of ladder diagram, flowchart, ladder programming for logic gets, flip- flop (JK, RS, D, T), ladders programming for various industrial process.

UNIT IV: System configuration:- Hardware, system, Sizing & selection, Wiring diagram, PLC installation, Safety enclosure, temperature noise, hook up Consideration, operator interrupts, interfacing of PC field bus, PLC Simulator.

UNIT V: Introduction to supervisory control: Introduction, Block diagram, SCADA system integrated with PLC, Channel, Scanning, Interrupt Scanning, Data processing, Distributed SCADA system, RTU.

UNITVI: Industrial Application of SCADA system, Relay control card, stepper motor control card, PC based Add-on Card, benefits of SCADA , Comparison of SCADA, DCS, PLC.

PRACTICALS:

Students are expected to perform minimum 8 experiments based on above syllabus.

TEXT BOOKS:

1 Programmable control logic principle and application By John W. Webb (PHI)
2. Computer Based Industrial Control by Krishnakant.
3. Process Control Instrumentation Technology, by C.D. Johnson, (7e)
4. Programmable Logic control By John R. Hackworth (Pearson Education)
5. Process control by Surekha Bhanot

REFERENCE BOOK:

1. Hand book Process control By B.G.Liptak Vol. II

7IE 02 COMPUTER – AIDED CONTROL

UNIT I: Introduction to PC in plant control, role of computer in process control , Element of computer aided process control, classification of computer aided process control, benefits using computer control. Types of computer control software.

UNIT II: Data acquisition and processing system: Introduction, Techniques of Data acquisition (synchronous, multi cannel, fast) data acquisition board.

UNITIII: Data logger system, microprocessor/ microcontroller based DAS. Direct digital control: Introduction, DDC structure, DDC software (position algorithms, Velocity algorithms)

UNIT IV: Distributed control system: Functional block diagram and generic futures, system architecture.
DCS sub system: Field station, presentation & monitoring devices, DCS interfacing with PLC & PC.

UNIT V: ISO / OSI reference model, network protocol.
Field bus: Introduction, network topology, profibus , modbus, Comparison of DCS with PLC,

UNITVI: Configuration and performance characteristics of virtual instrumentation system, Lab view, Fault finding and trouble shooting technique of instrument and system, causes and remedy of faults.

TEXT BOOKS :

1 Process control concept , dynamic and application by S. K. Singh (PHI)
2 Computer Based Industrial Control by Krishnakant.
3 Process Control Instrumentation Technology, by C.D. Johnson, (7e)

REFERENCE BOOKS:

1) Hand Book: Process Control by B.G. Liptak.
2) Electronic Instruments Hand book (2/e),1997 by clyde F. Coombs , TMH

7 IE 0 3 BIOMEDICAL INSTRUMENTATION

Unit I : Introduction to Biomedical Instrumentation: sources of biomedical potentials, Different bioelectric signals like ECG, EMG & EEG.

Biopotential electrodes: basic electrode theory, nernst equation, electrical conductivity of electrode jellies & creams, skin contact impedance & its measurement. Electrodes for ECG, EEE & EMG.

Unit II : Cardiovascular system : physiology of heart & cardiovascular system, ECG lead configuration, ECG recorders, Vector cardiograph, Phonocardiograph, measurement of cardiac output, blood flow & blood pressure.

Unit III : Nervous System: anatomy of nervous system, neuronal communication, neuronal receptors. Types of nervous system (central & peripheral), spinal reflexes. , EEG measurements, 10-20 electrode placement system , Recorder for EEG & EMG.

Unit IV : Therapatic equipments : cardiac pacemakers, types of pacemaker, programmable pacemaker , ventricular synchronous pacemaker , cardiac defibrillators, Diathermy unit : shortwave, micro wave & ultrasonic.

Unit V: Medical Imaging System : Instrumentation for diagnostics X-Ray : properties, X-ray units, X-ray machines & generation process, special imaging techniques for X-rays.
Ultrasonic Imaging System : Physics of ultrasound, basic modes of transmission, Ultrasonic display modes : A scan, B scan & M scan with applications. Biological effects of ultrasound.

Unit VI : Electrical safety: general consideration for biomedical recorder amplifiers, sources of noise in zero level recording circuits, physiological effects of electrical currents, electric shock hazards, leakage currents, methods of accident prevention. Test instruments for checking safety parameters of biomedical equipments.

PRACTICALS:

Students are expected to perform minimum 8 experiments based on above syllabus.

TEXT BOOKS:

1) Handbook of Biomedical Instrumentation by R.S.Khandpur, TMH Pub.
2) Biomedical Instrumentation & Measurements by L.Cromwell, F.Weibell, E.A. Pfciffer, PHI Pub.

REFERENCE BOOKS :

1) Introduction to Biomedical Equipment by Carr & Brown.
2) Medical Instrumentation by J.G.Webster, 3rd edition, John Wiley.

7 IE 0 4 PROJECT PLANNING ESTIMATION AND ASSESSMENT

Unit I : Definition of Project, Purpose, Scope, Organization Structure, Project implementation and Cost estimation , Documentation, I & C document, Manpower Planning, Project time Schedule.
Quality management: Concepts and applications of Kaizen, quality circle, ISO 9000 series, just-in-time, quality Planning and total quality management, elements of TQM, Quality Circles.

Unit II : Project monitoring and control: PERT/CPM techniques, Project Bar Chart, Tendering procedure, Bid evaluation and procurement procedure, project coordination, multi-agency interaction.

Unit III: Specification, Configuration and Design Criteria : Degree of automation, Manpower matching, instrument Specification sheet, area classification and Instrument selection, control system specification .
Control console, centers and panels: Types, Design, Inspection, and specification.
Intelligent operator interface (IOI).

Unit IV: Test Procedure, Installation and Commissioning: Factory acceptance and Site acceptance test , Inspection reports and check list, installation and Commissioning, control schedule , site activities up to hand over, ,Spares management, Maintenance, annual maintenance contract.

Unit V: Project Engineering and documentation, standard symbols and legends, process flow sheet, P and I diagrams, control Schematics, instrument list, interlock diagrams, plant G. A. diagrams, power/air distribution, loop schematics and termination diagram, installation sketches and bill of material , control system documentation.
Cable Engineering: Different classes of conductors , NEMA Standards. Types and specifications of cables, Cable schedule, routing of cables, types of glands, ferruling and terminations.

Unit VI: Discrete State control system: Two state control system, non-interactive Variables, sequential system, Time sequence system and composite sequential system.
Field bus Wiring: Terminator, Power Conditioners, Spurs, Segments, and repeaters.
Networking: Hubs, routers, LAN cards, and Cat cables. (52)

PRACTICALS:

Students are expected to perform minimum 8 experiments based on above syllabus.

TEXT BOOKS :

1. Applied Instrumentation in Process Industries, Vol. I &II by Andrew & William.
2. Batch Control System By T. G. Fisher.
3. Management System by John Bacon.

REF. BOOK :

1. Applied Instrumentation in process Industries Volume I, II By Andrew & Willim

7 IE 05 PROFESSIONAL ELECTIVE - I
(1) FUZZY LOGIC AND NEURAL NETWORKS

UNIT-I : Introduction :
Biological Neurons and their artificial models introduction to neural computing, Components of neuron, input and output weight, threshold, weight factors, transfer functions, concepts of supervised and unsupervised learning. (8)

UNIT-II : Supervised Learning : Single layer network, perceptron, Linear separability, Training algorithm and limitations.
Multilayer Network : Architecture of feed forward network, Learning rule, generalized delta rule, learning function. Back propagation algorithm. (9)

UNIT-III : Unsupervised Learning : Introduction, Counter propagation networks, Kohonenôs self organizing maps.
Hopfield networks. (8)

UNIT-IV: Introduction : Uncertainity in information, basic concepts of Fuzzy sets, operations on fuzzy sets, properties.
Fuzzy relations : operations, properties, value assignments. (8)

UNIT-V: Membership functions : Features, fuzzification, membership value assignments, Fuzzy Rule based systems, Graphical technique of inference.
Defuzzification : Lambda-cuts for Fuzzy sets and Fuzzy relations, Defuzzification methods. (9)

UNIT-VI: Applications:

1. Fuzzy pattern Recognition - feature analysis, partitioning of feature space, single sample identification multifeature pattern recognition.
2. Simple Fuzzy logic controller - Control system design stages, Assumptions in a Fuzzy control system design, general fuzzy logic controllers, simple examples. (8)

TEXT BOOKS :

1. J.M. Zurada : ñIntroduction to Artificial Neural Systemsò, Jaico Publishing House.
2. Meherotra Kishan, Mohan C.K., Ranka Sanjay : ñElements of artificial neural networksò, Penram Int. Pub., Mumbai
3. Timothy Koss : ñFuzzy Logic with Engineering Applicationsò, McGraw Hill International Edition.

REFERENCE BOOKS

1. N. K. Bose and P. Liang : ñNeural Network Fundamental with Graphs, Algorithms and Applicationsò, Tata McGraw Hill Edition.
2. G.J. Klir and T.A. Folger : Fuzzy sets, Uncertainity and Informationò, PHI Publication
3. Kosko Bart : ñNeural Networks & Fuzzy systemsò, Prentice Hall of India Pvt.Ltd., New Delhi

7 IE 05 PROFESSIONAL ELECTIVE-I
(2) ROBOTICS & AUTOMATION

UNIT-I : Definition of a Robot, A brief introduction to Robot Technology, Sensory perception, Intelligence, End Effectors, Sensory feedback, Robot Vision / Computer Vision and its fundamental components, Tactile Sensing, Range finding and real world navigation Speech synthesis and recognition.

Robot control fundamentals : The Artificial intelligence view point, comparison of human brain and computer in the context of intelligent bahaviour, problem representation in A.I. system problem solving technique in A.I. (12)

UNIT-II : Definition of knowledge, Domain and logic : Elements of logic, proportional calculus, predicate calculus, pros and cons of logic, production system and their basis elements, sementic Nets and their characteristics, Frames, A Brief about Expert system comparison of various methods of knowledge representation. (10)

UNIT-III : Elements of speech, Time Domain Analysis / Synthesis of speech and waveform digitization, frequency Domain Analysis / Synthesis of speech phoneme Speech Synthesis, various type of speech recognition Systems and their basics ideas, Isolated word Recognition, Connected Speech understanding. (12)

UNIT-IV: Elements of vision, Image Transformation, Image Analysis, Image Understanding of Machine perception, Industrial Vision System. (9)

UNIT-V : Triangularation Method, Time of Flight (TOF), Ranging Method, Robot Position and Proximity Sensing, Tactile-Sensing System, Sensing Joint Forces and their importance in Robot programming, sensing tough and slip. (9)

UNIT-VI: Various Root Programming Languages and their characteristics, characteristics of Robot Task Level language, comparison of Robot programming language, features of the high level languages used in conventional programming language, featuring with the high level language used in conventional programming. (12)

BOOKS RECOMMENDED

1. Staugard A.C. : ñRobotic and AIò, Prentice Hall, Engle Wood Cliff N.J. 1987.
2. Lee C.S.G., Fu K. S., Gonzalez R.C. : ñRobotic-Control, Sensing and Intelligenceò, Mc-Graw Hill, Singapore, 1987.
3. Klafferetal : ñRoboticsò
4. Parent M. and Laugreau C. : ñRobot Technology (Vol.4 : Logic and programmingò, Kogan Page, London, 1985.
5. Aleksander I. ,Farreny H. and Ghallab M. : ñRobot Technology ñ (Vol-1).
6. Decision and Intelligence ñKogan Page, 1986.

7 IE 0 5/7XT03/7XN03/7IT01 PROFESSIONAL ELECTIVE-I (3) DIGITAL SIGNAL PROCESSING

UNIT-I: Introduction to DSP, Frequency domain description of signals & systems, Discrete time sequences systems, Linearity unit sample response, Convolution, Time invariant system, Stability criteria for discrete time systems, Solutions of linear difference equations. (9)

UNIT-II: Introduction to Fourier transform of Discrete Time Signal and its properties, Inverse Fourier transform, Sampling of continuous time signal, Reconstruction of continuous time signal from sequences, Z-Transform and its properties, complex Z-plane, ROC Determination of filter Coefficients, relationship between Fourier Transform and Z-Transform, Inverse Z-Transform. (12)

UNIT-III: DFT and its properties , Circular convolution, Linear convolution from DFT, FFT, Decimation in time and frequency algorithm. Introduction to wavelet transform. (10)

UNIT-IV: Filter categories, Direct form I, Direct form II, Cascade and parallel structure for IIR and FIR Filter, Frequency sampling structures for F.I.R. filter, Steps in Filter Design, Design by Pole Zero Placements, FIR filter design by Windowing method, Rectangular, Triangular and Blackman window. (8)

UNIT-V: Analog filter types, Butter worth, Elliptic filter, Specification and formulae to decide to filter order, Methods to convert analog filter into IIR digital, Mapping of differential, Impulse invariant, Bilinear, Matched Z transformation. (8)

UNIT-VI: Multi rate DSP, Introductory concept of multi rate signal processing, Design of Practical sampler, Rate converters, Decimators and Interpolator, Filter Bank application and examples. (8)

TEXT BOOKS :

1. Oppenhavm & Scheffer : Discrete time Processing (PHI)
2. Proakis& Monolakis D.G. : Digital Signal Processing (PHI)
3. Mitra S.K. : Digital Signal Processing (PHI)

REFERENCES

1. Roman Kuc : Digital Signal Processing (MCW)
2. Ifeacher E.C., Jervis B. W. : Digital Signal Processing (Addison Wesely)
3. P. P. Vaidyanathan : DSP and Multirate Systems (PHI)
4. Rabiner and Chrocherie : Multirate DSP (PHI)

7 IE 0 5 PROFESSIONAL ELECTIVE I (4) OPTOELECTRONIC INSTRUMENTATION

UNIT I: Light and Elements of solid state physics, nature of light, wave nature of light, light sources black body radiation, units of light, Energy bands in solids, semiconductor types, works function.

UNIT II: DISPLAY DEVICES : Luminescence, Insestion Lurninescence and the light emitting diode, Radiative recombination processes, LED materials, Commercial LED materials, LED construction, response time of LEDs, LED drive circuitry plasma display liquid crystal displays.

ZASERS : Emission population inversion, optical feedback classes of laser, doped insulator lasers. Semiconductor lasers, gas lasers, liquid dye lasers, laser applications, measurement of distance holography.

UNIT III: OPTICAL FIBERS : -

Classification of optical fiber, priciple of light transmission through a fiber, fabrication of optical fibers, material consideration loss and band width limiting mechanism, perform

fabrication technique, fiber drawing, fiber optic communication system.

UNIT IV: Fiber optic sensors, intensity modulated sensors, microben strain intensity modulated sensor, liquid level types hybrid sensor, internal effect intensity modulated sensor, phase sensor, diffraction grating sensors, sensors using single mode fiber, interferometric temperature sensor, distributed fiber optic sensors, polarization problem in interferometric sensors using single mode fiber.

UNIT V: Medical applications of fiber sensors, Fabry-Perot fiber optic sensors, Electric field and voltage sensors, Chemical fiber optic gyroscopes, magnetic field and current fiber sensor, military and aerospace applications, important applications of integrated optic fiber technology, Local area networks.

UNIT VI: Special applications, ADM, video link, satellite link, computer link, nuclear reactor link, digital video transmission in optical fiber networks, video compression, N.A. measurement, working of OTDR, microprocessor based OTDR, applications of OTDR, dispersion measurements, Bit Error Rate (BER) measurement, attenuation measurement using OTDR, cut-off wavelength measurement, microbending loss measurement. (52)

TEXT BOOK : -

1) Subir Kumar Sarkar : Optical Fibers & Fiber Optic Communication Systemsò, S. Chand & Co., 2001.

REFERENCE BOOKS :

1) Morris Tischler : ñOptoeelctronics : Fiber Optics and Lasersò, A Lab Text Manual, 2nd Edition, McGraw Hill, 1992.
2) Frederick C.Allard : ñFiber Optics Handbook for Engineers & Scientist (Optical & Electro-optical Engineering Series)ò, McGraw Hill, 1990.
3) John M.Senior : Optical Fiber Communications, Principles & Practiceò, 2nd edition, Prentice Hall of India, 1996.

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EIGHTH : SEMESTER

8 IE 0 1 INSTRUMENT AND SYSTEM DESIGN

SECTION - A

UNIT I: Basic concept of instrument Design: Functional requirements and Specification. Operational environment: - commercial, industrial, military. NEMA, DIN, BIS, ANSI standards.

UNIT II : Printed Circuit board Design: General components, layout scheme, grid system, PCB size, mechanical stress, Design rules for digital circuit PCB and analog circuit PCBS. Single and multilayer boards Designing technique for small signal ckt.

UNIT III: Automation and computer use in PCB design artwork , CAD packages and tools, soldering techniques, component assembly, testing.

SECTION - B

UNIT IV: Reliability, MTTR, MTBF, concepts of availability, component screening, infant mortality and bath tube curve, Component ageing. Failure rate analysis, Statistical-sampling criteria. Sampling for units with low failure rates, Redundancy.

UNIT V : Electronic design guidelines: Noise in electronics circuit, the design of low noise circuits, Components limits, sensitive device, sensitive inputs, input Filtering, damping, suppressors.

UNIT VI: Enclosure Design guidelines: Grounding and shielding techniques, protection against electromagnetic interference and electrostatic discharge. Packaging for various operational environments including IP-51 & IP-54.

TEXT BOOKS :

(1) The Art of Electronics (Second edition 1989), Hill & Horowitz, Cambridge University Press.
(2) Electronics, Discharge & Electronics Equipments by Warren.
(3) Reliability Engineering by E. Balguruswamy.
(4) Printed Circuit Boards by Walter Bosshart.

REFERENCE BOOKS :

1. Electronics Instrument Handbook, 1999 ï by Coombs.
2. Basic concept of instrument Design.
3. PC Based PCB design .
4. Electronic design guidelines.
5. Enclosure Design guidelines.

8 IE 02 PROCESS MODELLING & OPTIMIZATION

UNIT I : Classification of models, major activity in model building, use of mathematical models, scope of coverage, principles of formulation.

Fundamental laws: Continuity equations, energy equations, equations of Motions, Transport equations, Equations of state equilibrium, Chemical kinetics.

UNIT II : Solving the mathematical models for dynamic system, heat transfer system, tanks types reactor systems, vaporizer, flashdrum, batch reactors , continuous distillation in multi -tray columns , dynamic modelling of process controlling loop .

UNIT III: Computer simulation; Newton Raphson method ,False position , Euler method , Runge-Kutta (fourth ï order), Adams ï Bashforth method.

UNIT IV: Process Identification: Purpose, Time domain ñEyeballò fitting of step test data, direct sine, pulse, and step signal testing. ATV identification.

UNIT V : The nature & organization of optimization problems, formulation of objective function, cost, time, value of money, measure of probability, methods of least squares.

UNIT VI: Single & multivariable optimization, linear programming and simplex method, sequential quadratic programming & reduced gradient optimization technique, Introduction to geometric programming & dynamic programming.

PRACTICALS:

Students are expected to perform minimum eight experiments based on above syllabus.

TEXT BOOKS: —

1) Process Modeling & Simulation Control for Chemical Engineers by W.L. Luben, McGraw Hill.
2) Optimization of Chemical Process by Edger.

8 IE 03 PROCESS INSTRUMENTATION

UNIT I : Introduction to Process control , Types of processes, process characteristics and controllability, time constant of a process , dead time in process, classification of process variables ,difficulties and requirement of process control implementation , self regulating and non-self regulating Processes, interacting & non-interacting processes.

UNIT II : Multiloop & multivariable process control systems, Feedback control, feed forward control, Cascade control, ratio control, auto selective control, adaptive control system, Coupling & decoupling control system, scaling the instruments.

UNIT III: Boiler instrumentation: combustion control, Air to fuel ratio control, 3-element drum level control, steam pressure, temp control, burner management and control, safely interlocks.

Furnace control, FB-FF-CS of heat exchanger, Evaporator control.

UNIT IV : Distillation column control: Flow control of distillate and bottoms products, reflux control, composition control, pressure & Temperature control.

Reactor control:- Flow, temp, Pressure, endpoint controls , Reactor safety interlocks. Dryer control, pumps & compressor control, cooling Tower control, water treatment control.

UNIT V: Application of DCS: Distillation columns, power plants, Iron and steel plants, cement plants, oil and gas fields, paper and pulp industries.

UNIT VI : Introduction to Intelligent controllers: optimal controller, predictive controller, Expert system and controllers, Artificial Neural networks controllers, fuzzy logic & Neurofuzzy control system, linear and non linear controllers, Single loop and multiloop controllers., model based PID controllers.

PRACTICALS:

Students are expected to perform minimum eight experiments based on above syllabus.

TEXT BOOKS:

1) Process Control Handbook by Bela G. Liptak
2) Process Control concept,dynamics and application by by S.K. Singh. (PHI)
3) Computer Based Industrial Control byð Krishnakant. (PHI)
4) Process Instrumentation & Control Handbook by Considine .

REFRENCE BOOK :

1. Hand book Process control By B.G.Liptak Vol. II

8 IE 04 PROFESSIONAL ELECTIVE-II
(1) ENVIRONMENTAL INSTRUMENTATION

UNIT I: Environmental definition, Constituents, biochemical cycle, causes of pollution, types of pollution and their measurement, effects of pollution, different sensors for measurement of pollution, difference between off ï line measurement and continuous monitoring.

Environmental toxicology and hazards. Common toxic agents, their analysis and safety measures. Environmental regulation and standards.

UNIT II : Review of standard methods of pollution analysis, sampling operation, Devices and techniques as related to environmental engineering.

Air pollution Analysis: Analysis of aerosols and Monitoring of gaseous pollutants like SO_2, H_2S, NO-NOx, CO-CO_2, ozone, NH_3, and organic gases , Vapor Analysis Monitoring of suspended particulate matter and trace matter and trace metal pollutants.

UNIT III: Water pollution Analysis Physical Examination-colour, conductivity, temp, odour , turbidity, hardness. Chemical Characterization-Ca^{2+}. Mg^{2+}, Na^+, K^+, $C1^-$, SO_4^{2-}, HCO_3^-, $A1^{3+}$, Ba $^{2+}$, Boron, F^-, NO_3^-, PO_4^{3-}, Fe^{3+}, Mn $^{2+}$, SiO_2 , Biological investigation-DO,BOD, bacteriological examination, water quality monitoring instrumentation. (pH meters, conductivity meters etc.) Water hardners testing & its removal, Water purification methods.

UNIT IV : Effluent Analysis, Physical Methods of characterization density, viscosity, temperature, conductivity, turbidity, volatile, and dissolved solids, oil and immiscible liquids, colour odour, radioactivity, analysis of organic pollutants, BOD, COD, TOC Specific analysis of Organic pollutants. Analysis of metal pollutants, Analysis of anion and dissolved gases dissolved oxygen , PH, dissolved chlorides, suspended Solids, nitrogen, sludge index.

UNIT V: Soil pollution and pesticide Analysis : Analysis of Micronutrients, trace elements pesticides, Chromatographic Characterization. Polarographic and Spectroscope Analysis of pesticides.
Noise Pollution and its Measurement: Units Devices and Maps Noise Control System.
Radiation Pollution and its Measurement and Control.

UNIT VI: Instrumentation setup for different type of pollution control like Wastewater treatment, HVAC control etc.
Environmental testing, Dry heat, Dry cold, Damp Heat, Salt Spray, Dust, Altitude bump, Vibration drop/Topple, free fall, and study of ISO 14001. (52)

TEXT BOOKS :

1) Environmental Pollution Analysis by S. M. Khopkar 1st ed, Wiley Eastern 1993.
2) Basic Concepts of Analytical Chemistry by S. M. Khopkar.
3) Environmental Engineering by Peary H. S. and others.
4) Sensor Systems for Environmental Monitoring by Campbell.
5) Basic Environmental Technology-(Ed-1997) by J. A. Nathanson.
6) Environmental Tech. Series, V,I,II,III,IV by Neal K. Ustler.

8 IE 04 PROFESSIONAL ELECTIVE-II
(2) ADVANCED BIOMEDICAL INSTRUMENTATION

UNIT I : Patient monitoring system : system concept, bedside patient monitors, central monitors, average reading heart monitor, intensive care monitoring, ambulatory monitoring. Biotelemetry: single channel & multichannel telemetry, telephone & computer based telemetry.

UNIT II: Magnetic resonance imaging system : principles of NMR imaging system, image reconstruction techniques, basic NMR components, applications, advantages & disadvantages of NMR, imaging techniques, Biological effects of NMR imaging.

UNIT III: Computer applications in medical field: biomedical computer applications, computerized patient monitoring system, computer aided ECG analysis, computerized catheterization laboratory, basics of Computer Axial Tomogrphy (CAT).

UNIT IV: Laser applications in biomedical field : principle of operation of Laser, types of Lasers, applications of lasers in endoscopy, engiography, opthalmology & removal of kidney stone.

UNIT V: Regulation of water & electrolyte balance, kidney structure, filteration & reabsorption, renal acid base control, artificial kidney, dialysis system.

UNIT VI: Biosignal conversions & averaging : sampling basics, simple conversion systems, conversion requirements for biomedical signals, signal conversion ckts., basics of signal averaging, signal averaging as a digital filter, software for signal averaging, limitations of signal averaging.

TEXT BOOKS :

1) R.S.Khandpur : Handbook of Biomedical Instrumentation (TMH)
2) L.Cromwell & F. Weibell : Biomedical Instrumentation & Measurements (PHI)
3) W.J.Tmpkins : Biomedical Digital Signal Processing (Eastern Economy Education)
4) Cass & Brown : Introduction to Biomedical Equipment Technology.
5) J.G.Webster : Medical Instrumentation, 3rd edition, John Wiley.

8 IE 0 4 PROFESSIONAL ELECTIVE - II
(3) POWER PLANT INSTRUMENTATION

UNIT I : Thermal power plant : unit overview, types of biolers, turbine generators, condensers, variable speed pumps and fans, material handling system.

UNIT II : Comparison of thermal, hydro, nuclear power plant, boiler safety standards, boiler inspection procedures.

UNIT III: Boiler instrumentation : control and optimization, combustion control, air to fuel ratio control, 3-element drum level control, steam temperature and pressure control, Oxygen/CO/CO_2 in flue gases, furnace draft, electrical megawatt controls, boiler interlocks, sequence event recorder, supervisory control, data acquisition systems, burner management systems and controllers.

UNIT IV: Automation strategy of thermal power plant (PLC, DCS, SCADA) and open system application, block schematic, control equipment, boiler automation, diagnostic functions and protection, digital electro-hydraulic governor, man-machine interface, software system, graphic display of automated power plant, application functions, variable pressure control.

UNIT V : Turbine instrumentation : speed calculation, valve actuation, auto-start-up, thermal stress control, condition monitoringand power distribution instrumentation.

UNIT VI: Hydroelectric power generation, regulation and monitoring of voltage and frequency, pollution and effluent monitoring and control.
Nuclear power generation and control station.

TEXT BOOKS :

1) Payne and Thompson : Efficient Boiler Operation Source Book
2) Popovic & Bhatkar : Distributed Computer Control for Industrial Automation, Dekker.
3) Dickinson and Cheremisinoff : Solar Energy Technology, Vol. I and II, Dekker.
4) Krishna Kant : Computer Based Industrial Control, PHI.
5) W.C.Turner : Energy Management Handbook.

REFERENCE BOOKS :

1) D.M.Considine : Energy Technology Handbook (MAH)
2) B.G.Liptak : Process Control, (Chilton)

8 IE 0 4 PROFESSIONAL ELECTIVE-II
(4) INSTRUMENTATION FOR AGRICULTURE AND FOOD PROCESSING

UNIT I : Introduction, necessity of Instrumentation and control for Food processing and Agriculture, Sensor Requirements; Remote Sensing, Biosensors in agriculture, Standards for food quality.

Soil science and sensors; pH conductivity, resistivity, temperature ,soil moisture and salinity, ion concentration, measurements, methods of soil analysis.
Instrumentation for environmental conditioning of seed germination and growth.

UNIT II : Flow Diagram of Sugar Plant. Sensors and Instrumentation set-up for it. Flow Diagram of Fermenter and Control (Batch process). Oil Extraction Plant and Instrumentation Set-up. Pesticides Manufacturing Process and Control. Flow Diagram of Dairy and Confectionery industry and Instrumentation set-up, Juice Extraction control set-up.

UNIT III: Application of SCADA for Dam parameters and control. Water Distribution and Management Control, Auto-drip Irrigation Systems. Irrigation Canal Management, upstream and downstream control concept, Supervisory control.

UNIT IV: Green Houses and Instrumentation; Ventilation Cooling and Heating, Wind speed, temp. And humidity, rain gauge, carbon and dioxide enrichment measurement and control.

UNIT V : Automation in Earth Moving Equipment and Farm Implements, Pneumatic, Hydraulic and Electronic Control Circuits in Harvesters, cotton pickers, tractors etc.
Application of SCADA and PLC in packaging industry.

UNIT VI: Leaf Area, length, Evapotranspiration, Temperature , wetness and respiration measurements and data logging. Electromagnetic , radiation, photosynthesis, infrared and UV, Biosensors methods in agriculture.
Agrometeorological Instrumentation Weather Stations.

TEXT BOOKS :

1) Industrial Instrumentation ï Patranabis, TMH.
2) Instrumentation Handbook ï Process Control by B.G.Liptak
3) Process Control and Instrumentation Technology by C.D. Johnson.
4) Outline of Chemical Technology By M. Gopala Rao, Marshall Sittig (3/e)

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7KS01 DIGITAL SIGNAL PROCESSING

Unit I: Discrete ï Time Signals and Systems: Introduction to DSP, Advantages, basic elements of DSP system, sampling theorem, A/D, D/A conversion, quantization. Elementary discrete-time sequences. Discrete-time systems: description, representation, classification (linear, time-invariant, static, casual, stable) (08Hrs)

Unit II: Analysis of DTLTI systems: The convolution sum, properties of convolution, Analysis of causal LTI systems, stability of LTI systems, step response of LTI systems, difference equation, recursive & non recursive discrete time systems, solution of difference equations, Impulse response of LTI recursive system. Correlation of discrete time signals. (08Hrs)

Unit III: z- Transform and Analysis of LTI Systems: Definition of z-Transform, properties, rational z-Transforms, evaluation of the inverse z- Transforms, analysis of linear time invariant systems in z-domain, transient and steady-state responses, causality, stability, pole-zero cancellation, the Schur-Cohn stability test. (08Hrs)

Unit IV: Fourier Transforms, the DFT and FFT: Definition & properties of Fourier transform, relation with z-transform. Finite duration sequences and the discrete Fourier transform(DFT), properties, circular convolution, Fast algorithms for the computation of DFT: radix-2 and radix-4 FFT algorithms (08 Hrs)

Unit V: Design of Digital Filters: Classification of filters: LP, HP, BP, FIR and IIR filters, filter specifications. Design of FIR filters using Windows and by Frequency sampling methods. Design of IIR filters from Analog filters using approximation of derivatives, Impulse invariant transformation, Bilinear transformation and Matched z-Transformation, Commonly used Analog filters and IIR Filter design example. (08Hrs)

Unit VI: Realization of Discrete-Time systems: Structures for realization of Discrete-Time systems, realization of FIR systems: Direct Form, Cascade Form, Frequency sampling and Lattice structures. Realization of IIR filters: Direct Form, Signal flow graph and Transposed structures, Cascade form, Lattice and Lattice ladder. Realization for IIR systems. (08Hrs)

TEXT BOOK :

J G Prokis and D G Manolokis, ñDigital Signal Processing: Principles Algorithms and applications (Pearson Education)

REFERENCE BOOKS:

1. S K Mitra: ñDigital Signal Processing: A Computer-Based Approachò (McGraw Hill)
2. E C Ifeacthor and B W Jervis ñDigital Signal Processing A Practical Approachò (Pearson)
3. A V Oppenheim, R W Schafer with J R Buck ñDiscrete Time Signal Processingò(PHI)
4. P Ramesh Babu: ñ Digital Signal Processingò Scitech Publications.

7KS02/7KE02 COMPUTER NETWORKS

UNIT I: Introduction: Brief history of computer networks & Internet, Layered architecture, Internet protocol stack, Network entities & layers, Application layer: Principles of protocols, HTTP, FTP, SMTP and DNS protocols. (08Hrs)

UNIT II: Transport layer: services & principles, multiplexing & demultiplexing applications, UDP, principles of reliable data transfer, TCP details, principles of congestion control, TCP congestion control. (08Hrs)

UNIT III: Network layer: network service model, routing principles, hierarchical routing, Internet Protocol (IP) & ICMP details, routing in the Internet, router internals, IPV6. 08Hrs

UNIT IV: Link layer: Introduction, services, multiple access protocol, LAN addresses & ARP, CSMA / CD, PPP details. (08 Hrs)

UNIT V: Network security: Basic issues, principles of cryptography, authentication and authentication protocol, version, integrity: digital signatures, message digests, hash function algorithm, key distribution & certification, secure e- mail, E-Commerce: SSL & SET, IP Sec details. (08 Hrs)

UNIT VI: Firewalls: Packet filtering and Application gateway, Network Management: Basic principles, infrastructure for network management, The Internet Network ï management framework: SMI, MIB, SNMP details, security and administration, ASN.1 (08 Hrs)

TEXT BOOK:

James F. Kurose & K W Ross: Computer Networking, Pearson Education (LPE)

Reference Books:

1. Douglas E. Comer: Computer Network & Internet, Addison Wesley.
2. Andrew S. Tanenbaum: Computer Networks, PHI (5E)
3. Leon Garcia & Widjaja: Communication Networks, TMH
4. William Stallings: Data & Computer Communication, Pearson Education.

7KS03 DESIGN AND ANALYSIS OF ALGORITHMS

Unit I : Iterative Algorithm Design Issue: Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies, Design using Recursion.

Unit II: Divide And Conquer: Introduction, Multiplication Algorithm and its analysis, Introduction to Triangulation, Covex Hulls, Drawbacks of D & C & Timing Analysis.

Unit III: Greedy Methods: Introduction, Knapsack Problem, Job sequencing with deadlines, Minimum Spanning Trees, Primôs Algorithms, Kruskalôs Algorithm, Dijkstras Shortest Path Algorithm.

Unit IV: Dynamic Programming: Introduction, Multistage Graphs, Traveling Salesman, Matrix multiplication, Longest Common Sub-Sequences, Optimal Polygon Triangulation, Single Source Shortest Paths.

Unit V: Backtracking: Combinational Search, Search & Traversal, Backtracking Strategy, Backtracking Framework, and Some typical State Spaces.

Unit VI: Efficiency of Algorithm: Polynomial Time & Non Polynomial Time Algorithms, Worst and Average case Behavior, Time Analysis of Algorithm, Efficiency of Recursion, Complexity, Examples of Complexity Calculation for Various Sorting algorithms. Time-Space Trade off and Time-Space Trade off in algorithm research.

TEXT BOOK:

Dave and Dave: ñDesign and Analysis of Algorithmsò Pearson Education

REFERENCE BOOKS:

1. Aho,Hopcroft & Ullman ñThe Design & Analysis of Computer Algorithmsò, Addison-Wesley
2. G. Brassard, P.Bratley: ñFundamentals of Algorithmicsò , PHI
3. Horowitz & Sahani: ñ Fundamental Algorithmsò , Galgotia.
4. Cormen, T.H, Lierson & Rivest: ñ Introduction to Algorithmsò, Mc Graw-Hill

7KS04 OBJECT ORIENTED ANALYSIS AND DESIGN

UNIT-I: Modeling Concept: Introduction, Object orientation, OO Development, OO themes, Modeling as a design technique, Class Modeling. Abstraction, The three models, Object and class concepts, Link and association concepts, Generalization & Inheritance, Navigation of class models. (08Hrs)

UNIT II: Advanced object and class concepts, Association Ends, N-ary association, Aggregation, Abstract classes, Multiple inheritance, Metadata, Reification, Constraints, Derived data, Packages, State Modeling: Events, States, Transitions and Conditions, State diagrams, State diagram behavior. (08Hrs)

UNIT III: Nested state diagram, Signal Generalization, Nested states, Concurrency, Relation of class and state models, Use case model, Sequence models, Activity models, Use case relationships, Procedural sequence model, Special constructs for activity models. (08 Hrs)

Unit IV: Development stages, Development life cycle, Devising a system concepts, Elaborating a concepts, Preparing a problem statements, Overview of analysis, Domain class models, Domain state model, Domain Interaction model. (08 Hrs)

Unit V: Application Analysis. Overview of System Design, Estimating Performance, Making a reuse plan, Breaking a system into subsystems, Identifying Concurrency, Allocation of subsystems, Management of data storage, Handling global resources, Choosing a software control strategy, Handling boundary conditions, Setting trade-off priorities, Architecture of the ATM system. (08 Hrs)

Unit VI: Overview of class design, Realizing the use cases, Designing algorithm, Recursing Downwards, Refactoring, Design Optimization, Reification of behavior, Adjustment of Inheritance, Organizing a class design, ATM examples (08 Hrs)

TEXT BOOK :

Blaha , Rumbaugh:òObject Oriented Modeling and Design with UMLò (2/e) Pearson Education.

REFERENCE BOOKS:

1. Dathan, Ramnath: ñObject Oriented Analysis, Design & Implementation,òOUP.
2. McRobb & Farmer: ñObject Oriented System Analysis & Designò Mc Graw Hill.
3. Booch, Rumbaugh & Jacobson: ñ The UML User guideò Pearson Education.

4. Whitten & Bentley: ñSystem Analysis & Design Methodsò Tata McGraw Hill.
5. Booch: ñObject Oriented Analysis & Design with Applicationsò, Pearson Education.

7KS05 PROFESSIONAL ELECTIVE - I
(I) COMPUTER GRAPHICS

Unit I : An overview of Computer Graphics and Graphics System: video display devices, Raster-Scan systems, Random-Scan systems, Graphics monitors and workstations, input devices, hard copy devices, Graphics software. (08 Hrs)

Unit II : Output primitives : Point and Lines, Line drawing algorithms,loading the frame buffer, line function, circle and ellipse generating algorithms, curves, parallel curves algorithms, Pixel addressing, filled-area primitives , functions, Cell array, character generation. (08 Hrs)

Unit III: Attributes of output primitives : Line and curve attributes,color and grayscale levels, area fill attributes. Character attributes, bundled attributes, antialiasing. (08 Hrs)

Unit IV: 2-D geometric transformations : basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, transformation functions, Raster methods for transformations. Two- Dimensional viewing : viewing coordinates, Window-to viewport coordinate transformation, viewing functions, clipping : point, line, polygon, curve, text, exterior. (08Hrs)

Unit V: Structures and hierarchical modeling : concepts, editing structures, basic modeling concepts, hierarchical modeling, GUI and interactive input methods : the user dialogue, input of graphical data, functions, initial values for input device parameters, interactive picture - construction techniques, virtual reality environments. (08Hrs)

Unit VI: Three dimensional concepts : display methods, graphics, Bezier curves and surfaces, B-spline curves and surfaces,Beta-splines, three dimensional geometric and modeling transformations : translation, rotation, scaling, three dimensional viewing : viewing pipeline, viewing coordinates, projections. (08Hrs)

TEXT BOOK:

D. Hearn, M.P.Baker : Computer Graphics, Second Edition, Pearson Education.

REFERENCES:

1. F.S.Hill: Computer Graphics Using Open GL, II edition, Pearson Education.
2. W.M.Newman & R.F.Sproul: Principles of Interactive Computer Graphics, 2/e, McGraw Hill.
3. F.S.Hill : Computer Graphics, McMillan.
4. D.Hearn & M.P.Baker : Computer Graphics, Prentice Hall.
5. Hamington : Computer Graphics, McGraw Hill.

7KS05 PROFESSIONAL ELECTIVE - I
(II) MULTIMEDIA TECHNOLOGIES

Unit I : Multimedia Authoring and Data Representations: Introduction, Components of Multimedia, Hypermedia and Multimedia, Overview of Multimedia Software Tools, Multimedia Authoring and Tools: Multimedia Authoring, VRML. Graphics and Image Data Representations: Graphics/Image Data Types, 1-Bit Images, 8-Bit Gray-Level, Images,Image Data Types, Popular File, Formats, GIF, JPEG, PNG,TIFF, EXIF, Graphics Animation Files, PS and PDF, Windows WMF, Windows BMP, Macintosh PAINT and PICT, X Windows PPM. (08Hrs)

Unit II: Color in Image and Video: Color Science, Color Models in Images, and Color Models in Video. Fundamental Concepts in Video: Types of Video Signals,Component Video, Composite Video, S-Video, Analog Video,NTSC Video, PAL Video, SECAM Video, Digital Video, Chroma Sub sampling CCIR Standards for Digital Video, High Definition TV. (08Hrs)

Unit III: Basics of Digital Audio: Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface, Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion, Quantization and Transmission of Audio, Coding of Audio,Pulse Code Modulation, Differential Coding of Audio, Lossless Predictive Coding, DPCM, DM, ADPCM. (08Hrs)

Unit IV: Multimedia Data Compression: Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding (VLC), Dictionary-BasedCoding, Arithmetic Coding, Lossless Image Compression. The JPEG Standard. (08Hrs)

Unit V: Basic Video Compression Techniques: Introduction, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, Intra-Frame (I-Frame) Coding, Inter-

Frame (P-Frame) Predictive Coding, Quantization in H.261, H.261 Encoder and Decoder, H.261 Video Bitstream Syntax, MPEG-1, Motion Compensation in MPEG-1 , Major Differences from H.261 (08Hrs)

Unit VI: Basic Audio Compression Techniques: ADPCM, Vocoders, Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP. MPEG Audio Compression: Psychoacoustics, Equal-Loudness Relations, Frequency Masking, Temporal Masking, MPEG Audio, MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithm, MPEG-2 AAC (Advanced Audio Coding). (08Hrs)

TEXT BOOK:

Ze-Nian, Li, Mark S. Drew ñFundamentals of Multimediaò (Pearson Education)

REFERENCE BOOKS:

1. Rajan Parekh ñPrinciples of Multimediaò (Tata McGraw-Hill)
2. S.J.Gibbs & D.C.Tsichritzis ñMultimedia Programmingò, Addison Wesley 1995
3. P.W.Agnew & A.S.Kellerman ñDistributed Multimediaò, Addison-Wesley 1996
4. C.A.Poynton, ñA Technical Introduction to Digital Videoò Wiley1996
5. F.Fluckiger, ñUnderstanding Networked Multimediaò, Prentice- Hall 1995

7KS05 PROFESSIONAL ELECTIVE - I
(III) WEB ENGINEERING

UNIT I: Introduction to the Web: History of web, Protocol governing the web, Web architecture, Major issues in Web solution development, Web servers, Web browsers, Internet Standards, TCP/IP protocol suites, IP Address, MIME, Cyber laws. Hypertext Transfer Protocol (HTTP): Introduction, web server and client, Resources, URL and its Anatomy, Message Format, Examples, Persistent and non persistent Connections, Web caching, Proxy. (08Hrs)

Unit II: Hypertext Markup language (HTML): History of HTML, HTML basics, Elements, attributes and tags of HTML, Basic Tags, Advanced Tags, Frames, Images, Meta Tag, Planning of web page, Model amd Structue of web site, Desiging web pages, Multimedia content. Cascading Style Sheet (CSS): Introduction, advantages, Adding CSS, Browser compatibilty, CSS and page layout, Selectors, Grouping, Type Selectors. (08Hrs)

Unit III: Extensible Markup Language (XML): Common Usage, Role of XML, Prolog, Body, Elements, Attribuyes, Validation, Displying XML, Namespaces. XML DTD, Introduction to DTD, Purpose of DTD, DTD in XML document, element type declaration, Attribute declaration, Entity declaration, DTD validation. 08 Hrs

Unit IV: W3C XML Schema: Introduction, limitation of DTD, strengths of schema, schema structure, schema element, element declaration, schema validation, Built in data types, declaring simple elements. (08Hrs)

Unit V: Java Script: Introduction, variables, literals, operators, control structure, conditional statements, Arrays, Functions, Parameter Passing, Function Pointer, Inner/Nested Functions, Objects. (08Hrs)

Unit VI: Common Gateway Interface (CGI): Internat programming paradigm, Server side programming, Language for CGI, Applications, Server environment, Environment variables, CGI building blocks, CGI scripting using C, shell script, writing CGI progarm, CGI security, Alternatives and enhancement in CGI. (08 Hrs)

TEXT BOOK:

Roy Uttam K: Web Technologies, Oxford University Press, 2010.

REFERENCES:

1. Dr. Raja Subramanian: Creating Web Sites in Engineering, University Science Press.
2. Mohler J.L. & Duff J.M.: Desiginig Interactive Web Sites, CENGAGE Learning.
3. Joel Sklar: Text Book of Web Design, CENGAGE Learning.
4. Meenakshi G.M.: Web Graphics, Scitech Publications(India) Pvt. Ltd.

7KS05 PROFESSIONAL ELECTIVE - I
(IV) HUMAN COMPUTER INTERFACE

UNIT I: Human factors of interactive software: Goals of system engineering & User-interface design, motivation for human factors, accommodation of human diversity, High level theories, Object-Action interface model, Recognition of the diversity, Eight golden rules of interface design, Preventing errors, Guidelines for data display and data entry, Balance of automation and human control. (08 Hrs)

UNIT II: Managing design process, Organizational design to support usability, the three pillars of design , Development methodologies, ethnographic observation, Participatory Design,

Scenario Development, Social impact statement for early design review, legal issues, Software tools: specification methods, Interface-Building tools, Evaluation and Critiquing tools. (08 Hrs)

UNIT III: Direct manipulation and virtual environments, example of direct manipulation system, Explan ations of direct manipulation, OAI model, Visual thinking and icons, direct manipulation programming, home automation, Remote Direct manipulation, Virtual environments. (08 Hrs)

UNIT IV: lnteraction devices: Keyboards and function keys, Pointing devices, Speech recognition , digitization and generation, Image and Video Displays, Printers. Response time and Display rate: Theoretical foundations, Expectations and attitudes, User Productivity, Variability. (08 Hrs)

UNIT V: Multiple window strategies, Individual windows design, Multiple window design, Coordination by tightly coupled windows, Image browsing and tightly coupled windows, Personal role management and elastic windows. Computer supported cooperative work: Goals of cooperation , Asynchronous interaction, Synchronous distributed and face-to-face, Applying CSCW to education. (08 Hrs)

UNIT VI: lnformation search and visualization, Database Query and phrase search in textual documents, multimedia documents searches, Information visualization, advanced filtering. Hypermedia and the World Wide Web, Genres and goals and designers, Users and their tasks, Object action interface model for web site design. (08 Hrs)

TEXT BOOK:

Ben Shneiderman:òDesigning the User Interfaceò, Pearson Education.

REFERENCE BOOKS:

1. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd ñHuman-Computer Interactionò,Prentice-Hall.
2. Joann Hackos, Janice Redish, ñUser and Task Analysis for Interface Designò,Wiley.
3. Jeff Raskin, ñThe Humane Interfaceò, Pearson Education.
4. Jesse James Garrett, ôThe Elements of User Experienceò, New Riders.

7KS06 DIGITAL SIGNAL PROCESSING - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KS07 DESIGN & ANALYSIS OF ALGORITHMS - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KS08 OBJECT ORIENTED ANALYSIS & DESIGN - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units along with one mini project.

7KS09 PROJECT AND SEMINAR

Seminar should be preferably based on the proposed project to be completed in final year. The seminar should be conducted in seventh semester and evaluated. Each candidate shall submit a seminar report, deliver the seminar and face the viva-voce. The distribution of internal 50 marks shall be as follows.

1. Seminar report preparation and submission :- 10 marks
2. Seminar delivery/ presentation:- 20 marks
3. Seminar viva-voce:- 10 marks
4. Attendance in all seminar sessions:- 10 marks

SEMESTER : EIGHT

8KS01 ARTIFICIAL INTELLIGENCE

Unit I : Introduction: Definition of AI, AI Techniques, Tic-Tac-Toe, Pattern Recognition, Level of the model, Critical for Success, Problems and Problem Specifications, Defining the Problems, Production Systems, Control Strategies, Futuristic Search, Problem Characteristics, Decomposition of Problems, Solution steps, Predictability, Absolute & Relative Solutions.

Unit II: Basic Problem Solving methods: Reasoning, Problem trees and graphs, Knowledge Representation, Matching indexing with variables, Heuristic Functions, Weak Methods, Problem reduction, Constraints Satisfaction, Means-ends analysis, Analysis of Search Algorithms.

Unit III: Games Playing, Minimax Search Procedure, adding alpha beta cutoffs, additional refinements, waiting for quiescence, Secondary Search, Using Book moves limitations.

Unit IV : Knowledge Representation using Predicate Logic: Representing simple facts in logic, augmenting the representation, resolution, conversion to clause form, Resolution in Propositional Logic and Predicate Logic, Unification Algorithms, Question Answering and Natural Deduction.

Unit V : Structural representation of knowledge: Some common known structures, choosing the level of representation, finding the right structure as needed, declarative representation, semantic nets, Conceptual Dependency, Frames, Scripts, Semantic- Semantic, Spectrum and procedural representation.

Unit VI : Natural Language Understanding: Concepts of Understanding, Keyword matching, Syntactic and Semantic analysis, Understanding single and multiple sentences, Using Four, Cover structures, Schemes and Scripts in Understanding, Dialogue Understanding.

TEXT BOOK:

Elaine Rich & Knight: ñArtificial Intelligenceò, McGraw Hill.

REFERENCE BOOKS:

1. Nils Nilson: ñ Principles of Artificial Intelligenceò.(Addison-Wesley)

2. R. J. Winston: ñ Artificial Intelligenceò.(Wiley)

3. Patterwson ñIntroduction to Artificial Intelligence and Expert Systemsò (PHI).

4. Rolston ñPrinciples of Artificial Intelligence and Expert Systemsò, McGraw Hill.

8KS02/8KE02 EMBEDDED SYSTEMS

Unit-I Introduction to Embedded System: Embedded Systems Vs General Computing Systems. History, classification, major application areas and purpose of Embedded Systems. Components of Embedded system: General Purpose and Domain Specific Processors, Memories for embedded systems.

Unit-II Components of Embedded system: Sensors & Actuators, Communication Interface, Embedded Firmware and other components. Characteristics of Embedded System, Quality Attributes of Embedded System. Embedded Systems Examples: Washing machine. Automotive application.

Unit-III Introduction to 8051Microcontroller: 8051 Architecture, 8051 Memory Organization, Registers, Oscillator Unit, Ports, 8051 Interrupt System, Timer units, the Serial Port, 8051 Power Saving Modes.

Unit-IV: Programming the 8051 Microcontroller: Addressing modes. 8051 Instruction Set: Data transfer instructions, Arithmetic instructions, Logical instructions, Boolean instructions, and Program Control Transfer instructions. Assembly Language based Embedded Firmware development.

Unit-V : Programming in Embedded C: Review of various constructs in C. Constant declarations, óvolatileô type qualifier, Delay generation and Infinite loops in Embedded C. Coding Interrupt Service Routines, Recursive and Re-entrant Functions, Dynamic memory allocation.

Unit-VI : VxWorks Real Time Operating System (RTOS): Characteristics, Real Time Kernel, Hard/Soft Real time. VxWorks Task Creation, Management and Task Scheduling, Kernel Services, Inter Task Communication, VxWorks Task Synchronization and Mutual Exclusion, Interrupt Handling, Watchdog for task Execution monitoring, Timing and Reference in VxWorks.

TEXTBOOK:

Shibu K V ñIntroduction to Embedded Systemsò McGraw-Hill.

REFERENCES:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newness Publication.
3. Vahid and Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8KS03/8KE03 SOFTWARE ENGINEERING

Unit I : Evolving role of Software. Software crises & myths. Software engineering. Software process & process models: Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts: People, Product, Process, Project. W5HH principles, critical practice. (08 Hrs)

Unit II: Measures, Metrics & Indicators. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection, refinement & RMMM plan. (08 Hrs)

Unit III: Project Scheduling: Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard. (08 Hrs)

Unit IV: System engineering: Hierarchy, Business Process & Product engineering: Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation. (08 Hrs)

Unit V: Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation. (08 Hrs)

Unit VI: Software testing fundamentals; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software. (08 Hrs)

TEXTBOOK:

Pressman Roger. S: Software Engineering, A Practitioner's Approach, TMH.

REFERENCE BOOKS :

1. Somerville: Software Engineering (Addison-Wesley) (5/e)
2. Fairly R: Software Engineering (McGraw Hill)
3. Davis A: Principles of Software Development (McGraw Hill)
4. Shooman, M.L: Software Engineering (McGraw-Hill)

8KS04 PROFESSIONAL ELECTIVE - II
(I) DISRIBUTED COMPUTING

UNIT-I: Basic distributed system: Introduction, Distributed computing models, Software concepts, Issues in designing distributed system, Client Server model, Case studies. (08 Hrs)

UNIT II: Inter process Communication: Message passing Group Communication, Remote Communication: Introduction, Remote procedural call basics, RPC Implementation, RPC Communication, Other RPC Issues, Remote method, Invocation basics, RMI Implementation. (08 Hrs)

UNIT III: Synchronization: Introduction, Clock Synchronization, Logical clocks, Global state, Mutual Exclusion, Election algorithms, Deadlock in Distributed systems. (08 Hrs)

UNIT IV: Distributed system management: Introduction Research management, Task assignment approach, Load balancing

approach, Load sharing g approach, Process management in a distributed environment, Process migration, Threads, Fault tolerance. (08 Hrs)

UNIT V: Distributed shared memory: Introduction, Basic concepts of DSM, Hardware DSM, Design Issues in DSM, Issues in implementing DSM systems, Heterogeneous and other DSM systems. (08 Hrs)

UNIT VI: Distributed File System: Introduction to DFS, File models, DFS design, Semantics of file sharing, DFS Implementation, File catching in DFS, Replication in DFS. (08 Hrs)

TEXT BOOK :

Sunita Mahajan & Seema Shah: "Distributed Computing" Oxford University Press

REFERENCE BOOKS:

1. Tanenbaum: "Distributed Operating Systems" Pearson Education.
2. Sinha: "Distributed Operating Systems Concepts & Design" PHI.
3. Tanenbaum & Van Steen: "Distributed Systems Principles & Paradigms" PHI, Second Edition.
4. Crichlow: "Distributed Systems- Computing Over Networks" PHI.

8KS04 PROFESSIONAL ELECTIVE - II
(II) MOBILE COMPUTING

Unit I : Introduction: Applications, History of wireless communication, A simplified reference model, Wireless Transmissions: Frequencies for Radio Transmissions, Signals, Antennas, Signal Propagations, Multiplexing, Modulation, Spread Spectrum, Cellular System. (08 Hrs)

Unit II: Medium Access Control: Motivations for a specialized MAC, SDMA, FDMA, TDMA.CDMA, Comparison of S/T/F/CDMA, Telecommunications System: GSM, DECT, TETRA, UMTS and IMT-2000. (08 Hrs)

Unit III: Satellite Systems: History, Applications, Basics, Routing, Localizations, Handover, Examples, Broadcast Systems: Cyclical Repetition of Data, Digital Audio Broadcasting, Digital video Broadcasting, Convergence of Broadcasting and mobile communications. (08 Hrs)

Unit IV: Wirelesses LAN: Infra Red Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11, HIPERLAN, Bluetooth. (08 Hrs)

Unit V: Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Ad-hoc Networks, Mobile Transport Layer:

Traditional TCP, Classical TCP improvements, TCP over 2.5/3G Wireless Networks. (08 Hrs)

Unit VI: Support for Mobility: File Systems, World Wide Web, Wireless Application Protocol (version 1.X) Arhitecture, i-mode, SyncML, WAP2.0. (08 Hrs)

TEXT BOOK :

ochen Schiller: ñMobile Communicationò Pearson Education, Second Edition.

REFERENCE BOOKS:

1. Mazliza Othman: ñ Principles of Mobile Computing and Communicationsò, Auerbach.
2. Agrawal and Zeng: ñIntroduction to Wireless and Mobile Systemsò Cengage Learning.
3. Upena Dalal: ñ Wireless Communicationò Oxford University Press.
4. Raj Kamal: ñMobile Computingò Oxford University Press.

8KS04 PROFESSIONAL ELECTIVE - II
(III) SOFT COMPUTING

UNIT-I: Fundamental of Neural Network: Basic concepts of Neural Network, Human Brain, Model of artificial neurons, Neural Network architecture, Characteristics of Neural Network, Learning methods, Taxonomy of Neural Network architecture, Early Neural Network architecture. (08 Hrs)

UNIT II: Architecture of a Backpropagation Network, The Perceptron Model, The solution, Single Layer Artificial Neural Network, Model for Multiayer Perceptron, Back propagation learning, Input Layer, Hidden Layer and Output Layer Computation, Calculation of error, Training of Neural Network, Method of Seepest Descent,Effect of Learning rate, Adding a momentum Term, Backpropogation Algorithm. (08Hrs)

UNIT-III: Fuzzy Set Theory: Fuzzy verses Crisp, Crisp sets, Operations and Properties of Crisp Sets, Partition and Covering, Fuzzy sets, Membership Function, Basic Fuzzy Set Operation, Properties of Fuzzy Sets, Crisp Relations, Cartesian product, other relations, Operations on Relations, Fuzzy Relations, Fuzzy Cartesian Product, Operations on Fuzzy Relations. (08Hrs)

UNIT IV: Fuzzy Systems: Crisp logic, Laws of Propositional logic, Inference in Propositional logic, Predicate logic, Interpretations of Predicate Logic Formula, Inference in Predicate Logic, Fuzzy logic, Fuzzy Quantifiers and Inference, Fuzzy rule based system, Defuzzification methods, applications. (08 Hrs)

UNIT V: Fundamental of Genetic Algorithm: Genetic Algorithms, Basic Concepts, Creation of offspring, Working Principle, Encoding, Binary, Octal, Hexadecimal, Permutation, Value, Tree, Fitness function, Reproduction. (08 Hrs)

UNIT VI: Genetic Modeling: Inheritance Operators, Cross over, Inversion & Deletion, Mutation Operator, Bit wise operator, Bit wise operator used in GA, Generational cycle, Convergence of genetic algorithm, Application, Multilevel Optimization, Real life problem, Differences and similarities between GA and other traditional methods, Advances in GA. (08 Hrs)

TEXT BOOK:

S. Rajesekaran, G. A. Vijayalakshmi Pai: ñNeural Network, Fuzzy logic, and Genetic algorithms Synthesis and Applicationsò PHI.

REFERENCE BOOKS:

1. S. Haykin: ñ Neural Networksò Pearson Education.
2. Jang,Sun and Mezutani: ñ Neuro Fuzzy and Soft Computingò .McGraw-Hill
3. J.Yen, R. Langari: ñ Fuzzy Logic: Intelligence, Control & Information ñ. Pearson Education.
4. N.P.Pahey: ñArtificial Intelligence and Intelligent Systemsò, Oxford University Press.

8KS04 PROFESSIONAL ELECTIVE - II
(IV) NETWORK SECURITY

Unit I: Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Internetwork Security, Internet Standards and the Internet Society. Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. (08 Hrs)

Unit II: Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Public Key Cryptography Algorithms, Digital Signatures, Key Management. (08 Hrs)

Unit III: Authentication Applications: Kerberos, X.509 Authentication Service, Public-Key Infrastructure, Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, (08 hrs)

Unit IV: IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management, Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). (08 Hrs)

Unit V: Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3, Intruders**:** Intruders, Intrusion Detection, Password Management. (08 Hrs)

Unit VI: Malicious Software: Viruses and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks, Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation. (08 Hrs)

TEXT BOOK:

William Stallings: ñNetwork Security Essentials Applications and Standardsò Pearson Education, Third Edition.

REFERENCE BOOKS:

1. Atul Kahate: ñCryptography and Network Securityò Mc Graw Hill.
2. Forouzan and Mukhopahyay: ñòCryptography and Network Securityò Mc Graw Hill.
3. Matt Bishop: ñ Computer Security: Art & Scienceò Pearson Education.
4. Brijendra Singh: ñ Network Security & Managementò PHI.

8KS05 ARTIFICIAL INTELLIGENCE - LAB.

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

8KS06 EMBEDDED SYSTEMS - LAB.

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

8KS07 PROJECT & SEMINAR

The project shall be internally evaluated (for 75 Internal Marks) in three phases based on the progress of the project work. Each phase shall be internally evaluated for 25 marks as follows:

Phase I: - Problem Definition and Design

Phase II: - Problem Implementation and Testing

Phase III: - Project Demonstration & Report submission.

The external evaluation of the project shall be based on demonstration of the project and viva-voce

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
COMPUTER ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7KE01 SIGNALS AND SYSTEMS

Unit I : Continuous time and discrete time signals, transformation of the independent variable, exponential and sinusoidal signals, unit impulse and unit step functions, operations on signals like folding, time-shifting, amplitude scaling and time-scaling, mixing of signals and modulation. (08Hrs)

Unit-II: Continuous time and discrete time systems, basic system properties, discrete time LTI systems, Continuous time LTI systems, Properties of linear time invariant systems, Causal LTI systems described by differential and difference equations, Singularity functions. (08 Hrs)

Unit III: Fourier Series representation of periodic signals: Response of LTI systems to complex exponentials, Fourier representation of continuous time periodic signals, convergence of the Fourier series, Properties of continuous time Fourier series, Fourier series representation of discrete ï time periodic signals, properties of discrete time Fourier series, Fourier series and LTI systems, filtering. (08 Hrs)

Unit IV: Continuous ï Time Fourier Transform: Development of the Fourier transform representation of an aperiodic signal, the Fourier transform for periodic signals, properties of the continuous time Fourier transform, the convolution property, multiplication property, Linear constant coefficient differential equations. (08 Hrs)

Unit V: Sampling: Representation of continuous time signals by its samples, reconstruction of a signal from its samples, aliasing, discrete time processing of continuous time signals, sampling of discrete time signals. (08 Hrs)

Unit VI : Z- Transform: Z- transform, the region of convergence for the z-transform, Inverse z- transform, properties of Z transform, analysis and characterization of LTI systems using z transforms, System function algebra and block diagram representations, the unilateral z ï transform. (08 Hrs)

TEXT-BOOK :

Oppenheim, Willsky, Nawab ó Signals and Systemsô, Pearson Education.

REFERENCE BOOKS:

1. Fred Taylor ó Principles of Signals and Systemsô, TMH.
2. Nagrath, Sharan, Ranjan Rakesh and Kumar Sukhbinder : óSignals and Systemsô, TMH
3. Sudhakar óSignals and Systemsô, TMH
4. Rawat: ñSignals and Systemsò Oxford University Press.

7KS02/7KE02 COMPUTER NETWORKS

UNIT I: Introduction: Brief history of computer networks & Internet, Layered architecture, Internet protocol stack, Network entities & layers, Application layer: Principles of protocols, HTTP, FTP, SMTP and DNS protocols. (08Hrs)

UNIT II: Transport layer: services & principles, multiplexing & demultiplexing applications, UDP, principles of reliable data transfer, TCP details, principles of congestion control, TCP congestion control. (08Hrs)

UNIT III: Network layer: network service model, routing principles, hierarchical routing, Internet Protocol (IP) & ICMP details, routing in the Internet, router internals, IPV6. (08Hrs)

UNIT IV: Link layer: Introduction, services, multiple access protocol, LAN addresses & ARP, Carrier Sense Multiple Access with Collision Detection (CSMA / CD) , PPP details. (08 Hrs)

UNIT V: Network security: Basic issues, principles of cryptography, authentication and authentication protocol, version, integrity: digital signatures, message digests, hash function algorithm, key distribution & certification, secure e- mail, E-Commerce: SSL & SET, IP Sec details. (08 Hrs)

UNIT VI: Network Management: Basic principles, infrastructure for network management, The Internet Network ï management framework: SMI, MIB, SNMP details, security and administration, ASN 1, Firewalls: Packet filtering and Application gateway. (08 Hrs)

TEXT BOOK:

James F. Kurose & K W Ross: Computer Networking, Pearson Education (LPE)

REFERENCE BOOKS:

1. Douglas E. Comer: Computer Network & Internet, Addison Wesley.
2. Andrew S. Tanenbaum: Computer Networks, PHI (5E)
3. Leon Garcia & Widjaja: Communication Networks, TMH
4. William Stallings: Data & Computer Communication, Pearson Education.

7KE03 MICROPROCESSOR AND INTERFACING

UNIT I: Pin configuration of 8086, Functions of various pins, Register organization. Physical memory organization and segmentation, General bus organization, I/O addressing, 8086 minimum mode system and timings.

UNIT II: 8086 Instruction set: Addressing modes of 8086. Group of instructions: data transfer group, arithmetic/logic group, branch group, machine control & I/O group of instructions. 8086 Programming using these instructions.

UNIT III: 8086 I/O address space. I/O instructions & bus cycle. 8255 PPI, pin diagram, internal organization, modes of operation, strobbed modes, interrupt driven mode, BSR mode. 8086 & I/ O Interfacing through 8255.

UNIT IV: 8086 interrupt signals & system. Priority & Interrupt Vector table. Programmable Interrupt Controller 8259, pin diagram, ICWs, OCWs, modes of operation and interfacing details, cascaded mode, SFNM, polled mode, SMM.

UNIT V: Programmable Timer Counter 8254, pin diagram, internal architecture, modes of operation. Interfacing 8254 with 8086. Memory types. Interfacing memory with 8086: Static RAM and Dynamic RAM interfacing examples.

UNIT VI: DMA controller 8237, pin diagram, internal architecture, transfer modes and interfacing with 8086 processor. USART 8251, pin diagram, internal architecture, modes of operation synchronous and asynchronous modes and interfacing with 8086.

TEXT BOOK:

John P Uffenbeck, 8086/8088 Families: Designing, Programming and Interfacing (PHI)

REFERENCE BOOKS:

1. Liu & Gibson ñ8086/8088 Microprocessorsò (PHI)
2. Douglas Hall ñ8086 Microprocessors & Interfacingò (McGraw-Hill)
3. Barry B Bray ñ The Intel Microprocessorsò (9/e) (PHI).
4. Triebel & A Singh ñThe 8086/8088 Microprocessorsò 4/e (PHI).

7KE04 MOBILE COMPUTING

Unit I : Introduction: Applications, History of wireless communication, A simplified reference model, Wireless Transmissions: Frequencies for Radio Transmissions, Signals, Antennas, Signal Propagations, Multiplexing, Modulation, Spread Spectrum, Cellular System. (08 Hrs)

Unit II : Medium Access Control: Motivations for a specialized MAC, SDMA, FDMA, TDMA.CDMA, Comparison of S/T/F/CDMA, Telecommunications System: GSM, DECT, TETRA, UMTS and IMT-2000. 08 Hrs

Unit III: Satellite Systems: History, Applications, Basics, Routing, Localizations, Handover, Examples, Broadcast Systems: Cyclical Repetition of Data, Digital Audio Broadcasting, Digital video Broadcasting, Convergence of Broadcasting and mobile communications. 08 Hrs

Unit IV: Wirelesses LAN: Infra Red Vs Radio Transmission, Infrastructure and Ad-hoc Network, IEEE 802.11, HIPERLAN, Bluetooth. 08 Hrs

Unit V: Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Ad-hoc Networks, Mobile Transport Layer: Traditional TCP, Classical TCP improvements, TCP over 2.5/3G Wireless Networks. 08 Hrs

Unit VI: Support for Mobility: File Systems, World Wide Web, Wireless Application Protocol (version 1.X) Arhitecture, i-mode, SyncML, WAP2.0. 08 Hrs

TEXT BOOK:

Jochen Schiller: ñMobile Communicationò Pearson Education, Second Edition.

REFERENCE BOOKS:

1. Mazliza Othman: ñPrinciples of Mobile Computing and Communicationsò Auerbach.
2. Agrawal and Zeng: ñIntroduction to Wireless and Mobile Systemsò Cengage Learning.
3. Iti Saha Misra: ñWireless Communications and Networks McGraw Hill.
4. Raj Kamal: ñMobile Computingò Oxford University Press.

7KE05 PROFESSIONAL ELECTIVE - I
(I) ARTIFICIAL INTELLIGENCE

Unit I : Introduction: Definition of AI, AI Techniques, Tic Tac Toe, Pattern Recognition, Level of the model, Critical for Success, Problems and Problem Specifications, Defining the Problems, Production Systems, Control Strategies, Futuristic Search, Problem Characteristics, Decomposition of Problems, Solution steps, Predictability, Absolute & Relative Solutions.

Unit II : Basic Problem Solving methods: Reasoning, Problem trees and graphs, Knowledge Representation, Matching indexing with

variables, Heuristic Functions, Weak Methods, Problem reduction, Constraints Satisfaction, Means-ends analysis, Anaysis of Search Algorithms.

Unit III: Games Playing, Minimax Search Procedure, adding alpha beta cutoffs, additional refinements, Waiting for quiescence, Secondary Search, Using Book moves limitations.

Unit IV: Knowledge Representation using Predicate Logic: Representing simple facts in logic, augmenting the representation, resolution, conversion to clause form, Resolution in Propositional Logic and Predicate Logic, Unification Algorithms, Question Answering and Natural Deduction.

Unit V: Structural representation of knowledge: Some common known structures, choosing the level of representation, finding the right structure as needed, declarative representation, semantic nets, Conceptual Dependancy, Frames, Scripts, Symantic- Semantic, Spectrum and procedural representation.

Unit VI: Natural Language Understanding: Concepts of Understanding, Keyword matching, Syntactic and Semantic analysis , Understanding single and multiple sentences, Using Four, Cover structures, Schemes and Scripts in Understanding, Dialogue Understanding.

TEXT BOOK:

Elaine Rich & Knight: ñArtificial Intelligenceò, McGraw Hill.

REFERENCE BOOKS:

1. Nils Nilson: ñ Principles of Artificial Intelligenceò.(Addison-Wesley)
2. R. J. Winston: ñ Artificial Intelligenceò.(Wiley)
3. Patterwson ñIntroduction to Artificial Intelligence and Expert Systemsò (PHI).
4. Rolston ñPrinciples of Artificial Intelligence and Expert Systemsò, McGraw Hill.

7KE05 PROFESSIONAL ELECTIVE - I
(II) COMPUTER GRAPHICS

Unit I : An overview of Computer Graphics and Graphics System: video display devices, Raster-Scan systems, Random-Scan systems, Graphics monitors and workstations, input devices, hard copy devices, Graphics software. (08 Hrs)

Unit II : Output primitives : Point and Lines, Line drawing algorithms,loading the frame buffer, line function, circle and ellipse generating algorithms, curves, parallel curves algorithms,

Pixel addressing, filled-area primitives , functions, Cell array, character generation. (08 Hrs)

Unit III : Attributes of output primitives : Line and curve attributes,color and grayscale levels, area fill attributes. Character attributes, bundled attributes, antialiasing. (08 Hrs)

Unit IV: 2-D geometric transformations: basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, transformation functions, Raster methods for transformations. Two- Dimensional viewing : viewing coordinates, Window-to viewport coordinate transformation, viewing functions, clipping : point, line, polygon, curve, text, exterior. (08Hrs)

Unit V: Structures and hierarchical modeling : concepts, editing structures, basic modeling concepts, hierarchical modeling, GUI and interactive input methods : the user dialogue, input of graphical data, functions, initial values for input device parameters, interactive picture - construction techniques, virtual reality environments. (08Hrs)

Unit VI: Three dimensional concepts : display methods, graphics, Bezier curves and surfaces, B-spline curves and surfaces,Beta-splines, three dimensional geometric and modeling transformations : translation, rotation, scaling, three dimensional viewing : viewing pipeline, viewing coordinates, projections. (08Hrs)

TEXT BOOK:

D. Hearn, M.P.Baker : Computer Graphics, Second Edition, Pearson Education.

REFERENCE BOOKS:

1. F.S.Hill: Computer Graphics Using Open GL, II edition, Pearson Education.
2. W.M.Newman & R.F.Sproul: Principles of Interactive Computer Graphics, 2/e, McGraw Hill.
3. F.S.Hill : Computer Graphics, McMillan.
4. D.Hearn & M.P.Baker : Computer Graphics, Prentice Hall.
5. Hamington : Computer Graphics, McGraw Hill.

7KE05 PROFESSIONAL ELECTIVE - I
(III) DESIGN AND ANALYSIS OF ALGORITHMS

Unit I : **Iterative Algorithm Design Issue:** Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies, Design using Recursion.

Unit II: **Divide And Conquer:** Introduction, Multiplication Algorithm and its analysis, Introduction to Triangulation, Covex Hulls, Drawbacks of D & C & Timing Analysis.

Unit III: **Greedy Methods:** Introduction, Knapsack Problem, Job sequencing with deadlines, Minimum Spanning Trees, Primôs Algorithms, Kruskalôs Algorithm, Dijkstras Shortest Path Algorithm.

Unit IV: **Dynamic Programming:** Introduction, Multistage Graphs, Traveling Salesman, Matrix multiplication, Longest Common Sub-Sequences, Optimal Polygon Triangulation, Single Source Shortest Paths.

Unit V: **Backtracking:** Combinational Search, Search & Traversal, Backtracking Strategy, Backtracking Framework, Some typical State Spaces.

Unit VI: **Efficiency of Algorithm:** Polynomial Time & Non Polynomial Time Algorithms, Worst and Average case Behavior, Time Analysis of Algorithm, Efficiency of Recursion, Complexity, Examples of Complexity Calculation for Various Sorting algorithms. Time-Space Trade off and Time-Space Trade off in algorithm research.

TEXT BOOK:

Dave and Dave: ñDesign and Analysis of Algorithmsò Pearson Education

REFERENCE BOOKS:

1. Aho,Hopcroft & Ullman ñThe Design & Analysis of Computer Algorithmsò, Addison-Wesley
2. G.Brassard, P.Bratley: ñFundamentals of Algorithmicsò , PHI
3. Horowitz & Sahani: ñ Fundamental Algorithmsò , Galgotia.
4. Cormen, T.H, Lierson & Rivest: ñ Introduction to Algorithmsò, Mc Graw-Hill

7KE05 PROFESSIONAL ELECTIVE - I
(IV) HUMAN COMPUTER INTERACTION

UNIT I : Human factors of interactive software: Goals of system engineering & User-interface design, motivation for human factors, accommodation of human diversity, High level theories, Object-Action interface model, Recognition of the diversity, Eight golden rules of interface design, Preventing errors, Guidelines for data display and data entry, Balance of automation and human control. (08 Hrs)

UNIT II: Managing design process, Organizational design to support usability, the three pillars of design , Development

methodologies, ethnographic observation, Participatory Design, Scenario Development, Social impact statement for early design review, legal issues, Software tools: specification methods, Interface-Building tools, Evaluation and Critiquing tools. (08 Hrs)

UNIT III: Direct manipulation and virtual environments, example of direct manipulation system, Explanations of direct manipulation, OAI model, Visual thinking and icons, direct manipulation programming, home automation, Remote Direct manipulation, Virtual environments. (08 Hrs)

UNIT IV: Interaction devices: Keyboards and function keys, Pointing devices, Speech recognition , digitization and generation, Image and Video Displays, Printers. Response time and Display rate: Theoretical foundations, Expectations and attitudes, User Productivity, Variability. (08 Hrs)

UNIT V: Multiple window strategies, Individual windows design, Multiple window design, Coordination by tightly coupled windows, Image browsing and tightly coupled windows, Personal role management and elastic windows. Computer supported cooperative work: Goals of cooperation , Asynchronous interaction, Synchronous distributed and face-to-face, Applying CSCW to education. (08 Hrs)

UNIT VI: Information search and visualization, Database Query and phrase search in textual documents, multimedia documents searches, Information visualization, advanced filtering. Hypermedia and the World Wide Web, Genres and goals and designers, Users and their tasks, Object action interface model for web site design. (08 Hrs)

TEXT BOOK:

Ben Shneiderman: ñDesigning the User Interfaceò, Pearson Education.

REFERENCE BOOKS:

1. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd ñHuman-Computer Interactionò,Prentice-Hall.
2. Joann Hackos, Janice Redish, ñUser and Task Analysis for Interface Designò,Wiley.
3. Jeff Raskin, ñThe Humane Interfaceò, Pearson Education.
4. Jesse James Garrett, ôThe Elements of User Experienceò, New Riders.

7KE06 COMPUTER NETWORK - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KE07 MICROPROCESSOR & INTERFACING - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KE08 MOBILE COMPUTING - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

7KE09 PROJECT AND SEMINAR:

Seminar should be preferably based on the proposed project to be completed in final year. The seminar should be conducted in seventh semester and evaluated. Each candidate shall submit a seminar report, deliver the seminar and face the viva-voce. The distribution of internal 50 marks shall be as follows.

1.	Seminar report preparation and submission :-	10 marks
2.	Seminar delivery/ presentation:-	20 marks
3.	Seminar viva-voce:-	10 marks
4.	Attendance in all seminar sessions:-	10 marks

SEMESTER : EIGHT

8KE01 DIGITAL SIGNAL PROCESSING

Unit I: Discrete ï Time Signals and Systems: Introduction to DSP, Advantages, basic elements of DSP system, sampling theorem, A/D, D/A conversion, quantization. Elementary discrete-time sequences. Discrete-time systems: description, representation, classification (linear, time-invariant, static, casual, stable) (08Hrs)

Unit II: Analysis of DTLTI systems: The convolution sum, properties of convolution, Analysis of causal LTI systems, stability of LTI systems, step response of LTI systems, difference equation, recursive & non recursive discrete time systems, solution of difference equations, Impulse response of LTI recursive system. Correlation of discrete time signals. (08Hrs)

Unit III:- Transform and Analysis of LTI Systems: Definition of z-Transform, properties, rational z-Transforms, evaluation of the inverse z- Transforms, analysis of linear time invariant systems in z-domain, transient and steady-state responses, causality, stability, pole-zero cancellation, the Schur-Cohn stability test. (08Hrs)

Unit IV: Fourier Transforms, the DFT and FFT: Definition & properties of Fourier transform, relation with z-transform. Finite duration

sequences and the discrete Fourier transform (DFT), properties, circular convolution., Fast algorithms for the computation of DFT: radix-2 and radix-4 FFT algorithms (08 Hrs)

Unit V: Design of Digital Filters: Classification of filters: LP, HP, BP, FIR and IIR filters, filter specifications. Design of FIR filters using Windows and by Frequency sampling methods. Design of IIR filters from Analog filters using approximation of derivatives, Impulse invariant transformation, Bilinear transformation and Matched z-Transformation, Commonly used Analog filters and IIR Filter design example. (08Hrs)

Unit VI: Realization of Discrete-Time systems: Structures for realization of Discrete-Time systems, realization of FIR systems: Direct Form, Cascade Form, Frequency sampling and Lattice structures. Realization of IIR filters: Direct Form, Signal flow graph and Transposed structures, Cascade form, Lattice and Lattice ladder. Realization for IIR systems. (08Hrs)

TEXT BOOK :

J G Prokis and D G Manolokis, ñDigital Signal Processing: Principles Algorithms and applications (Pearson Education)

REFERENCE BOOKS:

1. S K Mitra: ñDigital Signal Processing: A Computer-Based Approachò (McGraw Hill)
2. E C Ifeachor, B W Jervis ñDigital Signal Processingò (Pearson Education)
3. A V Oppenheim, R W Schafer with J R Buck ñDiscrete Time Signal Processingò(PHI)
4. P Ramesh Babu: ñ Digital Signal Processingò Scitech Publications.

8KS02/8KE02 EMBEDDED SYSTEMS

Unit-I : Introduction to Embedded System: Embedded Systems Vs General Computing Systems. History, classification, major application areas and purpose of Embedded Systems. Components of Embedded system: General Purpose and Domain Specific Processors, Memories for embedded systems.

Unit-II : Components of Embedded system: Sensors & Actuators, Communication Interface, Embedded Firmware and other components. Characteristics of Embedded System, Quality Attributes of Embedded System. Embedded Systems Examples: Washing machine. Automotive application.

Unit-III : Introduction to 8051Microcontroller: 8051 Architecture, 8051 Memory Organization, Registers, Oscillator Unit, Ports, 8051 Interrupt System, Timer units, the Serial Port, 8051 Power Saving Modes.

Unit-IV: Programming the 8051 Microcontroller: Addressing modes. 8051 Instruction Set: Data transfer instructions, Arithmetic instructions, Logical instructions, Boolean instructions, and Program Control Transfer instructions. Assembly Language based Embedded Firmware development.

Unit-V : Programming in Embedded C: Review of various constructs in C. Constant declarations, óvolatileô type qualifier, Delay generation and Infinite loops in Embedded C. Coding Interrupt Service Routines, Recursive and Re-entrant Functions, Dynamic memory allocation.

Unit-VI : VxWorks Real Time Operating System (RTOS): Characteristics, Real Time Kernel, Hard/Soft Real time. VxWorks Task Creation, Management and Task Scheduling, Kernel Services, Inter Task Communication, VxWorks Task Synchronization and Mutual Exclusion, Interrupt Handling, Watchdog for task Execution monitoring, Timing and Reference in VxWorks.

TEXT BOOK:

Shibu K V ñIntroduction to Embedded Systemsò McGraw-Hill.

REFERENCE BOOKS:

1. Rajkamal , ñEmbedded Systems, Architecture, Programming & Designò TMH.
2. Tammy Noergaard ñEmbedded Systems Architectureò Elsevier Newness Publication.
3. Vahid and Givargis ñEmbedded System Designò John Wiley & Sons P Ltd.
4. Peter Marwedel ñEmbedded Systems Designò Springer, Netherland.

8KS03/8KE03 SOFTWARE ENGINEERING

Unit I: Evolving role of Software. Software crises & myths. Software engineering. Software process & process models: Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts: People, Product, Process, Project. W5HH principles, critical practice. (08 Hrs)

Unit II: Measures, Metrics & Indicators. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks :

identification, risk projection, refinement & RMMM plan. (08 Hrs)

Unit III: Project Scheduling: Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard. (08 Hrs)

Unit IV: System engineering: Hierarchy, Business Process & Product engineering: Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation. (08 Hrs)

Unit V: Software architecture, Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis & modeling, ID activities, Tools, design evaluation. Component level design: Structure programming, Comparison of design notation. (08 Hrs)

Unit VI: Software testing fundamentals; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software. (08 Hrs)

TEXT BOOK:

Pressman Roger. S: Software Engineering, A Practitioner's Approach, TMH.

REFERENCE BOOKS :

1. Somerville: Software Engineering (Addison-Wesley) (5/e)
2. Fairly R: Software Engineering (McGraw Hill)
3. Davis A: Principles of Software Development (McGraw Hill)
4. Shooman, M.L: Software Engineering (McGraw-Hill)

8KE04 PROFESSIONAL ELECTIVE - II
(I) NETWORK SECURITY

Unit I: Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Internetwork Security, Internet Standards and the Internet Society. Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, Stream Ciphers and RC4, Cipher Block Modes of Operation, Location of Encryption Devices, Key Distribution. (08 Hrs)

Unit II: Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions and HMAC, Public Key Cryptography Principles, Public Key Cryptography Algorithms, Digital Signatures, Key Management. (08 Hrs)

Unit III: Authentication Applications: Kerberos, X.509 Authentication Service, Public-Key Infrastructure, Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME, (08 hrs)

Unit IV: IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management, Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET). (08 Hrs)

Unit V: Network Management Security: Basic Concepts of SNMP, SNMPv1 Community Facility, SNMPv3, Intruders**:** Intruders, Intrusion Detection, Password Management. (08 Hrs)

Unit VI: Malicious Software: Viruses and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks, Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation. (08 Hrs)

TEXT BOOK:

William Stallings: ñNetwork Security Essentials Applications and Standardsò (3/e) Pearson.

REFERENCE BOOKS:

1. Atul Kahate: ñCryptography and Network Securityò Mc Graw Hill.
2. Forouzan and Mukhopahyay: ñòCryptography and Network Securityò Mc Graw Hill.
3. Matt Bishop: ñ Computer Security: Art & Scienceò Pearson Education.
4. Brijendra Singh: ñ Network Security & Managementò PHI.

8KE04 PROFESSIONAL ELECTIVE - II
(II) MULTIMEDIA TECHNOLOGIES

Unit I: Multimedia Authoring and Data Representations: Introduction, Components of Multimedia, Hypermedia and Multimedia, Overview of Multimedia Software Tools, Multimedia Authoring and Tools: Multimedia Authoring, VRML. Graphics and Image Data Representations: Graphics/Image Data Types, 1-Bit Images,

8-Bit Gray-Level, Images,Image Data Types, Popular File, Formats, GIF, JPEG, PNG,TIFF, EXIF, Graphics Animation Files, PS and PDF, Windows WMF, Windows BMP, Macintosh PAINT and PICT, X Windows PPM. (08Hrs)

Unit II: Color in Image and Video: Color Science, Color Models in Images, and Color Models in Video. Fundamental Concepts in Video: Types of Video Signals,Component Video, Composite Video, S-Video, Analog Video,NTSC Video, PAL Video, SECAM Video, Digital Video, Chroma Sub sampling CCIR Standards for Digital Video, High Definition TV. (08Hrs)

Unit III: Basics of Digital Audio: Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface, Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion, Quantization and Transmission of Audio, Coding of Audio,Pulse Code Modulation, Differential Coding of Audio, Lossless Predictive Coding, DPCM, DM, ADPCM. (08Hrs)

Unit IV : Multimedia Data Compression: Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding (VLC), Dictionary-BasedCoding, Arithmetic Coding, Lossless Image Compression. The JPEG Standard. (08Hrs)

Unit V: Basic Video Compression Techniques: Introduction, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261, Intra-Frame (I-Frame) Coding, Inter-Frame (P-Frame) Predictive Coding, Quantization in H.261, H.261 Encoder and Decoder, H.261 Video Bitstream Syntax, MPEG-1, Motion Compensation in MPEG-1 , Major Differences from H.261 (08Hrs)

Unit VI: Basic Audio Compression Techniques: ADPCM, Vocoders, Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP. MPEG Audio Compression: Psychoacoustics, Equal-Loudness Relations, Frequency Masking, Temporal Masking, MPEG Audio, MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithm, MPEG-2 AAC (Advanced Audio Coding). (08Hrs)

TEXT BOOK:

Ze-Nian, Li, Mark S. Drew ñFundamentals of Multimediaò (Pearson Education)

REFERENCE BOOKS:

1. Rajan Parekh ñPrinciples of Multimediaò (Tata McGraw-Hill)
2. S.J.Gibbs & D.C.Tsichritzis ñMultimedia Programmingò, Addison Wesley 1995
3. P.W.Agnew & A.S.Kellerman ñDistributed Multimediaò, Addison-Wesley 1996
4. C.A.Poynton, ñA Technical Introduction to Digital Videoò Wiley1996
5. F.Fluckiger, ñUnderstanding Networked Multimediaò, Prentice- Hall 1995

8KE04 PROFESSIONAL ELECTIVE - II
(III) EXPERT SYSTEM DESIGN

Unit I : **Expert Systems:** Definition, Components and characteristics of an expert system, Acquiring knowledge, representing knowledge, Controlling reasoning, Explaining solutions. Knowledge Representation: Principles and techniques, Examples: STRIPS and MYCIN. (08 Hrs)

Unit II: **Rule-Based Systems:** Canonical systems, Production systems for problem solving, The syntax of rules, The working memory, Controlling the behavior of the interpreter, Conflict resolution, Forward and backward chaining, Rules and meta-rules. (08 Hrs)

Unit III: **Associative Nets and Frame Systems:** Graphs, trees and associative networks, type-token distinction and cognitive economy, adequacy of associative nets, Representing typical objects and situations. Introduction to frame, Complex nodes in a network, Defaults and demons, multiple inheritance and ambiguity, Comparison of nets and frames. (08 Hrs.)

Unit-IV: **Representing Uncertainty:** Sources of uncertainty, Expert system and probability theory, Conditional probability, Certainty factors, Certainty factors versus conditional probabilities, Vagueness and possibility, Fuzzy sets, Fuzzy logic, Possibility theory, The uncertain state of uncertainty. (08 Hrs)

Unit V: **Knowledge Acquisition**: Theoretical analyses of knowledge acquisition, Stages of knowledge acquisition, Different levels in the analysis of knowledge, Ontological analysis, Expert system shells, Knowledge acquisition methods, Knowledge-based knowledge acquisition. (08 Hrs)

Unit VI: **Constructive Problem Solving:** Motivation and overview, case study: R1/XCON, Elicitation, evaluation and extensibility. Design for Explanation: Rule based explanation, Frame based explanation, Explanation and automatic programming, Explanation facilities. (08 Hrs **)**

TEXT BOOK:

Peter Jackson: ñIntroduction to Expert Systemsò Pearson Education, Third Edition.

REFERENCE BOOKS:

1. Donald A Waterman: ñA Guide to Expert Systemsò Pearson Education.
2. James P. Ignizio: ñIntroduction to Expert Systemsò Mc Graw Hill.
3. Dan W. Patterson: ñIntroduction to Artificial Intelligence and Expert Systemsò PHI.
4. Janakiraman, Sarkesi and Gopakrishanan: ñIntroductions of Artificial Intelligence and Expert Systems, Macmillan India Limited.

8KE04 PROFESSIONAL ELECTIVE - II
(IV) SOFT COMPUTING

UNIT-I: **Fundamental of Neural Network:** Basic concepts of Neural Network, Human Brain, Model of artificial neurons, Neural Network architecture, Characteristics of Neural Network, Learning methods, Taxonomy of Neural Network architecture, Early Neural Network architecture. (08 Hrs)

UNIT II : **Backpropogation Networks:** Architecture of a Backpropagation Network, The Perceptron Model, The solution, Single Layer Artificial Neural Network, Model for Multiayer Perceptron, Back propagation learning, Input Layer, Hidden Layer and Output Layer Computation, Calculation of error, Training of Neural Network, Method of Seepest Descent,Effect of Learning rate, Adding a momentum Term, Backpropogation Algorithm. (08Hrs)

UNIT-III: **Fuzzy Set Theory:** Fuzzy verses Crisp, Crisp sets, Operations and Properties of Crisp Sets, Partition and Covering, Fuzzy sets, Membership Function, Basic Fuzzy Set Operation, Properties of Fuzzy Sets, Crisp Relations, Cartesian product, other relations, Operations on Relations, Fuzzy Relations, Fuzzy Cartesian Product, Operations on Fuzzy Relations. (08Hrs)

UNIT IV: **Fuzzy Systems:** Crisp logic, Laws of Propositional logic, Inference in Propositional logic, Predicate logic, Interpretations of Predicate Logic Formula, Inference in Predicate Logic, Fuzzy logic, Fuzzy Quantifiers and Inference, Fuzzy rule based system, Defuzzification methods, applications. (08 Hrs)

UNIT V: **Fundamental of Genetic Algorithm**: Genetic Algorithms, Basic Concepts, Creation of offspring, Working Principle, Encoding, Binary, Octal, Hexadecimal, Permutation, Value, Tree, Fitness function, Reproduction. (08 Hrs)

UNIT VI: Genetic Modeling: Inheritance Operators, Cross over, Inversion & Deletion, Mutation Operator, Bit wise operator, Bit wise operator used in GA, Generational cycle, Convergence of genetic algorithm, Application, Multilevel Optimization, Real life problem, Differences and similarities between GA and other traditional methods, Advances in GA. (08 Hrs)

TEXT BOOK:

S. Rajesekaran, G. A. Vijayalakshmi Pai: ñNeural Network, Fuzzy logic, and Genetic algorithms Synthesis and Applicationsò PHI.

REFERENCE BOOKS:

1. S. Hykin: ñ Neural Networksò Pearson Education.
2. Jang,Sun and Mezutani: ñ Neuro Fuzzy and Soft Computingò .
3. Zurada: ñ Artificial Neural Neworksò.
4. N.P.Padhey: ñArtificial Intelligence and Intelligent Systemsò, Oxford University Press.

8KE05 DIGITAL SIGNAL PROCESSING - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

8KE06 EMBEDDED SYSTEMS - LAB.:

Minimum Eight experiments/programming assignments must be completed based on the respective syllabus uniformly covering each of the units.

8KE07 PROJECT & SEMINAR:

The project shall be internally evaluated (for 75 Internal Marks) in three phases based on the progress of the project work. Each phase shall be internally evaluated for 25 marks as follows:

Phase I: - Problem Definition and Design
Phase II: - Problem Implementation and Testing
Phase III: - Project Demonstration & Report submission.

The external evaluation of the project shall be based on demonstration of the project and viva-voce

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SYLLABUS PRESCRIBED FOR
BACHELOR OF ENGINEERING
TEXTILE ENGINEERING
SEMESTER PATTERN (C. G. S.)

SEVENTH SEMESTER

7 TX 01 TEXTILE MATHEMATICS

SECTION - A

Unit -I: Fibres-Introduction, Fibre Dimension ,Tensile strength, work of rupture. Trash & lint Content of cotton, Oils ,Fats ,Sizes & Resins in Fibre samples. Qualitative analysis of fibre mixture.

Unit-II : Yarns-Opening & Cleaning, drafting, calculations on Card mechanism , Draw Frame, Draft in Combing machines.

Unit –III : Yarns- The speed frame , yarn dimension twist in yarn, irregularity ,Ring frame .

SECTION - B

Unit-IV: Yarn preparation- Introduction, winding rate wind & traverse ratio, cone winding, yarn tension & tensioning devices , yarn clearing & clearing devices.

Unit-V: Warp preparation, sizing & weft preparation.

Unit-VI: Fabrics-Woven fabric structures Weaving Mechanisms.

Note: Only numerical in the Examination will be asked

REFERENCE BOOK :

1. Textile Mathematics, vol.1, vol.2, vol. 3 by J.E Booth

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7 TX 02 TEXTILE TESTING - III

SECTION-A

Unit -I : Serviceability: Introduction, Snagging, Pilling, Factors affecting pilling of fabric. Pilling test, Abrasion resistance, factors affecting abrasion resistance. Abrasion tests, wear. Wearer Trials, Advantages & Disadvantages of Wearer Trials vis a vis Laboratory Tests.

Unit -II : Comfort: Introduction. Thermal Comfort, Heat balance. Heat loss, Air Permeability & its Measurement. Effect of Air Permeability on fabric properties, Measurement of Thermal

Resistance & Transmittance of fabrics. Moisture transport, sensorial comfort, water absorption, water repellency. Measurement of water vapour permeability, water repellency & water permeability. Hydraulic bursting strength tester,

Unit- III : Objective evaluation of fabric handle: Bending Length, stiffness, Handle, Drape, Crease recovery, shear. Bias extension, formability, fabric friction, Kawabata system. Fabric assurance by simple testing.

SECTION- B

Unit -IV : Flammability terms used relating to flammability, factors affecting flame resistance, flammability testing, and recent progress in flammability testing, flame proofing & flame resistance finishes.Dimensional stability: Introduction, Hygral expansion, Relaxation shrinkage, swelling shrinkage, felting shrinkage, methods of measuring dimensional stability.

Unit- V : Colour fastness testing: Introduction, sample preparation, outline of colour fastness tests. Colour fastness to Washing, Rubbing, Light, Heat (sublimation), Perspiration, Sea Water, Hpochlorite, Peroxide, Chlorinated Water, Dry Cleaning Agents, Saliva.

Unit -VI : Testing of Technical Textiles: - Bacterial filtration efficiency, cone drop penetration test, Testing of Tribological properties of Composites. Tension meters, stroboscope, tachometer, Nep counting. Quality: Definition of quality. Types of Quality. Quality Control, Quality assurance, ISO 9000. Textile Product labeling, Voluntary & Mandatory Care Labels.

REFERENCE BOOKS :

1) Principles of Textile Testing -J.E. Booth
2) Physical Testing of Textiles - B.P.Saville
3) Textile Testing - Grover & Hamby.
4) Handbook of Technical Textiles:- Anand & Harrocks.

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7 TX 03 CHEMICAL PROCESSING –I

SECTION-A

Unit-I : Sequence of wet processing for cotton material:- Grey inspection, shearing, cropping, singeing and different singeing methods. Desizing- Object, chemistry and technology of different desizing process (Acid, enzymatic, oxidative, novel methods), batch and continuous methods of desizing.

Unit-II : Scouring- object, chemistry of scouring(saponification, emulsification, detergency, surface tension), technology of scouring (lime-acid-soda ash process, caustic boiling, soap soda ash process for colour goods), bio-scouring batch and continuous scouring process. Bleaching- Objective, Chemistry and technology of Hypochlorite,peroxide & chlorite bleaching. Preparation process for synthetic and blended fabric in brief, batch and continuous process.

Unit-III : Mercerization- Chemistry and technology (Chainless, Padless, Pad chain), Physical chemical effect of mercerization. Evaluation of Desizing, scouring (Copper number method, methylene blue absoption method and bleaching performance (test methods).and mercerization.

SECTION- B

Unit-IV : Dyeing - Define dye, classification of dyes based on method of application, chemical constitution and different term used in dyeing. Dyeing machines ï Principal and working of different dyeing machines for fiber, yarn and fabrics. Latest Technological features of different dyeing machines.

Unit-V : Dyeing for cellulosic ï direct dye, Vat dye, solublised vat dye, Azoic dye and Sulphur dye, reactive dye. Effect of Process parameters on dyeing performance, various dyeing faults their causes and remedies.

Unit-VI : Dyeing of Protein and synthetic fiber- Acid, basic, mordant and disperse dye. Dyeing of blend like polyester ï cotton, polyester-viscose and polyester-wool. Effect of process and material parameter on dye performances, various dyeing faults their causes and remedies

REFERENCE BOOKS :

1. Textile Chemistry, Vol. II by R.H. Peters,
2. Textile Scouring and Bleaching by E.R. Trotman
3. Chemical Technology in the Pretreatments in processes of texile By S.R.Karmakar
4. Technology of Bleaching and Mercerising by V.A. Shenai,
5. Mercerization by J.T. Marsh
6. Technology of Textile processing, Vol. II, by V.A. Shenai
7. Chemistry of Dyes and Principles of Dyeing by V.A. Shenai,
8. Technology of Textile processing, Vol. VI, by V.A. Shenai
9. Technology of Dyeing by V.A. Shenai,

10. Dyeing and Chemical Technology of Textile Fibres by E.R. Trotman,
11. Chemical Processing of Synthetic Fibres and Blends by K.V. Datye and A. A. Vaidya.
12. Textile Preparation and Dyeing by Asim Kumar Roychowdhury.

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7 TX 04 TEXTILE MILL MANAGEMENT

SECTION-A

Unit- I : Factors governing of site selection for textile mill, plant layout: - objective, kinds of layout their advantages &disadvantages, effect of automation on plant layout, advantages of a good layout, symptoms of bad layout.

Unit- II : Introduction - Management, management function, principal of scientific management, personal management- Concept, personal functions, manpower planning, need of trainning, objects of remuneration, fringed benefits. Motivation, Promotion, Transfer.

Unit- III : Marketing management Concept, marketing function, pricing practice, need of advertising& sales promotion, market reasearch. Sources of funds for textile industry, Introduction to working capital, Balance sheet, Profit & LossAccount, Budget, Budgeting, Auditing.

SECTION - B

Unit- IV : Sepration of organisation with respect to manpower, machinery for spinning millfor spinning of cotton carded, comed as well as manmade fibres & blended yarns & organisation of quality control and their check and their standard norms at various levels in spinning.

Unit- V : Prepration of organisation of weaving department with respoect tof manpower & machine with conventional, modern prepration and weaving machine for weaving cotton & blended fabrics. Overall process control schemes for weaving their norms at variouc levels.

Unit- IV: Brief outline of factory act - 1948 and labour law in textile industry. (Trade union, collective bargaining, workers participation, industrial disputes)Architectural and structural aspects of textile mill building morphology- general principles of building construction & building foundation, material for construction with special reference to wall, roof, floors and fire resistance, noise in textile mills, its measurement and control, colour scheme for building interior and machinery in textile mills.

REFERENCE BOOKS:

1) Management of textile industry - Dubeja
2) Practical cotton mills management - Benjamin
3) Ind. Engg. and Management - O.P.Khanna

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7 TX 05 PROFESSIONAL ELECTIVE - I
(1) ADVANCED NON- WOVEN TECHNOLOGY

SECTION - A

Unit- I : Global Nonwoven Market Scenario And Development Of Nonwovens. Status Of Various Technologies Of Nonwoven Fabrics. Detail Applications of Non Woven In Technical Textiles, Geotextile, Medical Textile And Their Product Wise Property Requirement.

Unit -II : Nonwoven Nanostructure Fabrics Formation Process With Reference To Electro Spinning, Nonwoven Composite Fabrics, Manufacturing Processes And Development Improvements In Spun lace Technologies: - Isojet System.

Unit -III : Evolon Fabric Technology- Introduction, Manufacturing Process, Characteristics & Application of Evolon Fabrics, Future Potential of Evolon Fabric Application. Airlaid Technology: - Introduction, Raw Material, Manufacturing Process, Characteristics And Application Of Airlaid Fabrics.

SECTION - B

Unit –IV: Nonwoven fabric finishing: Introduction, Wet finishing, Application of chemical finishes, Lamination, Mechanical finishing, Surface finishing, Developing technologies.

Unit - V: Characterisation & testing of nonwoven fabrics: Introduction, Fabric weight, thickness, density and other structural parameters, General standards for testing nonwovens, Measurement of basic parameters, fibre orientation distribution, porosity, pore size and pore size distribution, tensile properties.

Unit -VI : Permeability characteristics (gas-liquid-water vapour), wetting and liquid absorption behaviour , thermal conductivity and insulation behaviour. Compressional behaviour & Frictional characteristics of nonwoven fabrics

REFERENCE BOOKS:

1. Non-woven fabrics by Banarjee.

2. Non-woven bonded fabrics by J. Lunescdors.
3. Hand Book of Nonwoven by S. J. Russell
4. Non-woven fabrics ï production and applications by M.L. Gulrajani.

7 TX 05 PROFESSIONAL ELECTIVE - I
(2) ADVANCED KNITTING TECHNOLOGY

SECTION - A

Unit–I : Yarn preparation:- Methods of Yarn Preparation, Indirect/ Mill Warping and Direct warping. Direct warping equipments for filament Yarns, Elastomeric yarns, Spun yarns, High-Modulus yarns, Pattern Beams.

Unit–II : Weft knitting:-Development in weft knitting machines :- needles, sinkers, cams, yarn feeder, fabric take down, yarn supply, auxiliary systems, machine drive, machine frame, in creel, yarn feeder , yarn feeler, yarn tension controller.

Unit–III: Warp knitting:-Multi guide bar machines and fabrics : Development of raschel lace ,pattern guide bars, guide bar nesting , multi bar tricot lace machines, chain links and electronic control of shogging , raschel mesh structures, Jacquard raschel ,Mayer jacquardtronic multi-bar lace raschel .

SECTION - B

Unit –IV: Double needle bar warp knitting machines: - Operating principles, double needle bar basic lapping principles, using two fully-threaded guide bars, simplex machine, double needle bar raschel.Jacquard Knitting: knitting principle of jacquard, Raschel jacquard Machine, Guide Deflection, jacquard designing, jacquard products.

Unit –V : Advance knitting techniques: Weft insertion technique, fall plate technique, cut and miss press technique, laying in technique, Spot or knop effects, Terry by the press-off method. Terry fabric Production, sinker pile fabrics. Speciality fabrics and machines: The range of speciality fabrics, The production of ûeecy on sinker-top machines ,Fleecy interlock , Plush, The bearded needle sinker wheel machine ,Sinker plush knitted on single-jersey latch needle machines, Full-density patterned plush , Cut loop , Double-sided plush ,Sliver or high-pile knitting , Wrap patterning

Unit –VI : Electronics in knitting**:-** The disadvantages of mechanical control, The disadvantages of mechanical programming , The advantages of electronic control and programming , The compatibility of electronic signals and knitting data , Microprocessors and computers , The computerised knitting

machine , Computer graphics and pattern preparation , The Stoll CAD pattern preparation system , The Shima total design system. Electronic Patterning equipment: Hell- Zangs, The DEC pattern Computer, An Improved DEC system.

REFERENCE BOOKS:

1. Knitting technology by David j. Spencer.
2. Warp knitting by Ajgaonkar.
3. Warp Knitting Production by Dr. S. Raz
4. Knitting technology NCUTE
5. Latest textile machines used globally NCUTE.

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7 TX 06 PROJECT & SEMINAR

7 TX 07 TEXTILE TESTING III - LAB

10 to 12 Practicals based on syllabus of 7 TX 02

7 TX 08 CHEMICAL PROCESSING - LAB

10 to 12 Practicals based on syllabus of 7 TX 03

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SEMESTER EIGHT

8 TX 01 PROCESS CONTROL IN TEXTILE MANUFACTURING

SECTION - A

Unit - I : Introduction, scope of process control in spinning and Weaving, key variables, establishing norms, Collection & interpretation of data for process control, Maximizing quality & Cost evaluation of fibre quality, Linear programming for cotton mixing. Yarn realization, Estimation & control of yarn realization, Waste & their norms.

Unit- II : Control of waste in Blow room, Carding and Comber. Control of cleaning efficiency in Blowroom and Carding. Factors affecting cleaning efficiency and Fibre Transfer efficiency. Fractionating efficiency of comber. Control of Quality, Productivity and variability in Blowroom, Carding, Comber, Drawframe and Speed Frame. Optimization of drafting performance. Controlling of roving stretch and break. Measurement and assesment of unevenness of sliver and roving. Different types of defects in spinning preparatory processes, their causes, control and remedies.

Unit- III : Scope of Process control in Ring spinning- Control of yarn quality-Control of count, strength and their variability within and between bobbin variations. Factors affecting yarn strength, Measurement and assessment of unevenness of yarn. Types of yarn irregularities, Measurement and assesment of imperfections, Causes of yarn imperfections, Control of yarn and uneveness and imperfections. Control of End breakages and Hairiness of yarn. Control of Efficiency, Productivity and waste. Yarn faults and package defects, Slubs, Crackness, Spiners doubles, Bad piecing and double gaiting, Slough off. Control, Causes and Remedies of yarn faults.

SECTION - B

Unit -IV : A system of process control for weaving:- Scope for process control- Loom productivity and contributing factor, Approach and methodology of control. Scope for process control in winding,- Introduction, Control of, Productivity and Waste in winding. Quality control of knot, splice and package, Controlling of yarn tension and end breakage rate. Optimization of yarn fault removal.

Unit - V : Process control in Warping, Sizing and Pirn winding: Warping: - Introduction, Control of end breakages, Quality of beams, control of productivity, Causes of low productivity. Sizing: - Introduction, Choice of size recipe and size pick-up, control of yarn sketch. Quality of size beam, devices for improving weavability of sized yarn, control of productivity and waste. Control of size loss. Pirn winding: Introduction, Control of quality, productivity and waste in Prin winding.

Unit-VI: Loom shed control (Productivity)- Scope for process control in Loom shed, introduction, control of speed, efficiency and loom stoppages. Loom performance. Control of loss of efficiency by snap reading. Calculation of expected loom efficiency for non automatic and automatic loom. Quality of grey fabric, Control of quality, productivity and waste in loom shed etc. Productivity - definition of indices of productivity. Measurement and analysis of productivity. Means to improve productivity, maximizing machine efficiency, controlling end breakage rate. Control on consumption of accessories: Introduction, selection of accessories.

REFERENCE BOOKS :

1) Process control in Spinning by ATIRA.
2) Process control in Weaving by ATIRA.

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8 TX 02 ADVANCE FABRIC MANUFATURING TECHNOLOGY

SECTION-A

Unit- I : Introduction to unconventional weaving machine:-limitations of shuttle loom, large weft supply package, weft accumulator, weft measuring systems, weft cutters, selvedges on unconventional looms. Classification of shuttleless looms.

Unit - II : Projectile loom:- introduction, main features, advantages, transfer of weft end from projectile feeder to projectile, projectile picking mechanism, electronically controlled projectile brake, weft insertion cycle, let-off motion, beat-up mechanism, tuck in selvedge, projectile monitoring, setting, weft tension variation, modern developments, energy utilization, scope and limitations.

Unit - III : Rapier loom -classification of rapier looms, rigid and flexible rapiers, methods of weft insertion, rapier driving for rigid and flexible rapiers, rapier heads, displacement and velocity of rapier, interference of rapier with warp threads, Hunts let off, weft tension variation, modern developments, energy utilization, scope and limitations.

SECTION-B

Unit- IV : Air jet loom - working Principle of Maxbo loom, different phases of weft insertion, weft measuring system, air requirements, air jet nozzles, buckling of weft and traverse aids for maintaining air flow confuser system, profile read and relay nozzles, methods of air jet control, timings of air jet loom, Weft yarn tension behaviour, automatic weft repair, multihole relay nozzles, Water jet loom - weft supply system, requirement of water, phages of weft insertion, weft insertion system (pump, nozzle) timing of water jet loom, quick style changing timing of water jet loom, Weft yarn tension behavior. Modern developments, energy utilization, scope and limitations of air and water jet looms. Techno economics unconventional weaving systems.

Unit- V : Weaving of certain commercial fabrics - Geotextile, denim, tire cord fabrics. Definition and quality particulars of standard woven fabrics bagging and slacking, belting, blankets, blazer cloth, chiffon ,corduory cotton suiting and trousering, crepe fabrics ,denim, dhotis ,drills ,felts, flannel, gabardine , jean, khaki, lawn, long cloth, moiré, muslin, pile, plain cloth , poplin, quilts, saree, satin , sateen, sheeting, shirting, velvet, woollen cloth, worsted cloth.

Unit - VI: Special weaving: - Ribbon weaving machines, Classification, manufacturing, advantages and uses of multiphase, multiaxial, three dimensional weaving.

REFERENCE BOOKS:

1) Weaving machine, mechanism management by D.B.Ajagaonkar & M.K.Talukdar
2) Weaving operations by Allen Armord
3) Principle of Weaving by R.Marks & A.T.C.Robinson
4) Weaving mechanism (vol 2) by N.N.Bannergee
5) Shuttleless loom by J.J.Vincent

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8 TX 03 CHEMICAL PROCESSING –II

SECTION - A

Unit-I : Printing ï Definition of printing ,difference between dyeing and printing , different steps Involved in printing viz, preparation of material ,Ingredients of printing paste, different thickener their chemical and theological behavior , drying of print , fixation of print (after treatments of printing).

Unit-II : Styles of printing viz direct, resist, discharge and their comparison, flock printing and batik printing. Different methods of printing viz block, roller, screen (flat bed and rotary). Nonconventional methods like transfer printing,inkjet/Digital prints machines.

Unit-III : Printing recipe ï Standard recipes for printing with various types of dyes such as direct, reactive , azoic ,vat , sulphur , disperse ,acid dyes and pigment colour with relevant after treatments .Different faults of printing and their prevention. Evaluation of different fastness properties (wash, light, rubbing,perspiration, sublimation and other allied fastness properties).

SECTION- B

Unit-IV : Finishing ï Object of finishing, classification of finishes, concept of anti crease, wash n wear and durable press finish. Concept of specialty finishes like ant shrink, antistatic, soil release, water repellent, water proof ,flame retardant, Parchmentisation, , softening finish, etc Novelfinishes ï Antimicrobial finish, cool finish, Aroma finish

Unit-V : Detail study of various finishing machine viz calendaring (types of calendars) , sanforising , stenter , drying machine testing of

finishes ï anti crease, ant shrink, fire retardant, water proof and water repellent, antimicrobial.

Unit-VI : Computer Colour Matching Concept of colour and brief idea about the relation between colour and chemical constitution, factors governing transmission, tristimulus value, , kubelka munkôs equation, methods of colour estimation, -manual, their limitations, instrumental, pass-fail criteria, brief idea of computer colour matching and formulation.

REFERENCE BOOKS :

1. Textile printing by L.W.C.Miles
2. An introduction of Textile Printing by W Clarke.
3. Technology of Printing by V.A. Shenai,
4. Textile finishing by A.J.Hall
5. Introduction to textile finishing by J T Marsh
6. Technology of Finishing by V.A. Shenai,
7. Instrumental colour measurements and computer aided colour matchings for textiles By Shah and Gandhi
8. Modern concept of colour and appearance by Asim Kumar Roychowdhury.

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8 TX 05 PROFESSIONAL ELECTIVE - II
(1) TECHNICAL TEXTILES

SECTION - A

Unit - I : Introduction: Definition and scope, Classification of technical textiles, Brief idea about technical fibres, Role of yarn and fabric construction, Composite material. Growth of industrial textiles, Engineering textile structures for industrial purposes. Difference with non-industrial textiles.

Unit - II : Filtration textiles: Definition of filtration parameters, Theory of dust collection and solid liquid separation, Filtration requirements, Concept of pore size and particle size, Role of fiber, Fabric construction and finishing treatments, Dust filtration - general, Protective masks and high temperature filtration-purification and separation of gases - Cigarette filters - liquid filtration - solid liquid filtration, liquid - liquid separation - Textiles used for the above applications and their features- Application of hollow fibres paper making clothes.

Unit - III : Geotextiles: Definition of geo textiles - Basic functions of geo textiles, Brief idea about geosynthetics and their uses, Essential properties of geotextiles, - types of geo textiles -classification of geo textiles - woven geo textiles - Non-woven geo textiles - knitted geo textiles- Bio degradable geo textiles - advantages,

materials used - composites and its uses. Geotextile requirements for separation, filtration, drainage, reinforcement, protection and waterproofing - geo textiles in temporary and permanent road construction railway stabilisation -Fibre used and fabrics for above application. Geotextile testing and evaluation, application examples of geotextiles.

SECTION -B

Unit –IV: Medical textiles: Classification of medical textiles, Description of different medical textiles, Material used in bio-textiles; Textiles for plantations; Non-implantations textiles; Textiles for extra-corporeal, AntImicrobial textiles - suture thread natural and synthetic - different types used - PTFE suture, coated polyester, high strength, Dialysate textiles - characters required - materials employed - cellulosic hollow fibres as membrane- Cuprammonium regenerated Acrylic and PVA membranes - requirements and fibres used for cardio vascular textiles - woven, knitted - requirements of artificial blood vessels. Details of textiles used for vascular adhernia surgery - other uses in this surgery.

Unit –V : Protective Clothing: Brief idea about different type of protective clothing, functional requirement of textiles in defence including ballistic protection materials and parachute cloth, temperature and flame retardant clothing, chemical protective clothing, water proof breathable fabrics. Textiles in protective clothing: introduction, protection against heat, impact and others for safety. Fabrics in defence system and weapons; other applications Automotive Textiles: Application of textiles in automobiles, requirement and design for different tyres, airbags and belts, methods of production and properties of textiles used in these applications.

Unit –VI: Sewing threads, cords and ropes: Types, method of production and applications, functional requirements, structure and properties. Sports and recreation textiles: Functional requirement of different type of product and their construction. Textiles in miscellaneous industrial applications: Introduction, paper makers felt, bearing and sealing materials, sound insulation, battery separators, electrical insulation textiles re-inforced products; Transports bags and sheets; Fabrics to control oil spills; Canvas cover and tarpaulins.

REFERENCE BOOKS:

1. ñHandbook of Technical Textilesò, Ed. A R Horrocks and S C Anand, Woodhead Publication Ltd., Cambridge, 2000.
2. ñWellington Sears Handbook of Industrial Textilesò, Ed. Sabit Adanaur, Technimic Publishing Company, Inc., Pennsylavania, USA, 1995.

3. ñEngineering with Geosyntheticsò, Ed. G V Rao and G V S Raju, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.
4. ñIndustrial Textileò, Ed., J Svedova, Elsevier, New York, 1990.
5. ñModern Textile Characterization Methodsò, Ed. M Raheel, Marcel Dekker, Inc., 1996.
6. Mukhopadhyay S K and Partridge J F, ñAutomotive Textilesò, Vol. 29, No. ½, The Textile Institute, 1999.
7. Sewing Threads (Textile Progress, Vol. 30, No. 3/4, 2000) J. O. Ukponmwan, A. Mukhopadhyay & K. N. Chatterjee, Textile Institute, Manchester, UK, ISBN 1 8703738 7.
8. Medical Textiles-International Conference on Medical Textiles,Bolton,Woodhed Publication,Cambridge,1997
9. John,N.W.MòGeotextileòBlackie publication,Glasgow,1987
10. Industrial Textiles ï Horrocks

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8 TX 04 PROFESSIONAL ELECTIVE - II
(2) NEW FIBRE SCIENCE

SECTION - A

Unit - I : New generation fibers: Introduction, Background, Transition to new fibers, The super-fiber with new performance: Introduction, Basic classes of super-fiber, Need for a strong fiber, Concept of ñgel-spinning, Final stage of pitch-based carbon fiber development, Use of super fibres, The future of super-fibers

Unit - II : High-tech fibers: A silk-like fiber surpassing natural silk, Ultra-fine fibers, Skin-like fabrics, Chameleonic fabrics, Photochroism-controlled clothing material, Perfumed fibers, Power fibers that store solar energy, Iridescent textiles, Protein plastics with the feel of human skin.

Unit-III : The aramid fiber race , Polyacetal fiber, Strong Vinylon RM, New liquid crystalline polymers: engineering plastics, Vectran: a fully aromatic polyester fibre, Developing polyallylate fiber Fibres from biomass of crab and shrimp shells, New applications of silk, Fibers produced by bacteria, New functions for cellulose.

Section- B

Unit-IV: Progression of high-tech fibers: Introduction, Biotechnology and fibers ,Electronics and fibers , Cars and fibers, Fibers in space, Fibers and nuclear power, Fibers in sport, Fibers for geotextiles, Fibers in the ocean. New high-tech fibers: Various categories of high-tech fibers, Development of Shingosen, Design of specialist fibers, Fabrics for relaxation using 1/ f fluctuations.

Unit - V : Cellulosic fibers: New solvent systems, New cellulosic fiber derivatives, New environmental and cost saving developments, Life-cycle assessment, Cellulose: the renewable resource. Carbon fibres : Introduction to carbon fibres, special application of carbon fibres ï properties and end uses of carbon fibre. Aramide fibres, Brief study on Nomex and Kevlar fibres.

Unit-VI: Fibers for the next generation: High-tenacity and high-modulus fibers, Microdenier (ultra-fine) fibers and Biomimetics, The next stage: technological improvements, New frontier fibers (super-function fiber materials, etc.), Super-biomimetic fiber materials, Super-natural materials, resources recycling, Fibers for health.

REFERENCE BOOKS:

1. New Fibres by Hongu and Phillips
2. Polymers for Engineering Applications by R. B.Seymour
3. High technology Fibres: Handbook of Fibre Science and Technology, Vol. III, Ed. by Lewin and Preston.
4. ñA Text Book of Fibre Science and Technologyò, New Age International (P) Limited, 1st Edn, 2000.

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8 TX 05 PROJECT & SEMINAR

8 TX 06 ADVANCE WEAVING TECHNOLOGY- LAB

08 to 10 Practicals based on syllabus of 8 TX 02

8 TX 07 CHEMICAL PROCESSING II - LAB

10 to 12 Practicals based on syllabus of 8 TX 03

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FOUR YEAR DEGREE COURSE IN
B TECH CHEMICAL ENGINEERING
CREDIT & GRADE SYSTEM
(MASS TRANSFER-II)

SEMESTER : SEVEN

7CH01 CHEMICAL ENGINEERING OPERATION - III
SECTION - A

UNIT I: Liquid-liquid extraction: Liquid equilibria, Representation in equilateral triangular and rectangular coordinates, choice of solvent: Selectivity Distribution coefficient, Recoverability, Density, Determination of plait point liver rule, single and multistage extraction:

1) Cross current extraction
2) Counter current extraction, fractional extraction. Applications in petrochemical industries, extraction of nuclear fuels and recent advancements in applications. **(8)**

UNIT II: Continuous or differential extraction, Calculation of NTU & HTU, Classification of extraction equipments, stagewise:

i) The mixer settle, Baffle plate columns, Scheibel columns. Differential
ii) Spray column, Sieve Iray column, packed columns, pulsed columns, centrifugal extractors, and their applications, Design of continuous-contact towers. **(7)**

UNIT III: Principles of leaching, Types of equilibrium, Multistage cross-current, counter current leaching and their graphical and RAT representation. Continuous counter current decantation verify types of solid-liquid extractors, shank system, Rotocel, Ballmamn extractor, Extractor for cellular material, extraction of oil from cellular material, agricultural material and seeds. **(7)**

SECTION - B

UNIT IV: Distillation: Thermodynamics of vapour-liquid equilibrium, Relative volatility, partial pressures, Dalton's, Raoult's and Henry's laws Methods of distillations: - Differential, Flash or equilibrium, Rectification and Batch distillations No. of plates by McCabe Thiele method. **(8)**

UNIT V: Panchon savarit, Lewis method, Reflux ratio, minimum reflux ratio, and Azeotroes, Antonic,Vanlaar. Consistency of system, Generation of Vapour-liq equilibria for unknown system Herington's consistency test. **(7)**

UNIT VI: Introduction to multicomponent distillation Azeotroic distillation, extractive distillation, steam distillation of plate columns, Sieve trays, valve trays, plate efficiency, factors determining column performance, Bubble cap trays, Packed column : Packings, calculation of enrichment in packed column and design of distillation column. **(8)**

TEXT BOOKS:

1) Unit Operation in Chemical Engineering: W.L. McCabe & J.C. Smith, McGraw Hill
2) Mass Transfer Operation: R.E. Treybal

REFERENCE BOOKS:

1) Mass Transfer: TKSherwood, R.I.Pigford, McGraw Hill
2) Chemical Engineering Vol. II: Coulson & Richardson
3) Transport Phenomena and Unit Operations: Geankoplis

7CH02 CHEMICAL REACTION ENGINEERING-I
SECTION - A

UNIT I: Classification of chemical reactions. Variables affecting the rates of reaction. Kinetics & Thermodynamics. Thermodynamics of chemical reactions. Classification of reactors. Order of reaction & rate constant. **(7)**

UNIT II: Rates of Homogeneous Reactions. Fundamentals of rate equation. Rate equations from proposed mechanism Analysis of simple & complex rate equation. Evaluation of rate equation from Laboratory data. **(8)**

UNIT III: Interpretation of rate data, Scale up and Design. Constant volume batch reactor. Variable volume Batch reactor. Temperature and reaction rate. **(7)**

SECTION - B

UNIT IV: Single ideal reactors. Ideal Batch Reactor. space time and space velocity, steady state mixed flow reactors, steady state plug flow reactor, Holding-time & space time for flow system. **(7)**

UNIT V: Design for single reactions Size comparison of single reactors Batch reactor, Mixed verses plug flow reactors Variation of reactant rates. General Graphical comparison. Autocatalytic reactions. **(8)**

UNIT VI: Design for multiple reactor system. Reactions in parallel & in series, series-parallel reactions. Batch recycle reactor, Flow recycle reactor. Temperature & pressure effects in single and multiple reactions. Optimum temperature profile. **(8)**

TEXT BOOKS:

1) Chemical Reaction Engineering: Octane Levenspiel, Wiley Eastern Ltd.
2) Chemical Engineering Kinetics: Smith J.M. McGraw Hill

REFERENCE BOOKS:

1) Reaction Kinetics for Chemical Engineers, Walas McGraw Hill
2) Elements of Chemical Reaction Engineering, H. Scott Fogler, Prentice Hall

7CH03 PROCESS DYNAMICS AND CONTROL

SECTION - A

UNIT I: Transmit response of control systems, optimization. **(7)**

UNIT II: Stability, Root locus, Transient response. Application of root locus to control system. Frequency response methods. Design of Nyquist criteria. **(8)**

UNIT III: Process applications, Controller mechanisms. **(7)**

SECTION - B

UNIT IV: Development and control systems for various chemical industries case studies. **(7)**

UNIT V: Introduction on advanced control techniques as feed forward, control, cascade control, ratio control, adaquative control and digital computer control. **(8)**

UNIT VI: Dynamics and control of chemical equipments such as heat exchangers, distillation columns, absorption column, etc. **(8)**

TEXT BOOKS:

1) Process Control: Pater Harriott, McGraw Hill, New York
2) Process System Analysis and Control: Koppel Conghawoner McGraw Hill

REFERENCE BOOKS:

1) Automatic Process Control: D.P. Eckman, Wiley
2) Chemical Process Control: George Stephanopoulos - Prentice Hall of India Pvt. Ltd.
3) Process Systems Analysis & Control: Donald R. Coughanour, McGraw Hill

7CH04 PROFESSIONAL ELECTIVE - I
(1) INDUSTRIAL WASTE TREATMENT

Objectives:

i) To impart the knowledge about disposal of effluents and the standards for disposal.
ii) To impart the knowledge about biological treatment methods and advanced treatment methods.

SECTION - A

UNIT I: Disposal Effects on Environment

Effects of industrial wastes on streams, land, air - wastewater treatment plants - water quality criteria. Effluent standards - Process modification - Bioassay studies - Environmental legislation Pollutants Reduction: Waste minimisation - House keeping - Volume and strength reduction - Material and process modifications - recycle, reuse and by-product recovery - Environmental audit. **(7)**

UNIT II: Effluent Treatment

Conventional methods of treatment and disposal of industrial wastes - Equalisation and Neutralisation - Separation of solids - Sedimentation and filtration - Coagulation and flocculation, absorption, chemical precipitation, chemical oxidation, Physiochemical treatment methods - Removal of dissolved impurities - Residue management - Combined treatment of industrial and municipal wastes. **(8)**

UNIT III: Biological Treatment Methods

Principles and methods for removal of suspended impurities and organics - aerobic and anaerobic decomposition of organic matter, Stabilization ponds, activated sludge process, Oxidation ditch. **(7)**

SECTION - B

UNIT IV: Advanced Waste Water Treatment:

Nitrogen removal - Phosphorous removal - Removal of refractory Organics - Removal of dissolved inorganic substances - Chemical precipitation - ion exchange - Reverse Osmosis - Electro dialysis. **(8)**

UNIT V: Industrial Process and Waste Treatment - I

Manufacturing process, waste water characteristics, composition, effects and appropriate treatment - flow sheets for chemical industries - Petro-chemical industries, Refineries, Pharmaceutical, Textiles - Apparel industries - Metallurgical industries - Steel plants, mines - Power industries - Fertilizer plants - Cement industry. **(8)**

UNIT VI: Industrial Process and Waste Treatment - II

Manufacturing process, waste water characteristics, composition effects and appropriate treatment flow sheets for Pulp and paper industry - Agro-industries, Sugar - Distilleries, Food processing industry - meat packing, pickles, poultry dairy - Leather tanning. **(7)**

TEXT BOOKS:

1. Rao.M.N. and Dutta, Waste Water Treatment, Oxford and IBH Publishing Ltd., Calcutta, 2008.
2. Eckenfelder, W.W., Industrial Waste Pollution Control, McGraw Hill Book Co., New Delhi, 2003.

REFERENCE BOOK:

1. Nemerow, N.L., Theory and Principles of Industrial Waste Treatment, Addison Wesley, Reading Mass, 1993.

7CH04 PROFESSIONAL ELECTIVE - I
(2) NEW SEPARATION TECHNIQUES

SECTION - A

UNIT I: Adsorption separations - Review of fundamentals, mathematical modelling of column contactors, pressure swing adsorption, ion chromatography, affinity chromatography, gradient chromatography, parametric pumping, counter-current, simulated counter-current and multidimensional chromatography. **(7)**

UNIT II: Membrane separation processes ï basic concepts, membrane modules, structure and characteristics of membranes. **(7)**

UNIT III: Design considerations of Reverse Osmosis, Ultra Filtration, Electro Dialysis, Gas permeation membranes, Pervaporation, Nano filtration and micro filtration. **(8)**

SECTION - B

UNIT IV: Detailed theories for membrane separations ï concentration polarization, gel formation and fouling, mathematical models for membrane systems with and without concentration polarization, Transport inside the membranes, solution diffusion membranes, porous membranes. **(8)**

UNIT V: Surfactant based separations - fundamentals of surfactants at surfaces and in solution, liquid membrane permeation, and foam separations, micellar separations. **(7)**

UNIT VI: Supercritical fluid extraction - Physicochemical principles, thermodynamic modelling, process synthesis and energy analysis. **(8)**

TEXT BOOKS:

1. P. C. Wankat, ñLarge scale adsorption and chromatographyò, CRC Press, 1986
2. R.T. Yang, ñGas Separation by Adsorption Processesò, Imperial College Press, 1997

REFERENCE BOOKS:

1. P.C. Wankat, ñRate Controlled Processesò, Springer Publications, 2005
2. Seader, ñSeparation Process Principlesò, Wiley Publication, Second Edition, 2008
3. R. W. Rousseau, ñHandbook of separation process technologyò, John Wiley and Sons, 1987
4. M. C. Porter, ñHandbook of industrial membrane technologyò, Noyes Publication, Park Ridge, New Jersey, 1990
5. J. F. Scamehorn and J. H. Harwell, ñSurfactant based separation processes, T. A. Hatton in Vol. 23 of Surfactant science seriesò, Marcel-Dekker., 1989
6 M. A. McHugh and V. J. Krukonis, ñSupercritical fluid extractionò, Butterworth, 1985

7CH04 PROFESSIONAL ELECTIVE - I
(3) OPTIMIZATION OF CHEMICAL PROCESSES

SECTION - A

UNIT I: Nature and organization of optimization problems, fitting models to data, method of least squares, factorial experimental designs, formulation of objective functions. **(7)**

UNIT II: Optimization theory and methods - basic concepts of optimization, optimization of unconstrained functions, one dimensional search, multivariable optimization. **(8)**

UNIT III: Linear programming and applications, nonlinear programming with constraints, optimization of staged and discrete processes. **(7)**

SECTION - B

UNIT IV: Optimum recovery of waste heat, optimum shell and tube heat exchanger design, optimization of heat exchanger networks. **(7)**

UNIT V: Optimization of multistage evaporators, optimization of liquid-liquid extraction processes, optimal design and operation of staged distillation columns. **(8)**

UNIT VI: Optimal pipe diameter, minimum work of gas compression, economic operation of fixed bed filter, optimal design of gas transmission network, optimal design and operation of chemical reactors. **(8)**

TEXT BOOKS:

1. T.F.Edger and D.M.Himmelblau, ñOptimization of Chemical Processesò, Mc.Graw Hill, 2001
2. G.S.Beveridge and R.S.Schechter, ñOptimization Theory and Practiceò, Mc.Graw Hill, 1970

REFERENCE BOOKS:

1. Kalyanmoy Deb, ñOptimization for Engineering Designò, John Wiley, 1995
2. V.Kafarov, ñCybernetic Methods in Chemistry and Chemical Engineeringò, MIR Publishers, 1976

7CH04 PROFESSIONAL ELECTIVE - I
(4) POLYMER SCIENCE AND TECHNOLOGY

SECTION - A

UNIT- I: Introduction - Definitions and concepts, polymerisation reactions, polymer structure, functionality and degradation, Characterisation of polymers. **(7)**

UNIT- II: Different types of polymers - natural and modified natural products, synthetic polymers, addition and condensation products and their preparations. **(7)**

UNIT- III: Methods of polymerisation - mass, solution, emulsion and suspension polymerisation processes, reactions and equipments used. **(7)**

SECTION - B

UNIT- IV: Polymer processing - Moulding, cold and hot compression moulding, injection and jet type moulding, extruding, calendaring and skiving. **(8)**

UNIT- V: Polymer processing - sheet forming, atmospheric and fluid pressure forming, lamination and impregnating. **(8)**

UNIT VI: Polymer processing - coating, expanding, casting, embedding, spinning and finishing. **(8)**

TEXT BOOKS:

1. Fred.W.Billmeyer, ñText Book of Polymer Scienceò, John Wiley and sons, 1980.
2. V.R.Gowarikar, ñPolymer Scienceò, New Age International, Second Edition,2006

REFERENCE BOOKS:

1. David J. Williams, ñPolymer Science and Engineeringò, Prentice Hall, 1971
2. Stanley Middleman, ñFundamentals of Polymer Processingò, McGraw Hill, 1977
3. Herman S. Kaufman and Joseph J Falcetta, ñIntroduction to Polymer Science and Technologyò, JohnWiley and sons, 1977
4. Rakesh K.Gupta and Anil Kumar, ñFundamentals of Polymersò, International edition, 1998

7CH05 PLANT DESIGN & PROJECT ENGINEERING

Objectives:

Learning fundamentals and applications of chemical engineering plant design, value engineering, optimization with emphasis on chemical engineering applications, fundamentals of engineering economics and the management decision making processes that are used in engineering problem solving. Understanding the concept of interest and equivalence, learning the methods of engineering economic analysis like present worth, rate of return, annual cash flow and benefit-cost ratio, depreciation, etc.

SECTION - A

UNIT I: Basic considerations in chemical engineering plant design, project identification, project identification, preliminary techno-economic feasibility, process selection, laboratory developments and its importance, pilot plant, scale-up methods, flow diagrams. Selection of process equipments: standard vs. Special equipments, materials of construction of process equipments, specification sheets. **(7)**

UNIT II: Plant Location: Objectives, levels of location problems, factors influencing location of a plant, locational analysis, selection criteria, significance, theories of plant location.
Plant Layout: Meaning of plant layout, design importance and scope, essentials, types of layout, factors influencing layout, dynamics of plant layout, planning for plant design. **(7)**

UNIT III: Cost estimation: equipment costs, cost indices, Williamôs point sixth rule, methods of estimation of fixed capital, product cost estimation. Interest formulae and their applications, time value of money, simple and compound interest, discrete, nominal and continuous rate of return and their relationships, issue and evaluation of bonds, concept of equivalence. **(8)**

SECTION - B

UNIT IV: Depreciation: Introduction, straight line method of depreciation, declining balance method of depreciation, sum of the years-digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation. (8)

UNIT V: Replacement and Maintenance analysis: Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset, capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely, practical factors in alternative and replacement investment. **(8)**

UNIT VI: Inventory control, scheduling a project using CPM/PERT, project management, optimum conditions, optimum production rates in plant operations, optimum conditions in cyclic operations, design reports. **(7)**

TEXT BOOKS:

1. Max Peters, Plant design and economics for chemical engineers, McGraw Hill
2. Panneer Selvam, R, Engineering Economics, Prentice Hall of India Ltd, New Delhi, 2001

REFERENCE BOOKS:

1. Chan S.Park, ñContemporary Engineering Economicsò, Prentice Hall of India, 2002
2. Donald.G. Newman, Jerome.P.Lavelle, ñEngineering Economics and analysisò Engg. Press, Texas, 2002

7CH06 CHEMICAL ENGINEERING OPERATION–III LAB (MASS TRANSFER-II)

List of Experiments:

1. To prepare boiling point (B.P.) diagram and plot x-y data on the equilibrium diagram.
2. Verification of Rayleighôs equation for differential (Batch) distillation.
3. To construct equilibrium curve from vapour liquid equilibrium (VLE) data.
4. To find the composition of distillate and residue after distilling n-butanol-methyl alcohol mixture by simple distillation.
5. To determine vaporization efficiency and thermal efficiency in case of steam distillation.
6. To construct a ternary diagram for acetic acid ï water-benzene system.
7. To study the performance of sieve tray extraction column and compare it with packed column (or spray column).
8. To find out number of stages in multistage continuous counter current operation and in single stage multiple contact of operation for solid liquid extraction (Leaching).
9. To compare single stage with two stage cross current liquid-liquid extraction with partially miscible solvent.
10. To compare single stage with two stage cross current extraction for a system in which solvents are immiscible.

Note: The students should perform minimum EIGHT experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7CH07 CHEMICAL REACTION ENGINEERING-I LAB

List of Experiments:

1. To determine the rate constant of saponification of ethyl acetate characterised by an acid like HCL.
2. To determine the activation energy of hydrolysis of an ester such as ethyl acetate.
3. To determine the kinetic of reaction between ethyl acetate and sodium hydroxide at room temperature using differential method of analysis.
4. To determine the kinetics of reaction between ethyl acetate and sodium hydroxide at room temperature by integral method.
5. Show that the decomposition of H2O2 in aqueous solution as first order reaction and determine value of rate constant.
6. To determine void volume porosity of catalyst particle.
7. To determine the RTD curve for packed bed reactor.
8. To determine the RTD curve for PFR.
9. To determine the RTD curve for mixed flow reactor.
10. Verification of performance equation of batch reactor.

Note: The students should perform minimum EIGHT experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7CH08 PROCESS DYNAMICS AND CONTROL-LAB

List of Experiments:

1. Sketch the response of the first order system for impulse change.
2. To find the response of a bare measuring thermometer. c) +ve step change d)-ve step change.
3. To find the response of mercury thermometer (kept in a thermal cell) for bare thermometer) +ve step change d)-ve step change.
4. To study underdamped response of manometer fluid with pressure change function.
5. To study the response of non-interacting system use in two tank for step change in flow rate.
6. To study the response level in one tank c) step change d) impulse change.
7. To verify efficiency of transportation lag when coupled with first order system.
8. To study a liquid level on-off controller.

9. To study the temperature control system.
10. To study the temperature control system.
11. To measure liquid level by bubbler system.

Note: The students should perform minimum EIGHT experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7CH09 PROFESSIONAL ELECTIVE-I - LAB

Minimum EIGHT experiments based on the syllabus are to be performed.

7CH10 INDUSTRIAL TRAINING

During the course of study from III to VII semester each student is expected to undertake a minimum of two industrial visits and undertake a minimum of two weeks of industry/field training. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of VII semester for 50 marks.

7CH11 PROJECT & SEMINAR

SEMINAR:

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/ survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for 50 marks. The Seminar Report will be evaluated by external examiner appointed by the University along with the Project - Viva Voce examination at the end of VIII Semester.

PROJECT:

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental , design or combination of these in the area of Chemical Engineering. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. On completion of the work, a project report should be prepared and submitted to the department.

The evaluation is based on continuous internal assessment by an internal assessment committee for 75 marks by way of oral presentations. The university examination at the end of VIII Semester carries 75 marks will be a Viva Voce examination conducted by a committee of one external examiner appointed by the University and one internal examiner/Guide.

SEMESTER : EIGHT

8CH01 TRANSPORT PHENOMENON

SECTION-A

UNIT I: Transport properties and mechanism, Rate process, flux, types of fluids, phenomenological laws, Rheology of non-Newtonian fluids, flow through circular pipes, Mathematical foundation, types of time derivatives, Divergence, Operators. **(7)**

UNIT II: Control Volume, Overall mass, momentum and energy balances, Extended Bernoulliôs equation, Reynoldôs transport equation, mass balance with chemical reaction. **(7)**

UNIT III: Equation of change based on differential balance, equation of continuity, Navier-Stokes equation, energy equation, application of Narier-Stokes equations to various flows through different geometric shapes, applications of energy equation, potential streamline, creeping and ideal flow. **(8)**

SECTION-B

UNIT IV: Flow around submerged solids, flow past flat plate, boundary layer, Prandtl equation, expressions for viscous drag, thermal boundary layer. Von Karmonôs integral momentum equation, analysis of integral equation, displacement thickness. **(8)**

UNIT V: Turbulent flow mechanism, intensity of turbulence, Reynoldôs sitresses, Prandtl mixing length, turbulent flow through circular pipes. Analogies of transfer processes, profiles of gradients, Reynoldôs Prandtl, Von Karmon, Chilton-Coulburn analogies, J factors, Dittus-Boelterôs equation. **(8)**

UNIT VI: Review of classical mass transfer problems, mass transfer in binary systems with or without chemical reactions. Theories of interphase mass transfer. Mass transfer analogies. **(7)**

TEXT BOOKS:

1) Transport Phenomenon: Bird, Stayward, Light Foot, John Wiley
2) Momentum, Heat and Mass Transport: Benett and Mayers, McGraw Hill

REFERENCE BOOKS:

1) Principles of Unit Operations: A.S. Foust, et-al, Wiley Toppan Int. Ed., Latest Edition
2) Fluid Dynamics and Heat Transfer: J.G. Kundsen and Katz, McGraw Hill, Latest Edition
3) Transport Phenomenon and Unit Operations: Geankoplis

8CH02 CHEMICAL REACTION ENGINEERING-II

SECTION - A

UNIT I: Residence time distribution. Models for non-ideal flow. **(7)**

UNIT II: Mixing concept and models: Rate equation for Heterogeneous reactions, fluid particle Reactions. Determination of rate controlling step. Application to Design. **(8)**

UNIT III: Fluid-Fluid reaction: The rate equation for different cases and application to design. **(7)**

SECTION - B

UNIT IV: Heterogeneous processes, catalysis and adsorptional determination of surface area, void volume. Pore volume distribution catalyst preparation, promoters and inhabitation catalyst reactivation. **(8)**

UNIT V: Rate equation for third solid catalytic, reactions. Internal External transport process in Heterogeneous Reactions. **(7)**

UNIT VI: Design of Heterogeneous catalytic reactors, fixed broad reactors, isothermal and adiabatic fixed bed reactor, non-isothermal & non-adiabatic fixed bed rector. Fluidized bed, Drickle bed, slurry reactor. **(8)**

TEXT BOOKS:

1. Chemical Reaction Engineering, Octave Levenspil, Wiley Eastern Ltd.
2. Chemical Engineering Kinetics, Smith J.M., McGraw Hill

REFERENCE BOOKS:

1. Elements of Chemical Reaction Engineering - H. Scott Fogler, Prentice Hall
2. Chemical Reactor Analysis & Design, Gilberth F. Froment & Kenneth B.Bischoof, John Wiley & Sons
3. Chemical Reactor Design, Vol. I & II, M. W. Rase

8CH03 SYSTEM MODELLING

SECTION - A

UNIT I: Introduction - models and model building, principles of model formulation, fundamental laws - continuity equation, energy equation, equations of motion, transport equations, equations of state, equilibrium and kinetics, classification of mathematical models. Numerical solutions of model equations ï Linear and non linear algebraic equations in one and more than one variables, ordinary differential equations in one and more than one variables. **(8)**

UNIT II: Lumped Parameter Models:
Formulation and solution techniques to be discussed for Vapour liquid equilibrium models, dew point and flash calculations for multicomponent systems, boiling operations, batch and continuous distillation models, tank models, mixing tank, stirred tank with heating. **(7)**

UNIT III: CSTR with multiple reactions. Non-isothermal CSTR - mutiplicity and stability, control at the unsteady state. Non-ideal CSTR models - multi-parameter models with dead space and bypassing, staged operations. **(7)**

SECTION - B

UNIT IV: Distributed Parameter Models (Steady State):
Formulation and solution of split boundary value problems - shooting technique, quasilinearization techniques, counter current heat exchanger, tubular reactor with axial dispersion, counter current gas absorber, pipe line gas flow, tubular permeation process, pipe line flasher. **(8)**

UNIT V: Unsteady State Distributed Parameter Models:
Solution of partial differential equations using finite difference method, convective problems, diffusive problems, combined convective and diffusive problems. Unsteady state conduction and diffusion, unsteady state heat exchangers, dynamics of tubular reactor with dispersion. Transfer function models for distributed parameter systems. **(8)**

UNIT VI: Model Parameters Estimation:
Introduction, method of least squares, curve fitting, parameter estimation of dynamic transfer function models ï step and impulse response models, Auto regressive Moving Average models, least square and recursive least square methods, parameter estimation of RTD models - moments method. **(7)**

TEXT BOOKS:

1. Roger E. Franks, ñModelling and Simulation in Chemical Engineeringò, John Wiley and Sons, 1972
2. W.F. Ramirez, ñComputational Methods in Process Simulationò, Butterworth Publishers, 1989

REFERENCE BOOKS:

1. Seinfeld and Lapidus, ñMathematical Methods in Chemical Engineeringò, Prentice Hall, 1974
2. W.L.Luyben,ò Process Modelling, simulation and Control for Chemical Engineersò, 1990
3. Santosh Kumar Gupta, ñNumerical Methods for Engineersò, Tata McGraw Hill, 1995

8CH04 PROFESSIONAL ELECTIVE - II
(1) PETROLEUM PROCESSING TECHNOLOGY
SECTION - A

UNIT I: Petroleum Exploration Production and Refining of Crude oils Crude oils: Chemistry and composition (Characteristics and constituents of crude oils, Classification of crude oils). **(7)**

UNIT II: Quality Control of Petroleum Products Classification of laboratory tests, distillation, vapour pressure, flash and fire points, octane number, performance number, cetane number, aniline point, viscosity index, calorific value, smoke point, char value, viscosity, viscosity index, penetration tests, cloud and pour points, drop point of grease, melting and settling points of wax, softening point of Bitumen, induction period of gasoline, thermal stability of jet fuels, gum content, Total Sulphur, Acidity and Alkalinity, Copper Strip Corrosion Test, Silver ï Strip Corrosion Test for ATF, Ash, Carbon Residue (Conradson method, Ramsbottom method) Colour, Density and Specific gravity, Refractive index of hydrocarbon liquids, water separation index (modified) (WSIM), ductility. **(8)**

UNIT III: Petroleum Products: Composition, Properties & Specification of LPG, Naphthas, motor spirit, Kerosine, Aviation Turbine Fuels, Diesel Fuels, Fuel Oils, Petroleum Hydrocarbon Solvents, Lubricating oils (automotive engine oils, industrial lubricating oils electrical insulating oils, Jute Batching oils, white oils, steam turbine oils, metal working oils, etc.) Petroleum Waxes Bitumens, Petroleum coke.

Crude Oil Distillation: Desalting of crude oils, Atmospheric distillation of crude oil, Vacuum distillation of atmospheric residue.

Thermal Conversion Process: Thermal Cracking Reactions, Thermal Cracking, Visbreaking, (Conventional Visbreaking and Soaker Visbreaking) Coking (Delayed Coking, Fluid Coking, Flexicoking), Calcination of Green Coke. **(8)**

SECTION - B

UNIT IV: Catalytic Converson Process Fluid catalytic cracking; Catalytic reforming; Hydrocracking Catalytic Alkylation, Catalytic Isomerization; Catalytic Polymerization. **(7)**

UNIT V: Finishing Process Hydrogen sulphide removal processes; Sulphur conversion processes; Sweetening processes (Caustic treatment, Solutizer process; Doctor treating process; Copper chloride sweetening,; Hypochlorite sweetening ;Air and inhibitor treating process; Merox processes;Sulphuric acid treatment;

Clay treatment); Solvent extraction processes (Edeleanu process, Udex process, Sulfolane process), Hydrotreating processes. **(7)**

UNIT VI: Lube Oil Manufacturing Process Evaluation of crude oils for lube oil base stocks, Vacuum distillation, Solvent deasphalting Solvent extraction of lube oil fractions (Furfural, NMP and Phenol), Solvent dewaxing, Hydrofinshing, Manufacture of petroleum waxes (Wax sweating, Solvent deoiling) Manufacture of Bitumens Selection of crude oil, Methods of manufacture of bitumens, (Distillation, Solvent precipitation, Air blowing). **(8)**

TEXT BOOKS:

1. Nelson, W.L., Petroleum Refining Engineering, McGraw Hill
2. Mall, I D ,Petrochemical Process Technology, McMillan India

REFERENCE BOOK:

1. Sarkar,G.N., Advance Petroleum Refining, Oscar Publication

8CH04 PROFESSIONAL ELECTIVE - II
(2) CORROSION ENGINEERING
SECTION - A

UNIT I: Basic aspects, introduction, classification, economics and cost of corrosion, emf series, Galvanic series, corrosion theories derivation of potential- current relationship of activation controlled and diffusion corrosion processes. Potential- pH diagrams Fe-H2O system, application and limitations. Passivation, definition, anodic passivation, theory of passivation, oxidation laws, effects of oxygen and alloying on oxidation rates. **(8)**

UNIT II: Forms of corrosion-definition, factors and control methods of various forms of corrosion such as pitting, inter granular, crevice, stress corrosion, corrosion fatigue, hydrogen embrittlement, corrosion processes and control methods in fertilizers, petrochemical and petroleum refineries. **(7)**

UNIT III: Environmental aspects: Atmospheric corrosion- classification, factors influencing atmospheric corrosion, temporary corrosion preventive methods, corrosion in immersed condition, effect of dissolved gases, salts, pH, temperature and flow rates on corrosion, Underground corrosioncorrosion process in the soil, factors influencing soil corrosion. **(8)**

SECTION - B

UNIT IV: Corrosion control aspects: Electrochemical methods of protection-theory of cathodic protection, design of cathodic protection, sacrificial anodes, anodic protection. Corrosion

inhibitors for acidic, neutral and alkaline media, cooling water system-boiler water system. Organic coatingsurface preparation, natural synthetic resin, paint formulation and applications. Design aspects in corrosion prevention, corrosion resistant materials. **(8)**

UNIT V: Corrosion Testing, monitoring and inspection, laboratory corrosion tests, accelerated chemical tests for studying different forms of corrosion. **(7)**

UNIT VI: Electrochemical methods of corrosion rate measurements by DC and AC methods, corrosions monitoring methods, chemical and electrochemical removal of corrosion products. **(7)**

TEXT BOOKS:

1. S.N. Banerjee, An Introduction to Corrosion and Corrosion Inhibition, Oxonian Press Ltd., New Delhi.
2. L.L Shrier Corrosion Vol. I & II, George Nownons Ltd., London Edition II

REFERENCE BOOKS:

1. M.G. Fontana & N.D. Greene,Corrosion Engineering, McGraw Hill, New York, Edition III
2. H.H. Uhlig, Corrosion and Corrosion Control. A Wiley- Inter Science. Publication John Wiley & Sons, New York
3. C.T.Munger- Organic Coatings
4. Jain & Jain, Engineering Chemistry, Dhanpat Rai & Sons, New Delhi

8CH04 PROFESSIONAL ELECTIVE - II
(3) BIOCHEMICAL ENGINEERING

SECTION -A

UNIT I: Introduction - principles of microbiology, structure of cells, microbes, bacteria, fungi, algae, chemicals of life - lipids, sugars and polysaccharides, amino acids, proteins, nucleotides, RNA and DNA, hierarchy of cellular organisation, Principles of genetic Engineering, Recombinant DNA technology, mutation. **(7)**

UNIT II: The kinetics of enzyme catalyzed reactions - the enzyme substrate complex and enzyme action, simple enzyme kinetics with one and two substrates, determination of elementary step rate constants. Isolation and utilisation of Enzymes -production of crude enzyme extracts, enzyme purification, applications of hydrolytic enzymes, other enzyme applications, Enzyme production ï intercellular and extra cellular enzymes. **(8)**

UNIT III: Metabolic pathways and energetic of the cell, concept of energy coupling, ATP and NAD, Photosynthesis, Carbon metabolism, EMP pathway, Tricabocyclic cycle and electron transport chain,

aerobic and anaerobic metabolic pathways, transport across cell membranes, Synthesis and regulation of biomolecules. **(8)**

SECTION - B

UNIT IV: Typical growth characteristics of microbial cells, Factors affecting growth, Batch and Continuous cell growth , nutrient media, enrichment culture, culture production and preservation Immobilisation Technology ï Techniques of immobilisation, Characteristics and applications, Reactors for immobilized enzyme systems. **(8)**

UNIT V: Introduction to bio reactors, types, Continuously Stirred aerated tank bioreactors, Determination of volumetric mass transfer rate of oxygen from air bubbles and effect of mechanical mixing and aeration on oxygen transfer rate, heat transfer and power consumption. **(7)**

UNIT VI: Fermentation-methods and applications, Downstream processing and product recovery in bio processes. **(7)**

TEXT BOOKS:

1. M.L.Shuler and F.Kargi, ñBioProcess Engineering : Basic conceptsò, 1st Edition, Prentice Hall, New Jersey, 1992
2. Mukesh Doble, Sathyanarayana N, Gummai, ñBiochemical Engineeringò,Prentice Hall, 2007

REFERENCE BOOKS:

1. Trevan, Boffey, Goulding and Stanbury, ñBiotechnologyò, Tata Mcgraw Hill Publishing Co.,NewDelhi, 1987
2. S.Aaiba, ñBiochemical Engineeringò, Academic Press, 1965
3. D.G. Rao, ñIntroduction to Biochemical Engineeringò, Tata McGraw Hill, 2005
4. J.E.Bailey and D.F.Ollis, ñBiochemical Engineering Fundamentalsò, McGraw Hill, 1986

8CH04 PROFESSIONAL ELECTIVE - II
(4) PETROLEUM REFINERY ENGINEERING
SECTION - A

UNIT- I: Introduction ï genesis, occurrence, exploration, drilling of crude oil. Composition and Evaluation of crude oil and testing of petroleum products. Refining of petroleum ï Atmospheric and vacuum distillation. **(8)**

UNIT- II: Refining of petroleum ï Atmospheric and vacuum distillation. Pretreatment of crude oil and transportation. **(7)**

UNIT-III: Cracking processes - Thermal cracking, Vis-breaking, Coking. Catalytic cracking (FCC), Hydro cracking, Rebuilding processes, bitumen blowing. **(8)**

SECTION - B

UNIT-IV: Treatment techniques for removal of sulphur compounds to improve performance, Storage and stability. Product treatment processes - various solvent treatment processes, Dewaxing, Clay treatment and Hydro fining. **(8)**

UNIT-V: Cracking of naphtha and gas for the production of ethylene, propylene isobutylene and butadiene. Production of acetylene from methane. **(7)**

UNIT-VI: Catalytic Reforming of petroleum feed stocks. Extraction of Aromatics. **(7)**

TEXT BOOKS:

1. B.K.Bhaskara Rao, ñModern Petroleum Refining Processesò, 2nd Edn., Oxford and IBH Publishing Company, New Delhi, 1990
2 W.L.Nelson, .ò Petroleum Refinery Engineeringò, 4th Edn., McGraw Hill, New York, 1985

REFERENCE BOOKS:

1. Robert. A. Meyers, ñHandbook of Petroleum Refining Processesò, McGraw Hill, 1986
2. G.D.Hobson and W.Phol, ñModern Petroleum Technologyò, Applied Science Publishers, IV Edition, 1975

8CH04 PROFESSIONAL ELECTIVE - II
(5) BIOFUELS

SECTION - A

UNIT I: History, diesel engine, diesel fuel, alternative diesel fuels, Biodiesel, definition, sources, standards. **(7)**

UNIT II: Use of straight vegetable oil, dilution with conventional diesel, blending with esters; Structure of triglycerides. **(7)**

UNIT III: Transesterification of oils, alcohols and catalysts used, mechanism of reaction, reaction conditions, process, glycerine recovery, raw materials and glycerine use, fuel related properties of various fats, oils and their esters, comparison with petroleum diesel. **(8)**

SECTION - B

UNIT IV: Combustion chemistry, lubricity, engine performance, engine problems and deposits using biodiesel in present engines. **(7)**

UNIT V: Tailpipe emissions using vegetable oil fuel and esters, comparison with petroleum diesel. **(8)**

UNIT VI: Health hazards on use of petroleum fuel and biodiesel, Safety and advantages of biodiesel. Storage conditions for biodiesel. **(8)**

TEXT BOOKS:

1. Biodiesel: A Realistic Fuel Alternative for Diesel Engines by Ayhan Demirbas
2. The Biodiesel Handbook by Knothe, Gerhard

8CH04 PROFESSIONAL ELECTIVE - II
(6) INDUS1RIAL PIPING

SECTION - A

UNIT I: Importance of piping in chemical industry.
Classification of pipes: - Pipe codes and specification, Schedule numbers, BWG, NPS. **(7)**

UNIT II: Material of construction of pipes. Pipe sizing: - Calculation of pipe diameter, thickness. Pipe fittings, advantages, calculation of frictional losses, and empirical correlations for flow of oil. Gasoline, hydrocarbons. **(8)**

UNIT III: Criteria for selection of pipe joints, pipe joints for similar and dissimilar material, expansion effects and methods for reducing them. **(7)**

SECTION - B

UNIT IV: Piping lay-out consideration, piping diagrams, types of pipe support, erection and maintenances of supporting, restraining and braing systems. Complex pipelines in series and in parallel. **(8)**

UNIT V: Calculation of equivalent lengths. Pipeline storage capacity. Fundamental considerations in piping vibrations, types of vibrations, their prevention and control. Cryogenic piping. **(8)**

UNIT VI: Single phase and two-phase flow. Piping for slurries. Insulation for piping systems. **(7)**

TEXT BOOKS:

l. Piping Design for Process Plants by H. F. Rase, John Wiley.
2. Process Piping Systems, D. J. Deutsch, Chemical Engineering Magazine, McGraw Hill

REFERENCE BOOK:

1. Industrial Piping, C.T. Littleton, McGraw Hill

8CH04 PROFESSIONAL ELECTIVE - II

(7) WINE MAKING

SECTION - A

UNIT I: History, definition, wine and wine industry, Wine production of selected areas, grape varieties Geographic, geological, and climatic attributes regarding wine production and quality. Structure and composition of grapes: Grape structure, chemical composition of grapes, e.g. sugars, acids, an thocyanins, tannins, etc., analytical techniques, fruit ripeness. noble rot. **(7)**

UNIT II: Processing of grapes: Grape reception, grape handling strategies, e.g. destalking, crushing, pressing and skin contact, must treatments, temperature control.
Fermentation: Alcoholic fermentation, role of yeast, enzymes, temperature and fermentation Vessels, strategies for the extraction of colour, aroma, flavour and tannin Carbonic maceration, whole bunch fermentation and thermovinification, theory and practice of malolactic fermentation. **(7)**

UNIT III: Maturation and blending: Maturation options, types of maturation vessel, inert storage, blending options, timing of bottling Stabilization, clarification, packing and labeling: Movement of wine in bulk, methods of stabilization and clarification, e.g. fitting, filtration, centrifugation, cold stabilization, etc., use of chemicals in wine making and wine handling - their function, action and application, international regulations governing the use of chemicals, packing into bottles and other containers, ingredient labeling, closures. **(8)**

SECTION - B

UNIT IV: Production of sparkling wines: Production techniques for sparkling wines, grape selection and pressing, temperature control, selection and blending of base wines, the second fermentation, Maturation, finishing. **(7)**

UNIT V: Production of fortified wines:
Production techniques for fortified wines, selection of base wines, timing of fortification. practice and significance of blending and maturation, finishing. **(8)**

UNIT VI: Quality assurance and quality control: Composition of wine and its faults, analysis of wine, its purpose, use and limitations, QA and QC systems and structures for wine and dry goods, practical issues of QA and QC, Effects of storage and transport on wine after packing. **(8)**

TEXT BOOK:

1. Exploring Wine, II Edition, by Koplan, Smith, & Weiss, Published by John Wiley & Sons, Inc. New York

8CH04 PROFESSIONAL ELECTIVE - II

(8) PETROCHEMICAL TECHNOLOGY

SECTION -A

UNIT-I: General Introduction - History, economics and future of petrochemicals, energy crisis and petrochemical industry, sources and classification of petrochemicals. **(7)**

UNIT-II: First generation petrochemicals - alkanes - C1, C2, C3, C4 petrochemicals, alkenes -C2, C3, C4, petrochemicals, alkynes - C2, C3, C4 petrochemicals, B-T-X aromatics, diene based petrochemicals. **(7)**

UNIT-III: Second generation petrochemicals - synthesis gas, methanol, formaldehyde chloromethanes, ethanol, acetaldehyde, acetic acid, acetic anhydride, isopropyl alcohol, ethylene oxide, propylene oxide, acetone, vinyl chloride, phenol, aniline and styrene. **(8)**

SECTION - B

UNIT- IV: Third generation petrochemicals - plastics, rubbers and fibres, olefinic polymers, polyethylene, polypropylene, polyisobutylene, diene polymers - polybutadiene, neoprene, polyisoprene, SBR, synthetic fibres. **(7)**

UNIT- V: Miscellaneous petrochemicals - petroleum proteins, synthetic detergents, resin and rubber chemicals, explosives - TNT and RDX. **(8)**

UNIT- VI: Various technological forecasting of the petroleum and petrochemicals. **(8)**

Text Books:

1. S.Maiti, ñIntroduction to petrochemicalsò, Oxford and IBH publishing Co.,1992
2. H.Steines, ñIntroduction to petrochemical Industryò, Pergamon, 1961

REFERENCE BOOKS:

1. G.D.Hobson and W.Pohl, ñModern Petroleum Technologyò, Applied Science Publishers, IV Edition, 1975
2. Richard frank Goldsten and A.Lawrence Waddams, ñThe Petroleum Chemical Industryò, E&FN Spon Ltd., 1967
3. G.T.Austin, ñShreves Chemical Process Industriesò, McGraw Hill, V Edition, 1986

8CH04 PROFESSIONAL ELECTIVE - II
(9) ENERGY TECHNOLOGY & MANAGEMENT
SECTION - A

UNIT-I: Fuels: Classification, Properties, tests and analysis. Solid Fuels: Coal, origin, classification, storage and handling, carbonization, gasification and briquetting, gasification of biomass. **(7)**

UNIT-II: Liquid fuels: Petroleum based fuels, synthetic fuels, alcohol and blended fuels, storage and handling.
Gaseous fuels: Water gas, carburetted water gas, producer gas, coal gas and natural gas. **(7)**

UNIT-III: Combustion - Air requirement for solid, liquid and gaseous fuels, combustion equipment Solar energy, Wind energy, Tidal energy. **(8)**

SECTION - B

UNIT-IV: Geothermal energy, Magneto hydrodynamics, Nuclear energy. Energy Management-Principles need, initiating and managing an energy management program. **(7)**

UNIT-V: Energy audit: Elements, and concepts, types of energy audits, energy audit with respect to industries like sugar, paper etc. **(8)**

UNIT-VI: Energy Conservation: Thermodynamics of energy conservation, cogeneration, waste heat recovery technologies. Industrial insulation, material selection, economical thickness. **(8)**

TEXT BOOKS:

1. S.Sarcar, ñFuels and combustionò, Orient Longman, 1990
2. G.D.Rai, ñNon conventional energy sourcesò, Khanna Publishers, IV edition, New Delhi, 2004
3. S.P.Sharma and ChanderMohan, ñFuels and Combustionò, Tata McGraw Hill, 2004
4. J.K.Harker and J.R.Backhurst, ñFuel and energyò, Academic Press, 1981

REFERENCE BOOKS:

1. D.A.Raey, ñIndustrial Energy Conservationò, Pergomon Press, 1980
2. J.D.Gilchrist, ñFuels, Furnaces and Refractoriesò, Pergamon Press, 1977

8CH04 PROFESSIONAL ELECTIVE - II
(10) ENERGY & ENVIRONMENT
SECTION - A

UNIT I: INTRODUCTION TO ENERGY SOURCES: Global Energy, Environmental Resources, Energy necessity and energy crisis. Indian Energy Scenario: Energy Consumption, needs and crisis, energy sources and availability. **(7)**

UNIT II: RENEWABLE SOURCES OF ENERGY AND ENVIRONMENT: Biomass ï introduction, energy plantation, bio-mass conversion technologies (wet and dry process), photosynthesis, agricultural waste derived energy, urban waste derived energy.
BIOGAS: Generation, factors affecting bio-digestion, advantages of anaerobic digestion, classification of bio-gas plants. **(7)**

UNIT III: HYDROPOWER: Site selection for hydroelectric power plants, classification of hydroelectric power plants, submergence, ecological imbalance, catchment area treatment, advantages and disadvantages of hydroelectric power plants. Submergence, Ecological Imbalance, Catchment Area Treatment. **(8)**

SECTION - B

UNIT IV: SOLAR ENERGY: Solar constants, solar radiation at earth surface, physical principles of conversion of solar radiation into heat. Concentrating collectors (focusing and non-focusing). **(7)**

UNIT V: TIDAL ENERGY: OTEC (Ocean Thermal Electric Conversion), methods of ocean thermal electric power generation, site selection. Energy from tides ï basic principles of tidal power, components of tidal power plant.
WIND ENERGY: Introduction, basic principles of wind energy conversion. Site selection considerations. Basic components of wind energy conversion system. Wind energy collectors. Natural gas ï classification and comparison of different gas turbine power plants, Associated Environmental Effects. **(8)**

UNIT VI: NUCLEAR ENERGY: necessity, general components of nuclear reactors, different types of reactors, breeding reactors, location of nuclear power plants, disposal of nuclear wastes, Associated Environmental Effects.
GEO-THERMAL ENERGY: introduction, nature of geothermal fields, geo-thermal sources, binary fluid geo-thermal power system and arrangement for hybrid plants. **(8)**

TEXT BOOKS:

1. Rai, G.D , ñNon-conventional Energy Sourcesò, Khanna Publications
2. Rao and Parulekar B.B., (1977), Energy Technologyï Non-conventional, Renewable and Conventionalò, 2nd Edition, Khanna Publishers

REFERENCE BOOKS:

1. Mathur, A.N., and Rathore, N.S., ñRenewable Energy and Environmentò ï Proceedings of the National Solar Energy, Himanshu Publications, Udaipur
2. Saha, H., Saha, S.K., and Mukherjee, M.K., (1990), ñIntegrated Renewable Energy for Rural Developmentò, Proceedings of the National Solar Energy Convention, Calcutta, India,
3. Wilber, L.C., (1989), ñHandbook of Energy Systems Engineeringò, Wiley and Sons
4. The Energy Research Institute (TERI), New Delhi, Publications
5. Ministry of Environment and Forests, Government of India, Annual Reports

8CH05 PROFESSIONAL ELECTIVE-II LAB

Minimum EIGHT experiments based on the syllabus are to be performed by the students.

8CH06 PROJECT & SEMINAR

SEMINAR:

The Seminar Report submitted by the student at the end of VII Semester will be evaluated by external examiner appointed by the University along with the Project - Viva Voce examination at the end of VIII Semester.

PROJECT:

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental , design or combination of these in the area of Chemical Technology. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. On completion of the work, a project report should be prepared and submitted to the department.

The evaluation is based on continuous internal assessment by an internal assessment committee for 75 marks by way of oral presentations. The university examination, which carries a **total of 150 marks**, will be a Viva Voce examination conducted by a committee of one external examiner appointed by the University and one internal examiner/Guide.

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FOUR YEAR DEGREE COURSE IN
B TECH POLYMER TECHNOLOGY
CREDIT & GRADE SYSTEM

SEMESTER : SEVEN

7PP01 POLYMER PROCESSING - I

SECTION - A

Unit-I&II: Injection moulding - Principle, process, Types of injection moulding m/c, Clamping unit, injection unit selection of injection moulding machines, materials used. M/c maintenance defects and remedies. Feed system in injection moulding, Quality in injection molding. Fundamental of injection moulding, typical injection moulding cycle, effect of materials, properties and process variables on product quality, Runners and hot runner moulding. Injection moulding of thermosets. Problems of calculation of optimum no. of cavities, Injection pressure, volumetric output, HP/KW required, Wall thickness, Shrinkage etc.Recent developments in injection molding such as Gas assist injection molding, two colour Injection moulding.

Unit III: Compression Moulding Principle, Process, types of process, materials used properties, of materials relevant to moulding process. Compression moulding cycle equipments and auxiliary equipments, Interrelation between flow properties of the polymers, process parameters as well as moulding design on product quality. Different types of compression moulds. Molding defects and remedies.

SECTION - B

Unit IV: Transfer Moulding: Principle, process description, Transfer moulding cycle. Types of process, materials used. Types of equipment comparison with compression Moulding, limitations, Defects and remedies.

Unit V: Lamination, casting, foaming of polymers, rotational molding and reaction injection moulding.

Unit VI: Recycling Tech: Types of recycling, size and material separation, Biodegradation, Incineration.

TEXT BOOKS:

1) Principles of Polymer Processing: Z.Tadmor and C.G.Goges.
2) S.P.I.Hand Book of Plastic Engg,Foadoes

REFERENCE BOOKS:

1) Injection Molding, Theory and Practice: I.I.Rubin
2) Injection Molding Design, Ilnd Edn.,: R.C. W.Pye.

3) Plastic Molding E0gg.: D. A. Dearie.
4) Injection Molding of Machine : Whelan
5) Reaction Injection molding (3033): Reichart.
6) Injection molding Hand Book (3881): Athalye.
7) Polymer Processing (5686): Mortan Jones.
8) Plastic Engg.: Crawford.
9) Basic Principles of Rotational molding: Bonins.
10) Molding of Thermosetting Plastics : Whealan.
11) Injection Molding Hand Book: Rosato.
12) Recycling of Plastics by Adab and Chandra.

7PP02 POLYMER REACTION ENGINEERING.

SECTION - A

Unit I: Classification of Polymerization reactions & reactors. Isothermal/ Non isothermal, constant volume/variable volume, single ideal reactor, Ideal batch and steady state flow Ideal reactors such as plug flow and constant flow stirred tank reactors. Material balance and energy balance across these ideal reactors. Performance/design equations for ideal reactors.

Unit II: Techniques of Polymerization: Bulk, Solution, Suspension, emulsion and Dispersion Polymerization, Their merits and demerits, gas phase olefin polymerization.

Unit III: Kinetics of emulsion polymerization, Smith Ewart theory for stage II Polymerization, Estimation of total number of Polymer particles, Kinetics of Dispersion Polymerization, Fitch Theory.

SECTION - B

Unit IV: Reaction Engineering of condensation polymerization -Kinetics of A-R-B type condensation polymerization, Average molecular weight in condensation Polymerization: Effect of stoichiometric ratio of functional group on degree of Polymerization, Molecular weight distribution in condensation Polymerization: equation for number average chain length and weight average chain length. Choice of reactor in condensation Polymerization regarding average molecular weight and molecular weight distribution. Control of molecular weight.

Unit V: Reaction engineering of radical Polymerization - Kinetic model of radical polymerization, Average molecular weight in radical polymerization. Determination of rate of Polymerization and rate constant by dilatometer, molecular weight distribution in radical Polymerization: equation for number average chain length and weight average chain length.
Choice of reactor in radical Polymerization regarding average molecular weight and molecular weight distribution. Control of molecular weight in radical Polymerization by different methods such as increase in the temperature of Polymerization, method of weak inhibition, use of chain transfer agents.

Unit-VI: Introduction of non-ideal reactor: Basic idea of R.T.D. studies. Constructional Features of large Polymerization reactors: For suspension technique: polymerization of Polystyrene and Polyvinyl chloride. Agitation, heating-cooling, cleaning arrangements in Large polymerization reactors.

TEXT BOOK:

1) Chemical Reaction Engineering: O Levenspiel.
2) Fundamental of Polymer Science & Engineering Anilkumar & S.K.Gupta.

REFERENCE BOOK:

1. Polymerization Reactors & Process: J.N.Henderson.
2. Polymerization Kinetics & Technology: Naj Platzer
3. Polymer Reaction Engineering (2318): Reicharl

7PP03 STRUCTURE PROPERTY RELATIONSHIP IN POLYMERS

SECTION - A

Unit I: Classification of polymer - on the basis of structure, regularity, chemical constitution, configuration and conformation of chain. Freely jointed chain: - segment of chain, size & shape of macromolecular chain, random flight model, random flight end to end distance. Internal rotation in macromolecule: internal rotation in freely jointed chain, the forces affecting internal rotation - different types of intra molecular / inter molecular interactions.
Flexibility of chain: thermodynamic and kinetic flexibility of chain, factors affecting flexibility, practical importance of chain flexibility.

Unit II: Super molecular structure: Molecular aggregation & stable state of assemblage, two phase structure in solid polymer, fringed micelle theory, structure of amorphous polymer, structural features of crystallizable polymers, degree of crystallinity and measurement of degree of crystallinity.

Unit III: Thermodynamics of crystallization and melting : Energetic of phase change, Glass transition temperature, equilibrium melting temperature, determination of equilibrium melting temperature, mechanism of crystallization, Kinetics of crystallization, Avramiôs equation, experimental studies of kinetics of crystallization in polymers, general kinetic features of crystallization.

SECTION - B

Unit IV: Morphology of crystallline polymers:- Polymer single crystal, folding of chain, lamellae. Structure of polymer crystallized from melt - spherullite. Extended chain crystal, strain induced morphology - fibrilar crystals, defect structure of crystalline polymer. Morphological changes during orientation. Structure formation during processing.

Unit V: Polymer structure and physical properties:

(a) The crystalline Melting Point: - Melting point of homologous series, effect of chain flexibility and other steric factors, side chain substitution, effect of co-polymerization.

(b) Mechanical Properties:- Effect of crystallinity, molecular weight, cross link density, and filler on mechanical strength of glassy and crystalline polymers. Mechanical strength and life time of polymer.

(c) Electrical Properties:- Electrical properties of polymers such as dielectric break down strength, dielectric loss, permittivity. Effect of chemical constitution of polymer, stero regularity and crystalline of polymer on electrical properties.

Unit VI: (a) Property requirement and polymer utilization for different applications such as Elastomers, Fibers, General purpose plastics, optical applications, electrical applications, Mechanical applications.

(b) Special applications of polymers and their structures: Liquid crystalline polymers, polymer sorbents and porous structure of polymer, ion exchange resins.

TEXT BOOKS:

1) Physical Chemistry of Polymers - A. Tager, MIR Pub., Moscow.

2) The Structure of Polymers - M.L.Miller, Reinhold Pub. Corporation, New York.

REFERENCE BOOKS:

1. Properties and Structure of Polymers - Arthur V. Tobolsky, John Wiley and Sons Inc. Pub.

2. Polymer Structure Properties and Applications - R.D.Deanin, Calmer Pub. Co., New York, 1972.

3. Properties of Polymers - D. W.Van Krevelin and P.J.Noftyier, Elsever S. Pub. Co., Amsterdam, 1976.

4. Polymer Materials Science - J. Schultz, Prentice Hall Inc., N. 1974.

7PP04 PROFESSIONAL ELECTIVE – I
(1) POLYMER BLENDS AND COMPOSITES

SECTION - A

Unit-I: Polymer Blends-Miscible and Immiscible type, compatibilization mechanism, compatibilizes used in polymer blends and their addition method, compatibility of polymer blends, criteria for compatibility, methods of blends preparation, such as mechanical graft, block and IPNS, Principle tests for polymer compatibility.

Unit-II: Transition behaviors to polyblends. Impact modification by Elastomer, types of impact modifiers, characteristics of impact modifiers, Effect of blend type and rubber content on impact strength of polymer blend. Bulk behavior of two phase polymer material. Toughening mechanism in Elastomer modified blend.

Unit-III: Preparation, properties, Uses and processing of commercial polyblends - Incompatible, semicompatitle or compatible type eg. Rubber - rubber polyblends, synthetic paper polyblends, HIPS, Blends based on PPO, PE, PVC, ABS, EVA, EPDM and PU-acrylic, etc.

SECTION - B

Unit-IV: Polymer composite, classification of composites, Fundamentals of polymer composites systems such as matrix, Reinforcement/ fiber and Reinforcement-matrix interphase, their role in polymer composite. Types of composites - mechanical, Thermal, Viscoelastic properties of composites in relation to processing, Selection criteria for material and reinforcements, Criteria for Process Selection of composites, Section thickness, Compatibility criteria for reinforcement and matrix.

Unit-V: Reinforced plastics types, material for reinforcement(polyester fibers, glass fibers, aramide fibers etc), type of matrix (Thermosets) and additives. Processing techniques of reinforced plastics & application, (open & close molding, pultrusion,RTM, Filament Winding, Pressure injection.)

Unit-VI: Designing aspects in Composites like flat sheets, hollow and solid structure (drafts, flanges, corners etc.), Defects and faults in Composite (Possible causes and Remedies), Application of composites in different fields-Automobile, Aerospace, Marine, Land transportation. Electrical and Electronics, Construction and industry.

TEXT BOOKS:

1) FRP Technology, Weatherhead, Applied Science Publishers Ltd, London.

2) Polymer Blends and Alloys By MJ.Folkes and P.S. Hope Blackie Academic and Professional Publication.

REFERENCE BOOKS :

1. Polymer Blends D.R.Paul and S.Newman Academic Press. New York 1976.
2. Polymer Blends and Alloys-Byutraki
3. Polymer Engg. Composites, M.O. W.R.Richardson applied science London 1976.
4. Polymer Blends and Alloys By MJ.Folkes and P.S. Hope Blackie Academic and Professional Publication.
5. Handbook of Fillers and Reinforcement for Plastics, H.S.Katz and J. V.Milweski, Van Nostrand Renhold Renhold Co.New York 1 978
6. SPI Handbook of Tech. and Engg. of Reinforcements for Plastics and Composites, J.G.Mohr.S.S.Oleesky, G.D.Shook, L.S.Meyer, Van Nostrand Renhold Co., New York 1973.
7. Structural Design with Plastics, B.S.Benjamin, Van Nostrand Renhold Co. New York, 1982.
8. Polymer Composite by Margolies.

7FEPP04 PROFESSIONAL ELECTIVE – I
(2) PACKAGING TECHNOLOGY

Objective :

Plastic material offer unique advantage in the area of packaging from aesthetics and functional point of view. Objective of this course is to introduce the students to the emerging area of plastic packaging technology.

SECTION - A

Unit I: Introduction: Need for packaging, packaging done by nature, purpose of packaging, types of packaging Packaging materials: glass, metal, wood, plastics etc, and complete detail of material selection criteria.

Unit II : Packaging Engineering: New product development, market, self life, quality assurance, logistic, graphic design, regulation, temperature evidence packaging, child resistance packaging, quality management system, verification & validation protocols, life cycle assessment, waste hierarchy, importance of 3 R (Reduce, reuse & recycle).

Unit III: Package Design Approach **:**Productï packaging relationship, productï package characteristics, compatibility factors, product type vs packaging requirements, product characteristicsï physical state, centre of gravity, size / weight, volume. product characteristicsï chemical: effect of gases, moisture, atmospheric gases, product characteristics ï biological: sensitivity to

microbial factors. Product characteristics ï physico chemicals: effect of moisture, vapor, oxygen & other gases

SECTION -B

Unit IV: Packaging Material Characteristics:Packaging material properties ï physical: influence of molecular / fiber directions, tensile, breaking load, tension, tear, torsion, puncture, burst, packaging, material Properties ï chemical: pH, chloride / sulphate content, imbedded and unreacted chemicals, packaging material properties ï biological: sensitivity to micro organisms, packaging material properties ï physic chemical: absorption & diffusion of moisture and gases ï barrier properties.

Unit V: Packaging Material Evaluation: Physical & mechanical properties: weight, dimensions, strength properties, stiffness, tear, tensile and others, chemical properties: alkalinity, acidity, resistance biological properties, sensitivity to microbes, chemicals, presence of chloride, sulphate, lignin, ash, flammability, physiological properties ï odor / flavors.

Unit VI: Packaging Machines :Bottle filling lines which includes bottle washing, sterilization, filling, screw capping/crown corking, induction sealing, labeling etc., form fill seal machines: types (vertical & horizontal), flow rap machine, retort machine, tetra packs, wooden packaging, miscellaneous packaging technique, bag in box, child resistance pack, packaging in canes etc, biodegradable and ecofriendly packaging, advantages and disadvantages, packaging used for export, advancements and developments and application.

TEXT BOOKS:

1) Packaging Handbookï A.S. Athalye, Tata McGraw Hill, New Delhi, 1992

2) Fundamentals of Packaging Technology ï F.A. Paine (Blackie & Sons Publication) 1967

REFERENCE BOOKS:

1. Packaging, Materials and Containers ï F.A. Paine (Blackie & Sons Publication),
2. Plastics in Packaging ï A.S. Athalye, Tata McGraw Hill, New Delhi, 1992
3. Plastic Packaging- Susan E.M. Selke (Hanser Gardner Publication), 2004
4. Plastics Packaging ï Properties, Processing, And Applications.[2nd Edition] By Susan E. M. Selke, John Culter, 2010.
5. Plastics Materials for Packaging By Barnetson [Rapra Publications], 1996

6. Understanding Plastics Packaging Technology By Susan E. M. Selke, John Culter,
7. Rigid Plastics Packaging ï Materials, Processes And Applications By F. Hannay [Rapra Publications], 2002.

7PP05 PLANT DESIGN & PROJECT ENGINEERING

Objectives:

Learning fundamentals and applications of chemical engineering plant design, value engineering, optimization with emphasis on chemical engineering applications, fundamentals of engineering economics and the management decision making processes that are used in engineering problem solving. Understanding the concept of interest and equivalence, learning the methods of engineering economic analysis like present worth, rate of return, annual cash flow and benefit-cost ratio, depreciation, etc.

SECTION - A

UNIT I: Basic considerations in chemical engineering plant design, project identification, project identification, preliminary techno-economic feasibility, process selection, laboratory developments and its importance, pilot plant, scale-up methods, flow diagrams. Selection of process equipments: standard vs. Special equipments, materials of construction of process equipments, specification sheets. (7)

UNIT II: Plant Location: Objectives, levels of location problems, factors influencing location of a plant, locational analysis, selection criteria, significance, theories of plant location. Plant Layout: Meaning of plant layout, design importance and scope, essentials, types of layout, factors influencing layout, dynamics of plant layout, planning for plant design. (7)

UNIT III: Cost estimation: equipment costs, cost indices, Williamôs point sixth rule, methods of estimation of fixed capital, product cost estimation. Interest formulae and their applications, time value of money, simple and compound interest, discrete, nominal and continuous rate of return and their relationships, issue and evaluation of bonds, concept of equivalence. (8)

SECTION - B

UNIT IV: Depreciation: Introduction, straight line method of depreciation, declining balance method of depreciation, sum of the years-digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation. (8)

UNIT V: Replacement and Maintenance analysis: Types of maintenance, types of replacement problem, determination of economic life of

an asset, Replacement of an asset with a new asset, capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely, practical factors in alternative and replacement investment. **(8)**

UNIT VI: Inventory control, scheduling a project using CPM/PERT, project management, optimum conditions, optimum production rates in plant operations, optimum conditions in cyclic operations, design reports. **(7)**

TEXT BOOKS:

1. Max Peters, Plant design and economics for chemical engineers, McGraw Hill
2. Panneer Selvam, R, Engineering Economics, Prentice Hall of India Ltd, New Delhi, 2001

REFERENCE BOOKS:

1. Chan S.Park, ñContemporary Engineering Economicsò, Prentice Hall of India, 2002
2. Donald.G. Newman, Jerome.P.Lavelle, ñEngineering Economics and analysisò Engg. Press, Texas, 2002

7PP06 POLYMER PROCESSING –I - Lab

LIST OF PRACTICALS

1. To study the working of intensive dry mixture during preparation of P V C compound.
2. To manufacture shoe sole compound using extruder.
3. To study the effect of processing parameters during preparation of Bottle cap by hand injection process.
4. Selection of injection moulding machine.
5. To manufacture Test sample using reciprocating screw injection moulding machine by various materials (LDPE, HDPE and P S)
6. Using heat Gun. (Shrink-Pack Techniques)
7. To study the rotational moulding machine and to prepare sample.
8. To manufacture two way electric plug using Transfer moulding machine.
9. To study the laboratory extruder.
10. Calculate the water absorption of filler percent in P V C sheet.
11. Production of articles by compression moulding and effect of process parameters on moulded articles.
12. To study the hydraulics and electric circuits of automatic injection molding m/c.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7PP07 POLYMER REACTION ENGINEERING - Lab

LIST OF EXPERIMENTS

1. To study kinetics of reaction by differential/integral method of analysis.
2. To find activation energy and frequency factor.
3. Performance of batch reactor.
4. Performance of C.S.T.R.
5. Performance of tubular reactor.
6. Bulk Polymerisation technique.
7. Emulsion Polymerisation technique.
8. Suspension Polymerisation technique.
9. R.T.D. Studies in m ixed vessel.
10. R.T.D.Studies in tubular flow.
11. To study kinetics of Polycondensation.
12. To study kinetics of Addition Polymerisation by dilatometer.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7PP08 PROFESSIONAL ELECTIVE-I - Lab

(1) POLYMER BLENDS & COMPOSITES

1. To prepare HDPE/PP blend.
2. To determine mechanical and thermal properties of HDPE/PP blend.
3. To prepare Rubber polyblends.
4. To determine the mechanical and thermal properties of rubber polyblends.
5. To prepare fibre reinforced composite by hand lay-up technique.
6. To determine mechanical and thermal properties of reinforced polymer composite(above prepared).
7. To prepare chopped strands reinforced composite by hand-lay up process.
8. To determine the mechanical & thermal properties of the above prepared composite.
9. To prepare fibre reinforced polymer composite using vacuum RTM.
10. To determine mechanical properties of the polymer composite made using vacuum RTM.
11. To give the surface treatment to and natural fiber / reinforcement and note the results.
12. To use the above treated natural fibers/reinforcement in polymer composites and determine their mechanical properties.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7PP08 (2) PACKAGING TECHNOLOGY

1. Identification of plastic material for packaging films.
2. To determine tensile strength of a given plastic film sample
3. To determine percentage elongation of given plastic film sample
4. To determine static & dynamic coefficient of friction of plastic film.
5. To determine dart Impact strength of plastic film with the help of dart Impact tester.
6. To determine dielectric strength of plastic film sample.
7. To determine shrinkage in film Using heat Gun. (Shrink-Pack Techniques)
8. To study the character-ties of shrink packaging.
9. To study the screen printing on plastic film.
10. To study characteristics of plastic films corresponding to the application.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

7PP09 INDUSTRIAL TRAINING

During the course of study from **III** to **VII** semester each student is expected to undertake a minimum of two industrial visits and undertake a minimum of two weeks of industry/field training. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of **VII** semester for **50 marks**.

7PP10 PROJECT & SEMINAR

SEMINAR:

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/ survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for **50 marks.** The Seminar Report will be evaluated by external examiner appointed by the University along with the Project - Viva Voce examination at the end of **VIII Semester.**

PROJECT:

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental , design or combination of these in the area of

Polymer Technology. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. On completion of the work, a project report should be prepared and submitted to the department.

The evaluation is based on continuous internal assessment by an internal assessment committee for **75 marks** by way of oral presentations. The university examination, at the end of **VIII** semester carries **75 marks**, will be a Viva Voce examination conducted by a committee of one external examiner appointed by the University and one internal examiner/Guide.

SEMESTER : EIGHT

8PP01 POLYMER PROCESSING-II

SECTION-A

Unit I & II : Extrusion & II Principles of extrusion, Design features of extruders such as type of drives, types of screws, L/D ratios, compression ratio, pitch, screen, breakers plate, barrels, heating and temperature controls. Mechanism of extrusion zones of extruder. M/c & equipments for the production of pipes, blown and cast film, tapes, wire coating etc. Behavior of various Polymers in extrusion, effect of material properties and process parameter on product quality, trouble shooting M/C maintenance. Twin screw extruder, co-extrusion and vented extruders.

Unit-III: Blow Molding: Principle, types of B.M., salient features of injection and extrusion B.M., Blow molding cycle, choice of material for blow molding. Comparision between extrusion and injection blow molding. Stretch blow molding, Principle and advantage. Wall thickness control, Parision programming and itôs methods, Trouble shooting.

SECTION - B

Unit IV: Calendaring: Principle and process description, types of calender units 2, 3 and 4 rolled calendars, Design of calender roll, Heating and temp control, roll crown, roll crossing and roll bending, materials for calendaring, calendaring sheets and films, embossing, coating and lamination by calendar, comparison between calendaring and extrusion.

Unit-V: Finishing techniques solvent cementing, electroplating, Hot stamping, vacuum metalizing, Heat sealing, welding, scree printing, Lecuring.

Unit-VI: Vacuum Forming: Process description, Diff. Techniques of vacuum forming, equipments used in vacuum forming, advantages and limitations and comparison of vacuum forming with injection molding.

Spinning: Process fundamentals, melt spinning, solution and wet spinning of fibers, Drawing and orientation, effects of unfolding, crystallinity and orientation on quality of spinning fibers.

TEXT BOOKS:

1) SP1 H.B. of Plastics Engg. by Benger.
2) Extrusion of Plastics by E.G. Fisher, Newness Butterworth, London.

REFERENCE BOOKS:

1. Polymer Extrusion by Rouwendari, Hanser Publication.
2. Extrusion of Plastfcs by- Finner
3. Dies, for Plastics Extrusion by M.V.Joshi
4. H.B. of Blow Molding by Rosato. Hanser Publication.
5. Plastics Extrusion Technology by Hensen.
6. Extrusion of Plastics-Klockner Windsor Publication.
7. Twin Screw Extruders by Martell.
8. PVC Technology by Athalye.
9. Decorating Plastics by Margolis.
10. Fundamentals of Fibre Formation by A.Ziabecki
11. Thermoforming by Throne.
12. Blow Molding of Plastics - Fisher.

8PP02 POLYMER VISCOELASTICITY & RHEOLOGY

SECTION - A

Unit-I: State of Aggregation and phase states of matter Molecular motion in Polymers, Transition relaxation processes in Polymers.

Unit-II: Glass Transition, mechanism of glass transition temperature Theories to determine the glass transition i.e. Dillatometric, Heat capacity, measurement, Thermo mechanical, Measurement of modulus of elasticity, effect of Tg on molecular mass, kinetic chain flexibility and chemical constituent, Importance of Tg and Tm, HDT.

Unit-III: Viscoelastic behavior, chain topology, branching & crosslinking of Polymer solution and melts stress-strain curves for Polymers, creep of Polymeric material, elastic deformation, irrecoverable follow deformation. Rubber like deformation, Time-temp superposition (WLF Equation) Models of viscoelastity such as Maxwell and kelvin model. Types of viscosity, stress relaxation.

SECTION-B

Unit-IV: Introduction and Basic concept of Rheology, classification of fluids, Newtonian and non Newtonian fluids, shear stress, shear strain and shear rate, shear modulus, bulk modules, Zero shear viscosity, Dependence of viscosity with temp, shear stress, shear rate fluid through channel, characteristic parameter during shear deformation.

Unit-V: Methods to determine shear viscosity by capillary Rheometer, cone and plate viscometer. Cup and bob viscometer, Measurement of normal stresses. Theories of viscosities of dilute (De-bye Bueche theory) and cone. Solutions (Grassleyôs entanglement theory), (Entanglement concern)

Unit-VI: Rheology of dilute and concentrated suspensions, effect of Rheology during Injection, moulding Extrusion: Film extrusion, sheet Extrusion and Blow moldings of polymers.
Rheometer, Bubble inflation rheometer, compressional rheometers, stresses relaxation instruments. Torque rheometers, rotational & sliding surface rheometers and their use in determining process ability.

TEXT BOOKS:

1) Physical Chemistry of Polymers - Tager.
2) Flow Properties of Polymer Melt by J.A.Brydson.

REFERENCE BOOKS:

1. The Flow of Highpolymers, S. Middleman John Wiley and Sons, George St. 1968.
2. Rheometry K.Walters, Chapman and Hall London 1975
3. Rheology of Polymers :G.V.Vinogradov and A.Ya Malkin Mir Pub MOSCOW 1980.
4. J.J. Alkonis and W.J.Macknight - Introduction to Polymer Viscoelasticity - Willey Inter Science, New York-1982.
5. Viscoelasticity of Polymers D.D.Ferry III Edn. John Willey and Sons New York 1981.
6. Polymer Sc. and Tech. of Plastics and Rubber; D.Ghosh.
7. Melt Rheology and its Role in Plastics Processing : Dealy

8PP03 PROFESSIONAL ELECTIVE –II

(1) TESTING AND PRODUCT DESIGN FOR PLASTICS

SECTION-A

Unit-I: Introduction - concepts of strength of Polymers, theoretical stress analysis, theory and types of fracture, comparison between metals and polymers, selection of polymer on strength & stiffness basis.

Unit-II & III: Principles tests for mechanical properties such as tension, shear, compression, flexural, hardness. Impact: pendulum, Izod, charpy, chip, Falling weight: Dart impact, high speed impact tester, abrasion creep:- tensile creep, flexural creep, stress relaxation. Electrical properties such as dielectric strength, dielectric constant, dissipation factor, arc resistance & electric resistance.

SECITON - B

Unit-IV: Testing of Polymers for thermal, optical, Environmental & Weathering Properties, Chemical Properties and other properties, such as nondestructive testing.

Unit-V: Importance of polymer material, material and process selection for designing of product, aspect of temperature, elasticity, flame resistance, impact strength, moisture, chemical wear, Permeability, weathering, odour and test.

Unit-VI: Processing parameter on structure, properties and quality of & VI & VI the product.
Aspect of parting line, wall thickness, Ribs and bosses, molded holes, insects, Threads, mold/dies, gates, runners, parting lines and their design aspects. Mould ability general considerations, and specific cases.

TEXT BOOKS:

1) Identification and Testing of Plastics by Athalye.
2) H.B. of Plastics Testing Technology by V.Shah.

REFERENCE BOOKS:

1. Product Design with Plastics by Dym.
2. Designing with Plastics by E.H.Renstein.
3. Plastics Product Design H.B.Part A and B by Miller.
4. Plastics Product Design by R.D.Beck.
5. Plastics Engg. by Croford.
6. Product Design and Testing of Polymeric Material by Che Reminisbroff.
7. H.B. of Plastic Test Methods Vol-I and II by Brown
8. Designing with Plastics and Composites by Rosato.
9. Quality Control and Testing Manual of Copet.
10. Plastics Product Design H.B.by Levy.
11. Mechanical Prop, and Polymers by Norbert M.Bikates.

8PP03 PROFESSIONAL ELECTIVE –II

(2) SURFACE COATING TECHNOLOGY

Objective: Surface coatings and adhesives are an important area of material science where polymeric materials are findings increasing applications. This segment of industry caters to the needs on construction, automobile, ship building, aviation, electrical insulation industry where a large number

of materials such as paints, varnishes, enamels and lacquers are extensively used for functional as well as aesthetic reasons. In the first section, effort has been made to introduce the student to various aspects of manufacture, testing and applications of these materials. Second section deals with adhesives- manufacturing, testing and applications.

SECTION - A

Unit I: **Introduction and Components of Surface Coatings** - Introduction of coatings, Detail classification of various coatings methods (Roll, pre-metered, Air knife coating), Selection criteria for coating methods, surface tension, wet ability, contact angles and spreading, types of applicator rolls. Surface coating- definations and general classifications, paints, varnishes and lacquers, mechanism of film formation, classification of oils, semi drying and non-drying oils, chemical properties of oils, introduction to pigments and dyes, organic and inorganic pigments. Role of various additives like-emulsifier, dispersing agents, anti-settling agent, biocides, antifoams, corrosion inhibitors, UV and light stabilizers, antioxidants etc. Solvents-properties of solvents, solvent (cutting) power, rate of evaporation, water as coating solvent, phenomenon of mixing, soaking, wetting ,grinding, dispersion and stabilization, Types of viscosity behavior, Surface Chemistry, Rheological phenomenon in coatings..

UNIT II: **Natural Resins and Polymers**- Natural resins- Rosin, shellac, natural bitumen, bituminous paints Synthetic Polymers-raw materials, chemistry, formulations, manufacturing processes, properties and some important aspects of following resins- alkyd resins, polyester, phenolic resins, epoxy resins, polyamide resins, polyurethanes, silicone resins, acrylic and vinyl resins, hydrocarbon resins.

UNIT III: **Formulation, Manufacturing, Coating Properties and Evaluation-** Typical formulations of various types of paints, general properties of paints, varnishes and lacquers, properties of raw materials used in coating formulations, adhesion and cohesion properties, factors affecting adhesion, wetting power. Physical and chemical and mechanical properties of paint films, Newtonian and non-newtonion flow behavior, factors affecting viscosity and influence on rheological behavior, test on liquid paints- density, dispersion, viscosity, consistency, application of films, spreading capacity, wet opacity, dry hiding, spreading time, drying time, wet and dry film thickness etc. Optical properties-color, gloss, haze & clarity, opacity, orange peel, transparency, hiding power, mechanical properties, electrical

resistance properties, environmental resistance and ageing properties of coatings.

SECTION - B

UNIT IV : **Adhesive Formulations**- Detail classification of Adhesives, Principle of adhesive formulation and production techniques, adhesive formulation for various industries viz. construction, packaging, textiles, automotive, abrasives and friction material shoes, electrical aerospace etc. Types of adhesives: Structural adhesives, epoxy, acrylic, phenolic, elastomeric modified adhesive, PU adhesives, natural such as starch, dextrin, cellulose ether, cellulose ester, pressure sensitive adhesives, hot melt adhesives, anerobic adhesives, temp based adhesives, solvent and emulsion based adhesives. Health and safety

UNIT V: **Theory and Mechanism of Adhesion-** Theories of adhesion-mechanical interlocking, diffusion theory, electrostatic theory, adsorption, chemisorptions, surface energetic and wetting equilibrium, kinetics of wet bonding operations, Various bonding processesð Methods of Adhesive Application, Methods of Adhesive Bonding, Methods of Bond Curing, Compatibility of adherents and adhesives, Bond stresses, Service Conditions and service life. Advantages and disadvantages of using adhesive bonding over conventional joining techniques.

UNIT VI: **Testing of adhesive Bonding** Surface Characterization, surface pretreatment and treatments for various substrates, techniques for evaluation of adhesives, Physical Testing of adhesives-assessment of durability and strength parameters (Fatigue, creep, flexural strength, peel strength, durability, fracture mechanics , Non-destructive testing), Joint Design- (Types of stresses, types of joints, selection criteria for joints), properties and testing of adhesives for tack, viscosity, cure time, etc.

TEXT BOOKS:

1) Surface coatings: Science and Technology, by Swaraj Paul, John Wiley and Sons, 1985
2) Adhesives Handbook, By Butterworths

REFERENCE BOOKS:

1. Coatings Technology Handbook, By Arthur A. Tracton, Third Edition.
2. Organic Coating Technology, Volume I, by Henry Fleming Payne, John Wiley & Sons,1954.
3. Surface Coatings, Volume I, by OCCA Australia (Prepd.), Chapman and Hall, 1983.
4. Outlines of Paint Technology, III Ed. By W. M. Morgans, Edward Arnold, 1969

5. Organic Coatings: Science and Technology, Volume I, by Z. W. Wicks, F. N. Jones and S. P. Pappas, Wiley-Interscience, 2007.
6. Basics of Paint Technology, Part I & II, by V. C. Malshe & Meenal Sikchi, 2002.
7. Datta P.K. & Gray J.S. Surface Engineering Vol. I Fundamentals of coatings. Royal Society of London, 1993.
8. Datta P.K. & Gray J.S. Surface Engineering Vol. II Fundamentals of coatings. Royal Society of London, 1993.
9. Datta P.K. & Gray J.S. Surface Engineering Vol. III Fundamentals of coatings. Royal Society of London, 1993.
10. Skeist, Irving, Handbook of Adhesives, Van Nostrand, New York, 3rd edition, 1990.

8PP04 MOULD DESIGN FOR PLASTICS

SECTION-A

Unit-I: Choice of materials for mould making, different types of steels and steel alloy used in mould making, composition and its propertice. Methods of heat treatment and advantages.
Properties of aluminum, berryilium, copper and zinc used for moulds. Selection of materials for specific mould components, Different machine tools and methods used in mould making like grinding, milling, and die sinking machines, casting hobbing and polishing operation. Electrodischarge machining. Electrolytic depositing process.

Unit-II & III: Injection mould: Classification of Injection moulds. Design of runners, gates, vents and sprue. Design of Ejection systems. Different techniques of Ejection. Design of cooling systems, cooling of cavity and core, cooling channels, bubbler, baffle and helical channel. Hot runner moulds - Design consideration, its advantages and limitation. Mould economics - Determination of No. of cavities and cost estimate, Runnerless Moulds, Different types nozzles for mould. Parting line, cavity and core location, use of core and inserts, locating ring and sprue bushing. Moulds for articles with Drafts and Undercuts, Allowance for shrinkage and warpage problems. Design of BLOW MOULDS: Design of simple blow moulds, Die design for parison control.

SECTION-B

Unit IV: EXTRUSION DIE: Design aspects of the following extrusion dies - Pipe Die, sheet Die, Monofilament Die, Blown film and cast film die, Tape Die, Profile Die.

Unit-V: Compression Mould: Flash, positive, semi positive moulds.

Detailes of cavity block, punch plate, guidepins, pressure pads, cores etc. standard components of compression mould typical design.

Unit-VI: Transfer Mould: Design of integral pot and auxiliary ram types. Design of standard mould parttike transfer pot, transfer plungers, sprue bush. Transfer pressure and clamping force.

TEXT BOOKS :

1) Plastics Product Design Handbook - Miller
2) Plastic Product Design-Beck R.D.

REFERENCE BOOKS :

1. Plastics Mould Engineering - Dubois J.H.
2. Injection Molds and Molding ï Dym
3. Dies for Plastics Extrusion -M.V.Joshi
4. Injection Mold Design 4th Edn. ï Pye
5. Moid Making H.B. ï Stoechhart
6. Design of Plastics Molds and Dies ï Sors
7. Injection Mold Design, Design Mannual for Thermoplastic Industry (1567)
8. Designing with Plastics and Composities - Rosato.

8PP05 POLYMER PROCESSING –II – Lab

LIST OF PRACTICALS

1. Study and construction of single screw extruders.
2. Manufacturing of Pipes/Pellets.
3. Manufacturing of Blown film.
4. Manufacturing of woven sack
5. Manufacturing of strands. (Granules Reprocessing)
6. Manufacturing of extrusion blow molded articles.
7. Manufacturing of articles by vacuum forming
8. Study of calender unit
9. Screen Printing process for plastics
10. To prepare solvent cement for plastics
11. To calculate the mixing index of PVC
12. To study the character-ties of shrink packaging.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

8PP06 PROFESSIONAL ELECTIVE –II – Lab

(1) TESTING AND PRODUCT DESIGN

1. Identification of different material used for different application
2. To determine percentage elongation at break of polymer sample
3. To determine tensile strength of a given plastic material.

4. To determine izod impact strength of a given plastic sample.
5. To determine dielectric strength of plastic.
6. To determine Rockwell hardness of a given plastic material by using hardness tester
7. To determine abrasion resistance value, of tire pile.
8. A case study on design and its design parameter for cold drink water
9. A case study on design and its design parameter of container
10. A case study on design and its design parameter of cosmetic container
11. To determine dart impact strength of plastic sheets.
12. To determine dart impact strength of plastic films.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

8PP06 (2) SURFACE COATING TECHNOLOGY

1. To find Tactility of PP.
2. To prepare adhesives based on Novlac.
3. To prepare Water soluble Adhesive.
4. To prepare Pressure Sensitive Adhesive by solution method.
5. To prepare Acrylic Adhesive.
6. To prepare Cellulosic Adhesive.
7. To prepare Multi-purpose adhesive by emulsion polymerization or rubber based adhesive.
8. To prepare Co-polymer of Epicholorohydrin with Novlac.
9. To prepare Starch Slime by using adhesive.
10. To prepare emulsion paints using vinyl acetate.
11. To give surface pre-treatment to various material surfaces (metal/ plasic/wood) by various pre-treatment process and apply primers and note the results.
12. To prepare joints of various materials using the above prepared adhesives and check the durability (pot life/shelf life) and strength of joints.

Note: The students should perform minimum 8 experiments from the list to complete the term. All experiments in this list shall be available in the laboratory. Additional experiments relevant to the syllabus may be added to the main list.

8PP07 MOULD DESIGN FOR PLASTICS - Lab (DRAWING)

Every student has to complete five sheets based on the following mould designs.

Compression Mould	1 sheet
Transfer Mould	1 sheet

Injection Mould	2 sheets.
Blow Mould	1 sheet
Extrusion Dies	2 Sheets.

8PP08 PROJECT & SEMINAR

SEMINAR:

The Seminar Report submitted by the student at the end of **VII Semester** will be evaluated by external examiner appointed by the University along with the Project - Viva Voce examination at the end of **VIII Semester.**

PROJECT:

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental , design or combination of these in the area of **Polymer Technology**. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. On completion of the work, a project report should be prepared and submitted to the department.

The evaluation is based on continuous internal assessment by an internal assessment committee for **75 marks** by way of oral presentations. The university examination, which carries a total of **150 marks**, will be a Viva Voce examination conducted by a committee of one external examiner appointed by the University and one internal examiner/ Guide.

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SYLLABUS PRESCRIBED
FOR BACHELOR OF TECHNOLOGY
(CHEMICAL TECHNOLOGY)
FOOD , PULP & PAPER, OIL & PAINT AND
PETROCHEMICAL TECHNOLOGY

SEVENTH SEMESTER

7 CT01 MASS TRANSFER

SECTION A

Unit I : Diffusion - molecular diffusion in gases & liquids, diffusivities of gases & liquids, application of molecular diffusion, mass-transfer coefficients in laminar flow, Eddy diffusion, Mass-transfer in turbulent flow. Analogies of transfer Process.

Models of Mass-Transfer analogies. Theories of mass transfer.

Interphase mass transfer Diffusion between phases, two phase mass transfer coefficients, individual & overall coefficients:

Stagewise processes co-current & countercurrent processes.

Equipment : Tray towers, general characteristics of tray towers, efficiencies Wetted Wal1 towers, packed towers characteristics of packed towers. Mass transfer coefficients in packed towers.

Gas absorption: Equilibra relationships, Material balance for co-current and counter current multistage equipment. Approach for dilute systems.

Calculation of HETP & HTU in continuous equipment for absorption and stripping, - Individuals & overall coefficients, Transfer units.

Unit II : Distillation : Various liquid equilibria for ideal & non ideal systems. Relative valtility, Azeotropes, Enthalphy concentration diagram, single flash vaporization. Partial condensation. Differential distillation for binary systems.

Fractionation McCabe - Thiele & Panchon- Savarit methods for multistage operations. Reflux, Reflux ratio & optimum reflux ratio. Reboilers, Total and partial condensers. Tray efficiencies, azeotropic & extractive distillation. Introduction of multicomonent distillation.

Unit III : Extraction - Liquid Liquid Ternary liquid equilibria, Different co-ordinate systems. Classification of equipment.

Single Stage and Multistage Co-current & counter current extraction. Calculation of number of stages analytical1y and graphical1y continuous Extraction. N. T. U. and H. T. U.

Ion exchange & Membrane separation techniques.

Unit-IV : Leaching, Principles, Equilibria calculation of single stage & multistage leaching- process equipment.

Unit V : Crystallization & Principles, Calculation of Yield, Heat effects, equipments.

Unit VI : Humidification, Fundamental concepts, General Theorems, Cycometric chart, Dehumidification and drying theory and mechanism, drying rates, Design and performance and continuous and Batch Dryers, Industrial Dryers.

PRACTICALS : Based on above syllabus.

BOOKS RECOMMENDED:

1. Unit operations in Chemical Engg. 3 Ed. W.L.McCabe & J. C.Smith, McGraw Hill & Kogakusha, Latest Edition.
2. Mass-Transfer RE.Trebal3 ed. McGraw Hill, Latest Edition.
3. Mass-Transfer 3-ed. T.K.Sherwood, RI.Pigford;C.R, McGraw Hill, Latest Edition.
4. Mass-Transfer Operation: RE. Treybal.
5. Design of equilibrium stage Process: B.D.Smith
6. Chemical Engineering, Vol II : Couslson Richardson.

7 CT02 CHEMICAL REACTION ENGINEERING-I
(KINETICS)
SECTION - A

Unit-I : Classification of chemical reactions. Variables affecting the rates of reaction. Kinetics & Thermodynamics. Thermodynamics of chemical reactions. Classification of reactors. Order of reaction & rate constant.

Unit-II : Rates of Homogeneous reactions. Fundamentals of rate equation. Rate equations from proposed mechanism Analysis of simple & complex rate equation. Evaluation of rate equation from laboratory data.

Unit-III : Interpretation of rate data, Scaleupard Design. Constant volume batch reactor. Variable volume Batch reactor. Temperature and reaction rate.

SECTION - B

Unit-IV : Single ideal reactors. Ideal Batch Reactor. space time and space velocity, steady state mixed flow reactors, steady state plug flow reactor, Holding-time & space time for flow system.

Unit-V : Design for single reactions

Size comparison of single reactors Batch reactor, Mixed verses plug flow reactors Variation of reactant rates. General Graphical comparison. Autocatalytic reactions.

Unit-VI : Design for multiple reactor system. Reactions in parallel & in series, series-parallel reactions. Batch recycle reactor, Flow-recycle reactor. Temperature & pressure effects in single and multiple reactions. Optimum temperature profile.

Practicals : based on above syllabus.

BOOKS RECOMMENDED:

1) Chemical Reaction Engg. : Octane Levenspiel, Wiley Eastern LId
2) Chemical Engg. Kinetics: Smith J.M., Mc Graw Hil:
3) Reaction Kinetics for Chemical Engineers: Waas. McGraw Hill.
4) Elements of Chemical Reaction Engg: Scott H., Fogler, Prentice Hall India.
5) Principles of Reaction Engg : S.D.Dawande, Central Techno., Pub., Nagpur.
6) Chemical Reaction Engineering : Gavhane K.A., Nirali Pub.
7) Chemical Kinetics and Dynamics : Stein feld, Allied Pub. Ltd., Chennai.
8) An Introduction to Chemical Engg. Kinetics and Reactor Design : Hill C.G., Jr., John Wiley.

SPECIAL TECHNOLOGY PAPER-IV

7 OT03 OIL & PAINT TECHNOLOGY

(TECHNOLOGY OF SOAPS, DETERGENTS, ESSENTIAL OILS AND GLYCERINE)

Surfactants : Concepts of surface activity. structure of surfactant molecules, Hydrophil - Lipophil balance. Methods for measurement surface activity, mechanism of detergency.

Typc of Surfactants : Anionic, Cationic, nonionic and amphoteric. Biodegradation of surfactants. Application of Surfactants.

Soaps: Raw materials for soap. industry classification and selection of raw materials. Properties of soap and soap solutions. Phase seperation in soap boiling. Plants and process employed in soap manufacture. Various types of soaps and cleaning preparation. Analysis of soaps.

Detergcnts: Classification. raw materials. plants and process employed in manufacture of detergents, analysis of detergents. LS.I.methods of testing of soaps and detergents.

Essential oils : Classification and chemical constituents of essential oils. Methods of extraction. Analysis of essential oils. Natural and synthetic perfumery. materials for industrial uses.

Glycerine : Manufacture of Glycerine from natural sources, sweet waters, propeties spent lyes. Synthetic glycerine.: Properties. analysis and utilization of glycerine.

Recent advances in the field

BOOKS RECOMMENDED :

1. Soap: Their Chemistry and Technology: J.G.Khane.
2. Soap Manufacture: J.Davidson.lnerscience Publishers. New York. Latest Edition.
3. Sulphated Oils and Allied Products: D.Burton and G.F.Robertshaw. Chemical Publishing Co., New York, Latest Edition.
4. Surface active agents and Detergents : A.M.Schwarttz. J.W.Perry and J.Berch, Interscience Publishers, New York. Latest Edition.
5. Industrial oil and fat products: A.P.Bailley, Interscience Publishers. New York. Latest Edition.
6. Technology of Laundry Soap Manufacture: Small Business Publications, New Delhi
7. House Hold & Industrial Surfactants : Small Business Publications, New Delhi.
8. The Technology of synthetic Detergent : Small Business. Publications, New Delhi.
9. Textiles Chemicals & Auxilaries : H.C.Speed and E. W.K.Schwartz, Reinhold Publications, New York, Latest Edition.
10. The Manufacture of Glycerol : G.Martin
11. The Modern Soap Detergent Industries: G.Martin
12. Textile Auxiliaries: Shenoy

OIL & PAINT TECHNOLOGY PRACTICAL- III

Producing fats and fat based products, Mechanical expression of Oil from Oil seeds, Refining and hydrogenation of Oils. Evaluation of Bleaching Earths. Activated carbon and charcoal. Preparation of soaps and detergents. Preparation of various types of detergents. Refining of commercial waxes. Preparation and evaluation *of* wax formulations. Preparation of metallic soaps. preparation of boiled oil. blown oils and stand oils and their evaluation. Preparation of ester gum. monoglycerides. sulphated and sulphonated oils, varnishes, lime and zinc harden resin and product evaluation. Fat splitting and separation of fatty acids. Preparation of paints and its analysis for wa ablity. drying lime. gloss and shade matching. Preparation of cosmetics. Analysis of pigment. Oil absorption. hiding power etc.

SPECIAL TECHNOLOGY PAPER-IV
THEORY
7 FT03 FOOD TECHNOLOGY-IV
(FOOD PROCESSING (I))

Unit Operation in Food Processing: Equipment for various operations like clearing. sorting. grading. size reduction and separation, mixing. filtration. expression, centrifugation, crystallisation etc. Application of heat in concentration. chilling and refrigeration. Thermal processing of foods. preliminary operations, methods of heat sterilisation and process time calculations. Food irradiation. Plant hygiene and water supply.

Process Technology of Cereals, Legumes and Oil Seeds: Post-harvest storage and handling. Insect infection and its control. Mycotoxins in cereals, Oilseeds and their products. Milling of cereals and legumes. By-products of milling industry Oil extraction. refining and hyderogeneration. Manufacture of margarine, salad Oils, cooking oils, shortening agents, lecithin CMS etc. Processing of Oil seeds for food uses.

Process Technology of Baking and Baked Products: Selection of raw materials, Rheology of dough and dough testing methods. Changes during fermentation of dough. Manufacture of bread, Biscuits, crakers, cookies, cakes and other bakery products. Manufacture of breakfast cereals, puffed cereals, fortified and enriched products. Extrusion cooked products. Quality control.

Process Technology of Tea & Coffee: Composition and Processing. Flavour and aroma, Methods of evaluation of quality. Process technology of Cocoa, Chocolate, Candy and Confectionary Products.

Raw materials, use of additives, tech. of processing of cocoa, Manufacture of chocolate candies and confectionary products. Quality control and standards.

Special Foods: Weaning and baby foods, processed protein and cereal foods textured proteins, synthetic foods, space foods. I.M.Foods, Simulated milk products, Pro-cooked and instantised foods. Quality food management.

Recent advances in the field.

BOOKS RECOMMENDED :

1. Fundamentals of Food Processing Operations by Jonslyn. M.A. and Heid, J.L., Published by AVI Publishing Co., Inc Westport, Connecticutt, Latest Edition.
2. Food Processing Operations, Vols.l,2 and 3 by Jonslyn, M.A. and Heid, J .L.,Publ. by A VI Publ. Co., INC, Westport Connecticut, Latest Edition.

3. The Freezing Preservation of Foods, Vols., 1,2,3 & 4 Edited by Eople, MJ.and Tressler, D.K.,Published by AVI Publ. Co., INC, Westport Connecticut, Latest Edition.
4. The Fundamentals of Food Engineering by Charu, S.E., Published by AVI Publ. Co., INC, Westport Connecticut, Latest Edition.
5. Grain storage part of System. Edited by Sinha, R.N. and Muir WE., Published by AVI Publ. Co., Inc, Westport Connecticut, Latest Edition.
6. Technology of cereals with Special reference to Wheat by Kent, N .L., Publishing by Pergamon Press, Oxford, Latest Edition.
7. Cereal Technology by Matz, Samuel, A., Published by the AVI Publishing Co., INC, Westport Connecticut, Latest Edition.
8. Coffee Processing Technology, Vols.1 and 2 by Sivetz M.,Published by AVI Publ.Co., INC, Westport Connecticut, Latest Edition.
9. Food Dehyderation, Vols, I and 2 by Copley, MJ. and Van Arsdel, WB., Published by the AVI Publ. Co., INC, Westport Connecticut, Latest Edition.
10. Modern Methods of Cocoa and Chocolate manufacture by Waters,H. W.,Published by J. & A. Churchill, 40, Glouceter Place, Portman Square, Latest Edition.
11. Wheat Chemistry and Technology, Edited by Pomeranz, Y.,PiJblished by the American Association of Cereal Chemists, Incorporated St.Paul, Mannesota, Latest Edition.
12. Modem Cereal Chemistry by Kent Jenos. D. WAmos, AJ .,Published by Foods Trade Press Ltd., 7, Garrick Street, WC.London, Latest Edition.
13. Snack Food Technology by Matz, S.A., Published by AVI Publ.Co., INC, Westport Connecticut. Latest Edition.
14. Bailey Industrial. Oil and Fat Products, Edited by Deniel Swern, Published by Interscience Publishers, A division of John Wiley and Sons, New York, Latest Edition.
15. Bakery Materials and Methods by Daniel, A.R., Published by Mac, Laren & Sons, Ltd., London,Latest Edition.
16. The Manufacture of Biscuits, Cakes and Waffer ôs by Fritsch,J. and Grospicrre, Published by Sir. Issac Pitman and Sons Ltd., London, Latest Edition.
17. Surgar Confectionary and Chocolate Manufacture by E.BJackson and Less, R.,Published by Leonard Hills Books, 24, Market Square, Aylesburry, Books.

FOOD TECHNOLOGY-III

PRACTICAL-III

FOOD ANALYSIS

Chemical and Instrumental Methods for the analysis of foods and their constituents like fruits, bakery foods, honey, tea, coffee, vinegar, glucose, syrup. Spices and condiments, confectionary products and dairy products. Analysis of cereals and cereal products. Determination of maltose No., sedimentation value etc. Identification and determination of food aditives, poisonous and toxic materials. Estimation of Aresenic and lead in processed foods.

BOOKS RECOMMENDED:

1. Modern foods Analysis by Hart, F.L. and Fisher, MJ.,Published by Springer Verlag, Berling, Heidelberg, New York,Latest Edition.
2. Official Methods of Analysis of the Association of Official Analytical Chemists, Edited by William Horwitz, Published by Association of Official Analytical Chemists, P.O.Box, 540, Benjamin Frankin Station, Washington, D.C. 20044, Latest Edition.
3. The Chemical Analysis of Foods and Food Products by Jacobs, MR, Published by D. Van Nostrand Company, INC, Prinoonton New Jorsey, New York Latest Edition.
4. Food Analysis by Less, R.,Published by Leonard Hill Books 450 Road, London, W2, LEG Latest Edition.
5. The Chemical Analysis of Foods, by Pearson, D., Published by lEA, Churchill, 104, Cloucester Place, London, Sixth Edition, Latest Edition.
6. Manual of Analysis of Fruit and Vegetable Products by Ranganna, S.,Published by Tata McGraw Hill Publishing Co., Ltd., New Delhi. Latest Edition.

SPECIAL TECHNOLOGY-IV

7 PC 03 PETROCHEMICAL TECHNOLOGY - IV

THEORY

Reactor Design in Petrochemical Processes

Unit I : Design aspects of pipe still heaters. Radiant and convection sections. calculation of heat flux. radius and number of pipes. band allowance.

Capacity. number of plates. shell thickness. reflux ratio. pressure. temp. and composition calculations.

Unit II : Capacity. role of fccd stocks. desi red product pattern. process variables. raw material of visbreaker. coker and catalytic crackcr. Deactivation in catalylic cracking, types, mechanism and kinetics.

Unit III : Details of loading capacities of different reactors in series for cata1ytic reforming. catalyst properties and composition. space time variation. variation of rates and extents of diff. reactions in diff. reforming, hydrocrdcking and isomerization reactors. problems associated with pressure and corrosion.

Unit IV : Trickel bed reactors for HDS, mass. transfer effects. ,ôarious reactions. role of pressure characteristics of fluidised bed reactors, paramcters. Kunni Lcva model, role of emmission phase. wake. diameter of bubble. application of FBR for acrylonitrile production.

Unit V : Packed bed reactors, multibed reactors. phathalic anhydride production in multi tubuler bed reactor. Details of slurry bed reactor, heat and mass transfer. effects in slurry reactors. problems of catalyst and product separation.

Unit VI : Reactor design aspects for production of PP.PE, Styrene. Problems of agitation. viscosity rise, mass transfer and heat transfer, power requirement.

Reactor design for alkylator. cooling systems. agitation and product separation.

Recent development in the field.

Practicals : Based upon the Theory

BOOKS RECOMMENDED (FOR REFERENCES):

1. J.M.Smith : Chemical Engineering Kinetics. 2nd Edn.. McGraw Hill. Latest Edition. .
2. Octave Levenspiel : Chemical Reaction Engineering, Wiley Eastern. Latest Edition. .
3. C. G.Hill. Jr. : An Introduction to Chemical Engineering and Kinetjcs and Reactor Design. John Wiley; Latest Edition.
4. J.J.Carbery : Chemical and Catalytic Reaction Engineering. McGraw Hill. Latest Edition.
5. A. R. Cooper and G. V. Jeffreys: Chemical Kinetics and Reactor Design Oliver and Boyd. Edinburgh. Latest Edition.
6. J.M.Coulson. J.F.Richardson & D.G.Peacock: Chemical Engineering. Vol III, ElBS, Latest Edition.
7. K.B.Denbig & IC.Turner: Chemical Reactor Theory. 2nd Edition, Cambridge University Press, Latest Edition.
8. O.A.Houghen and K.M Watson: Chemical Process Principles. Part-III Kinetics and Catalyst: John Wiley - Latest Edition.

SPECIAL TECHNOLOGY -IV

7 PT03 PULP AND PAPER TECHNOLOGY-IV (STOCK PREPARATION)

Introduction. beating. refining. factors afecting bealing. equipments used in stock preparation such as peaters.,refiners, pulpers etc. consistency regulaters, stock proportioners, chest and agitators. pums stock preparation systems for main grades of paper. board and tissue.

Internal Sizing of Paper : Introduction. application of internal sized papers, chemistry of intemal sizing, wettability and contact angle materials used for internal sizing. size requirements for different pulps, factors deterimental to internal sizing.

Filling and loading: Definations. influence of loading. on physical properties of paper. adverse effects of fillers. properties of fillers. preparation of fillers. theories of fillers retention.

Colouring of Paper : Colour measuring instrument. shades of colour, colouring materials. dyes and pigments and fluoroscent brightening agents. dyeing of paper, colour selection and dye fonnula.

Special Additives: Introduction wet end adhessives. use of starches, gums, and synthetic resins in paper making, wet strength, papers, chemistry of wet strength process, mechanism of wet strength, retention of resins, curring of wet strength resin, Water and water reuse.

Recent development in the field.

BOOKS RECOMMENDED :

1. Pulp and Paper: Science and Technology Vol- II by C.E.Libby
2. Pulp and Paper Manufacture, 2nd Edn., Vol.-II by Mac Donald McGraw HilL
3. Pulp & Paper: Chemistry and Chemical Technology Erd, Edn. Vol-III by James Casey.
4. ñHand Book of Pulp and Paper Technologyò by K.N.Britt

PULP AND PAPER TECHNOLOGY - PRACTICAL- III

Analysis of Paper-Moisture content, ash content, cold water and hot water extractibles, determination of copper number, Determination of rosin size, Alpha Cellulose content etc.

7 CT04 PROFESSIONAL ELECTIVE - I (1) CORROSION ENGINEERING

Corrosion, direct, two stage attack, electrochemical attack, Environment conditioning. Higher corrosion resistance through proper selection of material, Isolation of corrosion, prone materials from destructive environment, Technologies of anodisation. enamelling, rubber lining, glass lining, refractory lining, painting and other surface protective measures. Corrosion Engineering in special applications such as material transport,

pumping, filtration, condensation, boiling, rivetting welding. high temperature environments, electrochemical environmental etc. Cost factor in competitive corrosion prevention/inhibition techniques.

BOOKS RECOMMENDED;

1. Uhilig, H.H.òCorrosion and Corrosion Controlò, John Wiley and Sons Latest Edition.
2. Bullar G. and Ison HC. KCorrosion and its Prevention in Watersò, Leonard Hill-London Latest Edition.
3. Maslov, P, ñChemical Materials for Constructionò Structures Publishing Co. Latest Edition.
4. Fontane, M.G, and Greehnee. N.D. ñCorrosion Engineeringò Mc Graw Hill Latest Edition.
5. Payne, H.F., ñOrganic Coatings Technologyò John Wiley and Sons.
6. Rajgopalan, K.S.Corrosion and its Preventionò, Chemical Engneering
   Education Development Centre, I.I.T. Madras

7CT04 PROFESSIONAL ELECTIVE - I (2) POLYMER SCIENCE AND TECHNOLOGY

SECTION - A

UNIT- I: Introduction - Definitions and concepts, polymerisation reactions, polymer structure, functionality and degradation, Characterisation of polymers. **(7)**

UNIT- II: Different types of polymers - natural and modified natural products, synthetic polymers, addition and condensation products and their preparations. **(7)**

UNIT- III: Methods of polymerisation - mass, solution, emulsion and suspension polymerisation processes, reactions and equipments used. **(7)**

SECTION - B

UNIT- IV: Polymer processing - Moulding, cold and hot compression moulding, injection and jet type moulding, extruding, calendaring and skiving. **(8)**

UNIT- V: Polymer processing - sheet forming, atmospheric and fluid pressure forming, lamination and impregnating. **(8)**

UNIT VI: Polymer processing - coating, expanding, casting, embedding, spinning and finishing. **(8)**

TEXT BOOKS:

1. Fred.W.Billmeyer, ñText Book of Polymer Scienceò, John Wiley and sons, 1980.

2. V.R.Gowarikar, ñPolymer Scienceò, New Age International, Second Edition,2006

REFERENCE BOOKS:

1. David J. Williams, ñPolymer Science and Engineeringò, Prentice Hall, 1971
2. Stanley Middleman, ñFundamentals of Polymer Processingò, McGraw Hill, 1977
3. Herman S. Kaufman and Joseph J Falcetta, ñIntroduction to Polymer Science and Technologyò, JohnWiley and sons, 1977
4. Rakesh K.Gupta and Anil Kumar, ñFundamentals of Polymersò, International edition, 1998

7 CT04 PROFESSIONAL ELECTIVE - I

(3) MAN MADE FIBER TECHNOLOGY

1) Classification of fibres: Types of natural fibers. man made fiber, synthetic fibers count, denie text, staple fibers, filament fiber, physical properties of fiber.
2) Degree of polymerization, cellulose and its properties, molecular weight, preparation and properties of cellulose acetate and rayons-viscose and cuprammonium.
3) Preparation and properties of polyester, terylene, nylon and polyamide.
4) Preparation and properties of synthtic fiber carbo chain type. Polyrinyal, polypropeline and poly acrilonimile.
5) Introduction to yarn spinning and testing of man made fiber.
6) Introduction to fabric forming by weaving process related to man made fiber.

BOOKS RECOMMENDED:

I. Textile Fibre by Mancrill
2. Textile Fibre by Murthy
3. Textile Fibre and their use by Hess
4. Physical Property of Textile Fibre by Norton & Hearle

7 CT04 PROFESSIONAL ELECTIVE - I

(4) INDUSTRIAL WASTE TREATMENT

SECTION - A

Unit-I : Environment, pollution, pollutant, Zero pollution, production waste, consumption waste, by product waste salvageb!e waste, types of pollution causes by wastes, greenhouse effect, Acid rains, Causes of acid rains, effects. Chloroflurocarbon, application of CFCôs in industry, role of CFCôs in depletion atmospheric ozone. Other effects of air

pollution. Agencies working on pollution control, their constitution, ageing of lakes and resvoirs, thermal stratification of lakes and reservoirs. example of wasteless processing.

Unit-II : Legislations of Environment protection, Indian standards for drinking water, effluent discharge, Indian Standard Codes for disposal of Wastes, Micro-organisms present in water, water borne diseases, determination of the dissolved solids, suspended solids, turbidity, pH, conductivity, DO, BOD by direct method & dilution method, COD sampling methods, Sampling procedures and precaution.

Unit-III : General Treatment: Screening and grease removal, Neutralization, Proportioniry, Chemical Coagulation, Sedimentation, filtration.

Biological Treatment: Kinetics of Biological growth, various suspended and attached grouth processes for the treatment of industrial effluent.

Advanced Waste Water Treatment : Ion exchange, Activated carbon adsorption, Electro dialysis, Reverse Osmosis. Disinfection of Water: Sterlization and methods for disinfection.

Sludge Disposal: Various alternatives for Sludge disposal.

SECTION - B

Unit-IV : Solid waste management, land pollution, composting, land filling, incineration, types of hazardous waste, treatment of hazardous waste, sources of radioactive wastes, treatment of radioactive waste. effects of radiations. Rewashable and recyclable solid waste, recycling in chemical industries.

Unit-V : Removal of particlated matter, comparative study of method employed e.g. cyclones, bag filters, precipitators, scrubbers, collectors etc., Pollutions control for fly ash, combustion and gasification plants. Various process for reducing SOx, NOx emissions.

Unit-VI : Waste management for industries like Food Industry Dairy Industry, Sugar Mill, Fertilizer, Pulp and Paper. Sulphonic acid, Cement, Tanneries.

Case studies and corrective measures taken in inaustry to prevent environmental hazards.

PRACTICALS : Based on above syllabus.

BOOKS RECOMMENDED:

1) Dr.S.P.Mahajan : Environmental Pollution Control
2) Matcaff and Eddy : Waste Water Treatment
3) Rao & Datta : Waste Water Treatment
3) V. V. Kafarov : Wasteless Chemical Processing

7 OT05 SPECIAL TECHNOLOGY PAPER-V
OIL & PAINT TECHNOLOGY
(TECHNOLOGY OF SURFACE COATINGS)

Convertible and non-convertible coatings: Chemical nature of coatings and their properties. Natural synthetic resin.

Chemistry of drying, Semi-drying and non-drying oils, chemistry and mechanism of heat and drying. Manufacture of synthetic drying oils, Processes and Plants employed in refining of drying oils.

Their manufacture and properties. Vents, diluents and thinners: Definition types of solvants and their properties.

Chemistry and tech.of resins: Natural and synthetic resins.

Pigment and extenders: Pigmentary properties and evaluation of pigments. General outlines of the methods of the manufacture of pigments. Properties and uses of important pigments. Organic pigments and colours.

Formulation of paints: Printing inks, leaquers, varnishes and linoleum. Methods of manufacture of paints, printing inks, and leaquers,I.S.1. methods for evaluation of paints and printing inks.

Recent development in the field.

BOOKS RECOMMENDED:

l. Outline of Paint Tech. - H.Hea
2 Organic Coating Tech. - H.R.Payne
3. Introduction to Drying Oil Tech. - A.R.MiIls
4. Paint and Varnish Manufacture - H. W. Chatfiels
5. Treatise on Coatings - Myas and Long.
6. Printing Inks - C.Ellis, Rainhold PbI., New York, Latest Edition.
7. Nitrocellulose Ester Leaquers - F.Zimmer
8. Paint Film Defects - M.Hers
9. Paint and Varnishes - A.S.Khanna
10. O.C.C.I. Paint Technology Manual (5 Volumes)
11. Tech.of Writting and Printing Inks, Small Business Publ.

7 FT05 SPECIAL TECHNOLOGY PAPER-V
FOOD TECHNOLOGY-V
(FOOD PROCESSING-II)
THEORY

Process Technology of Fruits and Vegetables - Pre and Post harvest changes in fruits and Vegetables, Storage, handing,and canning of fruits and Vegetables and their products. Technology of fruits and Vegetables Juices, purees, concentrates, jams, jellies, marmalades, preserves fruit butters, candied fruits, pickles etc.

Process Technology of Meat and Poultry : Live stock and poultry preparations, slaughter, cutting dressing and gradding, Various cuts of meat. Post-mortem changes. Preservation and packing of meat, poultry and their products.

Quality control in processed meat and poultry products, Microbiological standards. By products of meat and poultry processing industries. Process technology of eggs and their products.

Process Technology of Fish and other Aquatic Foods: Sources, methods of fishing, handling and storage processing of fish and fish products. By products of fish processing. Fish oils, Standards of fish and fish products. Processing of other aquatic foods like crabs, frogs, moiluses etc.

Process Technology of Milk and Milk products: Composition of milk, processing, storage and distribution of milk, manufacture of cream, butter, ghee, evaporated, condensed and skimmed milk, whole and skimmed milk powder and other fermented milk products. Manufacture of cheese. Preparation of Indian milk products like Khoa Channa, curd and their products, Standards for milk products.

Process Technology of Beverages: Carbonated Beverages. Fruit Juices, and R.T.S. beverages. Alcoholic Beverages. Quality control.

Packaging: Functions of packaging materials, Rigid and flexible packages, Metallic, glass and plastic containers. Laminated packaging. Requirement of packaging for specific products. Testing of packaging materials. Biodegradable packaging. Quality Attributes of Foods and their Evaluation. Flavour, armoa and texture of foods. Food additives. Spices and condiments. Contamination in foods.

Food Adulteration and Food Laws: PFA and FPO rules, ISI and Agmark standards.

Recent development in the field.

BOOKS RECOMMENDED:

1. Preservation of Fruits and Vegetables by Girdharilal and Siddappa,

G.S.Published by Indian Council and Agricultural Research, New Delhi, Latest Edition.

2. Fruits and Vegetable Juice Processing Technology Edited by Treassler, D.K. and Jonslyn, M.A., Published by the AVI Publishing Co., Inc. Westport, Connecticut, Latest Edition.
3. Practical Canning by Lock *A.,* Published by Foods Trade Press Ltd., 7 Garrick Street, W.C.2, London Latest Edition.
4. The Meat Hand book by Levie A, Published by the AVI Publishing Co., Inc. Westport, Connecticut, Latest Edition.
5. The Science of Meat and Meat Product, Edited by Price, J.F. and Schweigert, B..S.Pub1ished by W.H. Freeman and Company, San Francisco, Latest Edition.
6. Poultry Products. Technology by Mountney, GJ., Published by the A VI Publishing Co., Inc. Westport, Connecticut, Latest Edition.
7. Fishery By-products Technology by Brody, J., Published by the A VI Publishing Co., Inc. Westport, Connecticut, Latest Edition.
8. Fish and Food Vols. 1,11,11I & IV Edited by Brog traom. G., Published by Academic Press, New York and London, Latest Edition.
9. Processed Cheese Manufacture by Dr. Meyer A.. Published by Food Trade Press, London, Latest Edition.
10. Drying of Milk and Milk Products by Hall. C. W. and Hendrick, T.I., Published by the AVI Publishing Co., Inc.Westport, Connecticut, Latest Edition.
11.. Modern Dairy Products by Lampert, I.M.,Published by Eurasia Publishing House, (P) (Ltd.), Ram Nagar, New Delhi - 110055, Latest Edition.
12. By products from Milk by Webb,B.H. and Whittier, E.O., Published by the A VI Publishing Co., Inc. Westport, Connecticut, Latest Edition.
13. The Chemistry and Testing of Dairy Products by New Lander, J.H. and Atherton, H. V., Published by Olsen Publishing Co., Milwakee Wisconsis, Latest Edition.
14. Food Adultration by Jacob, T., Published by the Mac-Millan & Co. of lndia, Ltd., Latest Edition.
15. The Spice Handbook of Parry, J. W., Published by Chemical Publishing Co., New York, Latest Edition.
16. Meat Technology by Gerrard F., Published by Deonord Hill, London Latest Edition.
17. Radiation Technology by Desrosier, N. W., Published by the AVI, Publishing Co., INC, (1960)

18. Symposium: Processing Agricultural and Municipal Wastes, Edited by Inglett, C.E., Published by the AVI Publishing Co., Inc., Latest Edition.
19. Introduction of Waste Water Treatment Processes by Ramalho, R.S., Published by Academic Press, New York, Latest Edition.
20. Processed Plant Protein Food Stuffs, Edited by Aultschul, A.M., Published by Academic Press, London, Latest Edition.
21. Chemistry of Food Packaging by Swalam, C.M., Published by American Chemical Society, Washington D.C., Latest Edition.
22. Packaging by Newbaner, R.G., Published by Van Nostrand, Reinhold Co., New York, Latest Edition.

7 PC 05 SPECIAL TECHNOLOGY PAPER-V
PETROCHEMICAL TECHNOLOGY-V
PETROCHEMICAL INDUSIRY
THEORY

A state of the art account typically of the following with emphasis in increasing order of depth, wherever possible on 1) routes possible, 2) Stochiometry reaction, mechanism and flow sheet, 3) history, economics and future trends, 4) qualitative discussion of physico-chemical and chemical engineering principles involved and engineering problems encountered in the more favoured route.

Defination of a petrochemical; source materials for manufacture of chemicals from hydrocarbons individual compounds and mixtures; Manufacture of major olefin building block -ethylene, propylene, butadience etc. Manufactures of BTX aromatics, naphathalene etc.

Production of acetylene, synthesis gas, hydrogen, sulphur, carbon block, Oxosynthesis.

Production of specific Hydrocarbon derivatives by hydrogenation, oxidation, hydration, alkylation, halogenation, sulphonation etc. As illustrated by benzene from cyclohexane; ethylene oxide, vinyl chlorides, acrylonitrile, phenol, DMT caprolatum, etc. Comparison of routes starting from paraffins, olefine, acetylene etc. Wherever possible.

Polymerisation - polyetheylene, polypropylene, piktestersm bikibsm, acrylic fibres, synthetic rubbers etc.

Safety aspects, pollution control, energy saving etc. in a petrochemical plants, The petrochemical Industry in India.

Recent development in the field

BOOKS RECOMMENDED :

I. R.N.Shreve, J.A. Brink: Chemical Process Industries, 4th edition Mc Graw Hill, Kogakusha 1977, Chapter-38, Page 687.

2. J .A.Kent : Riegalôs Handbook ofIndustrial Chemistry, 7th edn., Van. Nostrand Reinhold Co., 1974, Chapter 14, Page 402.

REFERENCE BOOKS :

1. Books 4 and 9 recommended under *Special Tech-III,* Petrochemical Technology

2. S.A.Miller : Acetylene, Vols. I & II, Ernest Benn. Latest Edition.

3. S.A.Miller : Ethylene and its industrial Derivatives, Ernest Benn., Latest Edition.

4. E.G.Nancock: Prophylene and its Derivatives, Ernest, Bean, Latest Edition.

5. E.G.Nancock: Benzene and its Derivatives, Ernest Bean, Latest Edition.

6. S.B.Chandlia : Oxidation of Hydrocarbons, Sevak Publication, Latest Edition.

7. T.Dumas, W.Bulani : Oxidation of Petrochemicals, Chemistry and Technology, Applied Science, Latest Edition.

8. R.Long : Production of Polymer and Plastic Intermediates from Petroleum, Butterworths, Latest Edition.

9. Articles in Hydrocarbon Processing, Chemical Engineer, Oil & Gas Journal Etc. as recommended furthering the academic session.

7 PT05 SPECIAL TECHNOLOGY - V

PULP & PAPER TECHNOLOGY

THEORY

1. Paper and paper board Manufacture : Introduction auxiliary equipments, Centric leaners, Sand traps, centrifugal separators and various screens.

2. Paper making machines : Fourdrinier machine, history and development of fourdrinier, modern fourdrinier machine appraoch flow system, head box slice, types of slices, drainage and formation on fourdrinier machine.

3. Fourdrinier design and construction, miscellaneous equipments, twinwire formation of paper,Informer, various types of former.

4. Cylinder mold machine: Introduction, History of cylinder machine, Vat, stock entries, and priliminary press, rolls and ripples, cylinder machine felts.

5. Pick-up and press section: Section picks-up, pressing theory, felts press section arrangements, suction rolls, crow ling and open draw.

6. Dryer section: Function of dryer section, theories of drying, cylinder drying. air drying, radiant drying, auxilliary equipment, operations and control, performance calculations. cost and economics.

Recent development in the field.

BOOKS RECOMMENDED :

1. Pulp and Paper Manufacture, 2nd edn., VoI.II, by B.Mac. Donald, Mc Graw-Hill.

2 Pulp and Paper, Science and Technology Vol-II, by C.E.Libby.

3. Handbook of Pulp and Paper Technology, by K. W.Britt.

SEMESTER - EIGHTH

8 OT01 SPECIAL TECHNOLOGY PAPER-VI

OIL & PAINT TECHNOLOGY

Technology of Waxes, Cosmetics and other Fat Based Products.

Waxes : Natural sources classification, Chemical composition, Extraction refining and processing of waxes, their modification and formulation. Synthetic waxes, properties, utilization, testing and evaluation of waxes.

Cosmetics. : Classification, manufacture and evaluation of cosmetic, preparation such as shampoos, shaving creams, lotions, toileteries and perfumery materials.

Other Fat based Products: Manufacture and utilization of nitrogen, phosphorous and sulphu containing compounds. Core oils, cutting oils, lubricants greases, plasticizers and products obtained by inter-exterification hydrogenation, oxidation and pyrolysis.

Fatty acids: Theory and practice of fat spliting and purification of products, Separation of fats and fatty acids and their applications in foods, pharmaceuticals, textile, plastics, leather and other industries.

Recent development in the field.

BOOKS RECOMMENDED :

1) The Chemistry and Technology of Waxes - A.H. Warth

2) Industrial Waxes - H.Benet (2 Volumes)

3) Fatty Acids and their Industrial Applications - E.S.Pattison

4) Industrial Oil and Fat Products - A.E.Bailey

5) Industrial Chemistry of Fats and Waxes - T.P.Hilditech.

6) Cosmetics Science and Tech. - W.Saggarin

7) Perfumes, Cosmetics and Soaps - W.A.Poucher (Vol.-I ,II, III)

8) Chemistry and Biochemistry of Natural Waxes - P.E.Kolattukudy.

9) Basics of Paint Technology, Part-I, V.C.Malshe, Meenal Sikchi, VICT, Mumbai.

8OT 05 OIL & PAINT TECHNOLOGY - IV - LAB

Analysis of butter, ghee, margarine, vanaspati, soap stock, sulphonated and oil spent lyes. Commercial fatty acids and glycerine. Evaluations of detergents. Analysis of fatty material by column thinlayer and gas liquid chromatography techniques. Analysis of mixture of oils and fats. Analysis of bye products and wastes. Preparation and, analysis of some industrially important fatty acids. Derivatives. Analysis of printing inks.

BOOKS RECOMMENDED FOR PRACTICALS:

1) Technical hand book of Oils, Fats and Waxes - PJ.Frayar and F.E. Weston (2 Volumes)
2) Analysis of Fats and Oils - V.C.Mehlenbacher.
3) Lab.handbook of Oils and Fat Analysis - D. V.Cock & c. Van Rede.
4) Analysis and Characterization of Oils, Fats and Fat Products : H.A.Boekenoogen.
5) Oils, Fat and Fatty Acids - Their Practical Exams: K.A. Williams
6) Synthetic Detergents, - A. Davidson
7) I.S.I.Method of Analysis of -
   i) Oils and Fats No. - IS-548-1964.
   ii) Soaps IS-286-195 I
   iii) Oil Seeds and Oil Cakes -IS-I 714-1970,IS-4 I 15-1967
   iv) Surface Active Agents - IS-5785-1970
   v) Printing Inks - IS-693 1-1972
   vi) Paints, Varnishes, and Pigments - IS-I 17-1964.
8) B.S.I. Methods of Analysis of Oils and Fats
9) Official and Tentative Methods of the American Oil Chemists Society, A.C.C.S.Publication.
10) Waxes - Natural and Synthetic - H.Bennet.
11) An Introduction to Drying Oil Technology- A.R.Mills
12) Thin layer Chromatography - Babbit.
13) Bleaching Earths - M.K.H.Siddiqui
14) O.C.C.I.Paint Tech. manuals, Vol. V, the Testing of Paint
15) Cosmetics Science and Technology - W.Sassauin.

8 FT01 SPECIAL TECHNOLOGY PAPER-VI

FOOD TECHNOLOGY-VI

THFORY

Biochemical Engineering and Fermentation Technology : Metabolic pathways of micro organisms. Parameters for growth energy, carbon and nitrogen. Sources requirements and biomass, estimation, surface, sub-merged and solid state cultures. Kinetics of growth and structured growth models. Measurement of dissolved oxygen, mass transfer coefficient. Effect

of aeration and agitation, Kinetics of substrate utilisation. Product yield and biomass production, batch, plugflow and chemostat cultures, Scale up in fermenter design.

Types of fermenters. Designing and operation of fermentation equipment. Methods of aeration, agitation and sterilisation. Control of contamination in fermentors. Antifoam devices, auxiliary equipment an instrumentation, Product recovery.

Fermentation technology of alcohol, alcoholic beverages, vitamins, antibiotics, vinegar, organic acis, solvents. SCP, enzymes and other miscelleneous products. Specific metabolic transformation Hydrocarbon fermentations. Cultivation of algae, mushrooms and the starter culture.

Immobilised enzymes, methods of immoblisation, properties an applications of immobilized enzymes. Reactor design for immoblilised enzyme Systems. Waste treatment, New special in fermentation technology.

Recent development in the field.

BOOKS RECOMMENDED:

1. Biochemical Engineering Fundamentals by Bailey, lame, E., Published by McGraw HiII Book Co., Latest Edition.
2 Advances in Biochemical Engineering. Vols. 1 to 6 Edited by Bhose, T.K. and Ficchter, A , Published by Springer Vorlag, Berlin, LLcid elberg NewYork, Latest Edition.
3. Biochemical and Biochemical Engineering, Science Vols. 1 to 2 Edited by Blakebrough, Published by Academic Press, London and New York, Latest Edition.
4. Industrial Fermentation, Vols. 1 & 2 By Under Kofler, L.A., Published by Chemical Publishing Co., INC, 212, Fifth Avenue, New York, Latest Edition.
5. Immobilized Enzymes, Antigens, Antibodies and Peptides, Vols. 1 & 2, 3 & 4 Edited by Weetal, H.H., Published by Marcel Decker, INC New York, Latest Edition.
6. Industrial Microbiology by Presscot and Dunn, Published by Me Graw Hill Book Co., INC, New York, Latest Edition.
7. Industrial Microbiology by Cas ida, L.E., Published by John Wiley and Sons, INC, New York, Latest Edition.

8 FT O5 FOOD TECHNOLOGY - VI - LAB
(FOOD PROCESSING)

Preparation of fruit juices, squash, jam, jelies, concentrates, pickles etc. Canning of fruits and vegatable and their evaluation. Processing of meat, fish and dairy products. Dehydration of fruits and vegetables and their evaluation. Preparation of bakery products like bread, biscuits, cakes. crackers etc. Preparation and evaluation of confectionery products like hard and soft boiled candies, fruit candies, chikki, etc. Preparation of beverages.

Evaluation of Michaelis - menten constant. Determination of BOD, COD and dissolved oxygen by chemical and instrumental methods; potting of Do Sag profiles, Determination of Kla.

Production, recovery and control tests of the fermentation products like alcohols, organic acids, enzymes and antibiotics.

BOOKS RECOMMENDED :

1. Practical Baking by Sultan, W.J.,The AVI Publishing Co., INC, Latest Edition.
2. Manufacture of Confectionary by an Industrialists, Industry Publishers Ltd., 22, R.G.Kar Road, Sham bazar, Calcutta.
3. The Chemical Anslysis of Foods by Pemson, J.& A. Chutchill Ltd., 404 Gloucester Place, London, w.L., Latest Edition.
4. Cannd Foods by Baumgartner, L. & A. Churchill Ltd., 104, Gloucester place, Portman Square Latest Edition.
5. Preservation of Fruits and Vegetables by Girdharilal and Siddapa. Indian Council and Agricultural Research, New Delhi, Latest Edition.
6. Practical Canning by Lock, A., Food Trade Press Ltd.,
7. Garrick Street, W.C.2, London, Latest Edition.
7. Introduction to Waste Water Treatment Processess by Ramalho, R.S. Published by Academic Press, New York, Latest Edition.

8 PC 01 SPECIAL TECHNOLOGY PAPER-VI
PETROCHEMICAL TECHNOLOGY - VI
PETROCHEMICAL PROCESS ANALYSIS
THEORY

Mathematical treatment, numerical problems etc. iIllustrating the physio-chemical and chemical engineering, principles, Process equipment design etc. pertaining to topics in the petroleum chemicals industry Petrochemical Technology- V (Theory) as exemplified by, the following.

Concept of equillibrium approach, criterion, kinetic severity, function safe conversion, etc., in liquid hydrocarbon mixture steam, cracking; calculation of number of tubes for propane cracking under operational conditions; parametric sensitivity in vapour phase catalytic reforming the simple smith model and the complete rare model; assessment of rate determining steps in oxosynthesis (liquid phase process) Naiglor, Natta catalysed Polymerisation of effylene : calculations pertaining to dynamic sorption capacity Ensorb type Processes, Hypersorption : thermal problems in polymer storage etc.

Recent development in the field.

8 PC 05 PETROCHEMICAL TECHNOLOGY - VI - LAB
REFINERY ENGINEERING

TBP distiIlation of petroleum fraction and construction of property midpercent, residue yield, distillate yield curves, Vertification of ASTM, TBP, Correlations. Comparison of characteristics of buble, packed column and mixer settler for extraction of acids from petroleum fractions into water, dilute alkali etc. Quantitative study of break through phenomena in adsorption of aromatics by siIlicagel.

8 PT01 SPECIAL TECHNOLOGY PAPER-VI
PULP AND PAPER TECHNOLOGY
(PROPERTIES AND TESTING OF PAPERS
AND POLLUTION CONTROL)

1. Finishing of paper and board: Calendering, realing and wrapping, winders. winding, super calendering, embossing.
2. Surface treatment of paper and board: Definitions, objectives, general approaches, typical surface treatment processes. adhesives, by products.
3. Insulating boards, hard boards, forming machines, dryers, fabrication and finishing.
4. Wastewater treatment and air pollution control
5. Analysis and testing: Introduction, test facilities. equipment. analysis
   and testing of pulp wood, wood pulps, paper and converted products.
6. Energy conservation and capacity utilization in pulp and industry, hand made papers and speciality papers.
   Recent deveopment in the field.

BOOKS RECOMMENDED :

1. Pulp and Paper Manufacture, 2nd edn. Vol-II. by B.Mac.Donald, McGraw Hill

2. Pulp and Paper, Science and Technology Vol-II, by C.E.Libby
3. Handbook of Pulp and Paper Technology. by K. W.Britt.

8 PT04 PULP AND PAPER TECHNOLOGY- VI - LAB

Processing of raw material, analysis of raw material and paper manufacturing, hand made paepr manufacturing. Testing of Paper.

8 CT02 CHEMICAL REACTION ENGINEERING-II (REACTOR DESIGN)

SECTION - A

Unit I : Residence time distribution. Models for non-ideal flow.

Unit II : Mixing concept and models: Rate equation for Heterogeneous reactions, fluid particle reactions. Determination of rate controlling step. Application to Design.

Unit III : Fluid-Fluid reaction: The rate equation for different cases and application to design. 8 design.

SECTION - B

Unit IV : Heterogenous processes, catalysis and adsorptionl determination of surface area, void volumn. Pore volume distribution catalyst preparation, promoters and inhibitation catalyst reactivation.

Unit V : Rate equation for third solid catalytic, reactions. Internal External transport process in Heterogeneous Reactions.

Unit VI : Design of Heterogeneous catalytic reactors, fixed bed reactors, isothermal & adiabatic fixed bed reactor, non-isothermal & non-adabatic fixed bed rector. fludized bed, Drickle bed, slurry reactor.

BOOKS RECOMMENDED:

1. Chemical Reaction Engineering, Octove Levelspil, Wiley Eastern Ltd.
2. Chemical Engineering Kinetics, Smith J.M., Mc Graw Hill.
3. Elements of Chemical Reaction Engineering - H.Scott Fogler, Prentice Hall.
4. Chemical Reactor Analysis & Design, Gilberth F Froment & Kenneth B Bischoof, John Wiley & Sons.
5. Chemical Reactor Design, Vol I & II, M W.Rase.

8 CT03 PLANT DESIGN & PROJECT ENGINEERING

SECTION-A

INTRODUCTION - Basic Considerations in Chemical Engg. plant design.

Unit I : Project identification, Preliminary teclmo economic feasibility, Process design aspects selection of process, factors affecting process selection. importance of laboratory developmcnt pilot plant, scale up methods. safety factors, Types of flow diagrams.

Unit II : Detection of process equipments - standard vs. special equipment, materials of construction for process equipments. selection criteria. specification sheets.

Unit III : Process auxilaries - piping design. layout. supports for valves, process control & instrumentation control system design.

Process utilities - process water, Boiler feed water, water treatment, waste treatment & disposal, oils heating systems. Chilling plant. compressed air & vaccum. Plant location & layout-Factors affecting both planning of layout. principles of plant layout, Use of scale methods.

SECTION - B

Unit IV : Cost estimation - factors involved in projcct cost estimation. Total capital investment, fixed capital & working capital. methods of estimation of investment.

Estimation of equipment cost production factors.

Estimation of total product cost - factors involved in estimating. Depreciation - types of methods of deternination depreciation. evaluation of depreciation methods.

Unit V : Profibility, alternative investments & replacements, methods for profitability evaluation. practical factors in alternative & replacement investment.

Unit VI : Economic considerations in process & equipment design, inventory control, Scheduling a project using CPM/PERT methods, project management. Option design, general production rates in plant operation.

Optimum conditions, optimum production rates in plant operation, optimum conditions in cyclic operation.

BOOKS RECOMMENDED :

1 Plant Design & Economics for Chemical Engineering By M.S. Peters & K.D.Timmerhaus, McGraw Hill (Japan), 2nd Edition, Latest Edition.
2. Chemical Engg. Plant Design: F. C. Vibradant & C.E.Dryden, McGraw Hill (New York), Latest Edition.

8 CT04 PROFESSIONAL ELECTIVE -II

(1) BIOCHEMICAL ENGINEERING

Scope and possibilities. characteristics and classification of biological matter, kinetics of microbial growth. balance equations for batch and cultures, kinetics of enzyme catalysed reactions. Analysis of mixed microbial populations. Design and analysis of biological reactors. Production, isolation and utilisation of enzymes. Transport phenomenas in biological systems.

BOOKS RECOMMENDED:

1. Aiba, A.E. Humpharey, N.F. Mills: Biochemical Engineering, Academic Press, New York. Latest Edition.
2. J.E. Bailey, D.F. Oltes : Biochemical Engineering Fundamentals, Mc Graw Hill, Latest Edition.
3. B.A.Tkinson : Biochemical Reactors, Pion Ltd. London, Latest Edition.

8 CT04 PROFESSIONAL ELECTIVE -II

(2) PETROLEUM PROCESSING ENGINEERING

Ii Itraduction to petroleum industry. World petroleum resources, petroleum industry in India. Origin, exploration, drilling and production of petroleum crudes, Transportation of crudes and Products. Crude pretreatment- Composition and classification of crudes. Methods of evaluation; ASTM, TBP and EFV distillation. Properties and specifications of petroleum products such as LPG, gasoline, naphtha kerosene, Diesel, oils, lubricating oils, waxes and the like.

Separation processes:

Design and operation of topping and vaccum distillation units. Tubes still furnales Solvent extraction processes for lube oil base stocks and for anomatics from naphtha and kerosene streams, solvent dewaxing Convertion Processes.

Thermal cracking, visbreaking and cooking processes. catalytic Cracking reforming, hydroprocessing alkulation, polymerisation and isomerisation, Safety and pollution considerations in refineries.

BOOKS RECOMMENDED:

1. Nelson, W.L. : Petroleum Refinery Engineering, Mc Graw Hill.
2. Hobson G.D., Phol, W. : Modern Petroleum Technology, Halsted Press, Division of Wiley Eastern.
3. Guthrie V.B.: Petroleum Products Handbook, McGraw Hill.
4. Kobew K.A.. Mcketta. J.J. : Advances in Petroleum Chemistry and Refining, lnterscience.

8 CT04 PROFESSIONAL ELECTIVE -II

(3) FUEL TECHNOLOGY

SECTION -A

Unit I — Comparison of various sources of energy. Alternatives to non-renewal sources. Characteristics and distribution, production and total deposits of coal and petroleum in India. Classification of Fuels Classification of Coal. Formation of Coal (colification process).

Unit II — Analysis of coal. Proximate and ultimate analysis. Significance of analysis. Rank of coal relation with moisture, ash, volatile matter. Reporting of coal analysis. Significance, composition of ash and mineral matter. Properties and testing of coal, Calorific value (Gross and net), Bob calorimeter, Boyôs gas calorimeter, weathenng index, swelling index, craking index. Grindability Index, specific gravity. Theoretical computations of calorific value.

Unit III — Testing of oils, viscosity, flash point, pour point, aniline point, carbon residue, Diesel index, octane and cetane number moisture content. Preparation of raw of mine coal. Washing of coal, washability curves. methods of coal washing, coal washeries in India, Gravity seperation, float and sink rest Efficiency of coal washing.

SECTION - B

Unit-IV — Carbonisation. Physical and chemical changes, high and low temperature carbonisation. Modern developments in design of coke ovens. Recovery of by products, Tar distillation, Blending of coals. Fuel economy in steel plants. Properties of metallurgical coke. Straight run distillation of crude oil. Thermal transfer and catalytic cracking. Polymerisation alkylation and ison.

Unit-V — General principles of combustion. Combustion of grates, mechanical stokers, combustion of pulverised coal, Suspenaed bed and fluridised bed combustion. Problems in combustion based on mass and heat transfer with chemical reaction..

Unit-VI — Gasification of coal. First and second generation gasifiers. Design of gasifier. Fixed and fluidised bed suspended gasifiers. Koppa Totrek, Lurgi Winker Hygas process. Orsat gas analysis, Gobour gas and sewage gas. Syntheis gas and its uses. Under ground gasification of coal.

BOOKS RECOMMENDED:

1. Fuels and Combustion : Samir Sarkar
2. Fules Fumaces and Refractories : O.P.Gupta
3. An Introduction to Study of Fuel : J C Marrae.
4 Fuels: J Francis
5. Fuels and Furnaces : Brame and King
6. Fuels : Huslam & Russel

8 CT06 PROJECT AND SEMINAR

Each student is required to prepare and submit either a typed review of about 6000 words 011 the recent literature OR a typedlhand written account of a critical study of a recent mathematical treatment pertaining to topics of current interest. in the branch of special technology choosen or related topics. The review/account press to be presented as a lecture by the student to be followed by discussion.

PROJECT WORK

A student or a group of students, not exceeding three, is required to prepare and submit typed reports of a quantitative study including material energy balances. process equipment design etc. of any modem processing unit or units in the brance, of special technology choosen. The study may be based on calculations made using literature data.

OR a student or the group has to carry out experiemental investigation of a research problem of interest in the branch of special technology chQosen under the guidance of a teacher in the special technology branch chosen and submit typed reports.

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NOTIFICATION

No. 89/2020 Date : 26/10//2020

Subject : Implementation of new Syllabi of Semester III & IV of B.E. (C.B.C.S.) as per A.I.C.T.E. Model Curriculum…

It is notified for general information of all concerned that the authorities of the University have accepted to implement new Syllabi of Semester III & IV of B.E./B.Text. E./B.Tech. (Chem.Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2020-21 & onwards as per "**Appendix – A**" as given below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

SYLLABI OF B.E. SEM. III & IV (CIVIL ENGINEERING) [C.B.C.S.]

THIRD SEMESTER

3CE01 MATHEMATICS III

Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Compute the partial Differential Equations.
- Understand the computational details behind certain numerical methods.
- Compute the Analytic function.
- Compute and interpret the correlation coefficient.

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Partial Differential Equations.
4. Compute different Numerical Methods.
5. Apply the knowledge of Complex Analysis.
6. Demonstrate the basic concepts of probability and statistics.

SECTION-A

Unit I : Ordinary Differential Equations :

Complete solution, Operator D, rules for finding the complementry function, the inverse operator, Rules for finding particular integral. Method of variation of parameters, Cauchy's and Legendre's Linear Differential equations. Simultaneous linear differential equations with constant coefficients Applications to civil engineering. (7)

UnitII: Laplace transforms:

Definition and elementry properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary differential equation using Laplace transform of periodic functions. Application to problems of beams and fluids. (7)

UnitIII : Partial DifferentialEquations :

P.D.E. of first order and first degree of types i) f(p,q) = O ii) f(p,q,z)=0, iii) f(p,q,x,y)=O iv) f(p,q,x,y,z)=O i.e. (a) Lagrange's form Pp + Qq = R (b) Clairtut's form z=px+qy+f(p,q) v) Equations reducible to above standard types linear Homogeneous P.D.E. of nth order with constant co-efficients. (7)

SECTION-B

Unit IV: **Numerical Methods :-** (i) Solution of Algebraic and transcendal Equations by Newton Raphson method and by method of False Position.

(ii) Solution of system of linear equations by Grout's method, Gauss Seidal method and Relaxation Method.

Numerical solution of differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method and Rungekutta forth order method. (7)

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation) (7)

Unit VI : Statistics :

Probability : Axioms, conditional probability, Baye's theorem, Mathematical Expectation and probability distributions (Binomial, Poisson and Normal). Curve fitting by method of least square only for line and parabola, Correlation, regression. (7)

TEXT BOOKS:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar. Poona Vidhyarthi Publisher
2. Higher Engineering Mathematics by B.S.Grewal. Khanna Publishers
3. Introduction to method of Numerical Analysis- S. S. Shastry, 2ND Edition, PHI Pvt. Ltd.,New Delhi.

REFERENCES:

1. A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
2. Advancing Engg. Mathematics, E.K.Kreyzig, John Wiley
3. Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

3CE02 – STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. To determine theMechanica lbehavior of the body and construction materials bydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel, Generalized Hook’s law, factor of safety. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit II: Axial force, shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Unit III: Stresses in beams (Bending, Shear), i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section. ii) Shear: Distribution of shear stresses on beam cross sections, impact loads and instantaneous stresses.

SECTION – B

Unit IV: Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's formula.

Books Recommended:

1. E. P. Popov, "Mechanics of Materials", Prentice Hall of India, New Delhi.
2. S.Timoshenko and O. H. Young, 'Elements of Strength of Materials', East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, 'Strength of Materials', Harper and Row, New York.
4. Shames, I. H., 'Introduction to Solid Mechanics', Prentice Hall of India, New Delhi.
5. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3CE03 – BUILDING CONSTRUCTION & ENGINEERING GEOLOGY

Learning Objectives of Subject:

1. To understand various types and components of civil structure.
2. To learn about the type of infilling material, its features and construction methodology.
3. To understand various levels in building – floor, sill, lintel, roof levels and their need.
4. To understand the need and type of vertical and horizontal circulation.
5. To make aware of knowledge and importance of rock, soil and its impact for site selection.
6. To help one to understand the reason for Earthquake and its impact on soil / rock properties.

Course outcomes:

At the end of the subject the students will be able -

1. To understand Load bearing and Frame structure.
2. To recognize various types of construction material and its suitability
3. To recognize the various levels in building and its need.
4. To know types of staircase, doors, windows and other related fixtures.
5. To recognize types of rock and minerals and its construction properties.
6. To know reason for earthquake and seismic waves.

SECTION - A

Unit I: Introduction: Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing & framed structures. Foundation: Definition and necessity, loads of foundation, Bearing Capacity soil, field methods of improving bearing capacity. Types of foundation – shallow foundation and Types of Shallow foundation.Causes of failure of foundations and precautions to be taken.

Unit II: Masonry: Classification of bricks, manufacturing of bricks, tests on bricks, properties of burnt bricks, fly ash bricks, ALC Blocks. Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Formwork: Different types, their relative merits, demerits, period for removal of formwork for different members. Earthquake resistant bands in masonry- Types, location and application.

Unit III: Floors: Types of Floors – Basement floor, ground floor and upper floors, Floorfinishes – Types of flooring material, different types of floor finishes, suitability, method of construction, criteria for selection. Roofs – Flat, pitched roof, steel roof trusses – types and suitability, types of roof covering. Arches, lintels – Types and their suitability, details of R.C.C. lintels.; chajja, precast lintels arches.

SECTION - B

Unit IV: Doors: Purpose, criteria for location, size of door, door frames.; its types, methods of fixing, Types of door shutters and their suitability, Windows – Purpose, criteria for location, no., sizes; shapes of Windows, types of windows; their suitability. Ventilators – Types and their suitability. Fixtures & fastening for doors and windows. Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design.

Unit V: Plastering - Necessity, types, processes of different types of plastering, defects inplastered work. Scaffolding – Purpose, types and suitability. Special Aspects of Construction – Damp proofing – causes of dampness, its effects, various methods of damp proofing.Fire proof construction –Fire protection requirements for a multistoried building. Sound proof Construction – Sound absorbents and their characteristic. Expansion & construction joints in building.

Unit VI: Introduction - Different branches of Geology and importance of Geology in CivilEngineering.Folds, faults, joints in Geology. Geological studies related to site selection for dams and reservoirs. Petrology - rock cycle, rock weathering and soil formation, study of common rock types. Earthquake Engineering - earthquake waves, causes and effects, magnitudeand intensity, earthquake zones of India.

Books Recommended:

1. Mackay W.B.: Building Construction, Vol. I, II, III, Longmans.
2. Sushil Kumar: Building Construction, Standard Publishers Distributors.
3. Singh Parbin: General & Engineering Geology.
4. Mukherjee: A Text Book of Geology.
5. TuyrellG.W.: The Principle of Petrology.
6. WadiaD.N. : Geology of India.
7. Sane L.S.: Construction Engg. ManakTalas, Mumbai.
8. National Building Code of India, 2016.
9. Punmia B.C.: Building Construction.
10. A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

3CE04 – TRANSPORTATION ENGINEERING

Learning Objectives of Subject:

1. To learn about basics of Road construction like surveys, alignment principles, types of roads.
2. To study and understand various road studies for safe road design principles and essential geometry.
3. To learn about various road pavements its construction and maintenance procedure.
4. To learn about railway transportation and terms related to it.
5. To learn about construction concepts of Airport runway, Apron layout , various survey and terms related to Airport Transportation.
6. To learn about Tunnels and Bridges components types and related transportation study.

Course outcomes:

At the end of the subject the students will be able –

1. To identify type of roads and its utility.
2. To understand the application of various road studies at time of survey and actual construction.
3. To design the various types of road pavements.
4. To understand rules regulations, signals , type of gauges and railway sleepers density.
5. To recognize the Airport features and design concept of components for Aero plains movement.
6. To identify types and components of Tunnels and bridges and its design components.

SECTION-A

Unit-I Highway: Road Transport characteristics, classification of Roads, Road Patterns, Alignment principles, Survey for highway.

Unit-II Geometric Design: Cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, overtaking sight distance, Horizontal alignment, curves, superelevation.

Unit-III Pavement Design and Traffic Engineering: Components of Flexible and Rigid pavement, Design factor, Traffic Characteristics, Traffic Studies, Construction and Maintenance – WBM Surface dressing, bituminous roads and construction procedure. Road parking system, traffic control devicesand 3 E's of traffic

SECTION-B

Unit-IV:Railway: Railway transportation, track sections, embankment & cutting. Points and crossing Left &right hand turnouts. Objects, Permanent way, gauges, coning of wheels, components of permanent way, Sleeper density, Rail fixtures & fastening. Rail types and functions.

Unit-V: Airport: Agencies controlling national & international aviation, various surveys to be conducted, airport site selection, Aero plane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, wind rose diagram. Basic runway length and corrections, Apron layout, Aircraft parking & parking system.

Unit-VI: Tunnel and Bridges: Tunnels- necessity, types, tunnel alignment, Size and shape of tunnels, and Tunnel lining. Tunnel drainage, ventilation & lighting of tunnels. Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board, different structural form – culverts, types of foundation, abutments, piers and wing wall.

Books Recommended:

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transportation& Highway Engg.
3) Dr.KadiyaliL.R. : Traffic Engg. & Transport Planning.
4) BindraS.P. : Principles & Practice of Bridge Engg.
5) Saxena &Arora : Railway Engineering.
6) Agrawal M.M. : Railway Engineering.
7) Khanna S.K., Arora M.G., Jain S.S. : Airport Planning & Design,
8) Srinivasan: Tunnel Engineering.
9) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
10) Duggal A.K. &Puri V.P. : Laboratory Mannual in Highway Engg.

3CE05 – CONCRETE TECHNOLOGY & RCC

Learning Objectives of Subject:

1. To understand basic construction material - Cement, its property and suitability tests.
2. To learn about meaning of concrete, strength of concrete, mixing proportion and suitability test.
3. To understand meaning of RCC and its need.
4. To learn various properties of concrete and use of different admixtures.
5. To learn about special concrete materials and methods.
6. To be able to perform mix design of concrete

Course outcomes:

At the end of the subject the students will be able -

1. To know need and composition of binding material, cement.
2. To recognize concrete and RCC and will be able to perform desired test for suitability,
3. To analyze RCC Components like slab and lintels.
4. To decide and utilize the admixtures as per the need of Concrete.
5. To understand importance of mix design.

SECTION-A

Unit I: Cement: Physical properties of Portland cement, laboratory tests on cement, types of cements. Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density.

Unit II: Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete. Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage.Durability of concrete,laboratory tests on concrete.

Unit III: Basic elastic theory and concept of reinforced concrete, types of reinforcement, Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, andchajjas.

SECTION-B

Unit IV: Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions. Construction chemicals: concrete curing compounds, polymer bonding agent, surface retarders, bond aid for plastering, protective and decorative coating.

Unit V: Special concrete: Ready Mix Concrete Light weight concrete, fiber reinforced concrete, Roller compacted concrete, self-compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete. Special concreting techniques: Guniting, grouting and shotcrete concrete, introduction & application of Ferrocement.

Unit VI: Introduction of mix design, factors governing mix design, IS Code method of mix design (IS: 10262 – 2019) and Ambuja method.

Books Recommended:

1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold (Publishers) ltd.
2. Neville, A. M.: Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks: Concrete Technology, ELBS
4. Gambhir, M. L. : Concrete Technology, Dhanpat Rai and Sons
5. Orchard D. F.: Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S.: Concrete Technology, S. Chand
7. Varshney, R. S.: Concrete Technology, Oxford Pub. house.
8. IS: 456 – 2000,
9. IS: 10262 – 2019,,
10. Krishna Raju: Design of Concrete Mixes, Mc – Graw Hill.
11. Ambuja Cement Concrete Mix Design- Ambuja Technical Literature series 79.

3CE06 – STRENGTH OF MATERIALS – LAB

List of Practical's in Strength of Material Lab (Minimum any eight practical from the list should be performed)

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

3CE07 BUILDING CONSTRUCTION & ENGINEERING GEOLOGY – LAB

List of Practical's in Building Construction & Engineering GeologyLab (Minimum any eight practical from the list should be performed)

1. Drawing of following building elements on A-2 size sheet.
   a) Paneled door, flush door, and glazed window.
   b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Fields visits to building under construction and its report writing including material of construction, construction processes, Human recourses required, and construction details.
6. Sketch book containing Free hand sketches of following:

Different types of foundations, Bonds in brick masonry, Types of floors. [Sections] Types of stairs. [Plans and side view], Line sketches of different types of steel roof trusses, Details of expansion joints, Details of damp proofing for basement, Fixtures & fastenings of doors & windows.

7. To determine shape and size of supplied bricks.
8. Field visit for different types of roof structures.
9. Field visit for studying building component in Load bearing and framed structure.
10. Megascopic study of silicate and non-silicate mineral, with special reference to physical properties of minerals and uses.
11. Megascopic study of the common igneous, sedimentary and metamorphic rocks, with special reference to engineering properties of rock and uses.

3CE08 TRANSPORTATION ENGINEERING – LAB

List of practicals in Transportation Engineering-Lab (Minimum eight experiments from the list should be performed)

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of Viscosity of Bituminous material
7. Determination of softening point of bituminous material.
8. Determination of ductility of bitumen.
9. Determination of marshal stability value

3CE09 CONCRETE TECHNOLOGY & RCC – LAB

List of Practicals in Concrete Technology & RCC Lab (Minimum eight practical from the list should be performed) :

1. Mix Design (Compulsory) by IS method.
2. Compulsory site visit and submission of site visit report.
3. Fineness of cement
4. Soundness of cement
5. Consistency and setting time of the cement
6. Compressive strength of cement
7. Sieve analysis of aggregate.
8. Bulking of sand (fine aggregate).
9. Silting of sand.
10. Workability by slump cone test compaction factor test
11. Admixture: Density, Compatibility Test
12. Workability by flow table method.
13. Compressive & Tensile strength of concrete.

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FOURTH SEMESTER

4CE01 BUILDING PLANNING DESIGNING & CAD

Learning Objectives of Subject:

1. To understand need of engineering drawings and methods to draw it.
2. To learn about various planning principles and able to apply on residential buildings.
3. To understand seasonal and climatic condition and corresponding provisions in structure.
4. To know regional rules regulation related to building construction.
5. To learn various types of plan – Block , Site , Line , Detail , Section etc.
6. To learn about smart buildings.

Course outcomes:

At the end of the subject the students will be able -

1. To make engineering drawings by First angle and Third angle method.
2. To apple building planning principles practically while developing projects.
3. To study the climatic conditions and decide the corresponding provision in structure.
4. To know about Bylaws, Town development authority rules and terms.
5. To draw various plans manually and computationally.

SECTION-A

Unit I: Importance of building drawing for Civil Engineering in construction & industry, estimation, Selection of scales for various drawings. Types of line and theirapplication. Methods of dimensioning in architectural drawing. Abbreviations and graphical symbols used in Civil Engineering Drawing as per IS: 962. Compare first angle and third angle method of projection. Layout of sheet for civil engineering drawing. Requirements of drawing and documents as per plan sanctioning authorities. Define FSI and TDR.

Unit II: Planning of residential building. Introduction, general principles of planning viz. aspect, prospect, roominess, privacy, grouping, circulation, ventilation, furniture requirement.

Climate of Indian and its influence on Building planning: Solar radiation, air temperature, wind, humidity, precipitation, earth & its motion, directions to their characteristics. Orientation of buildings: factors affecting orientation, sun, wind, rain. Requirement of the owner. Alternatives of building types viz. individual bungalows, semidetached houses, row houses, apartments. Provision of mezzanine floor, balconies and porches in the building. Common utilities such as parking, security, water supply, sanitation, etc. for apartments. Criteria for earthquake resistant planning of building.

Concepts of Digitized / Smart Buildings, Internet of Things (IOT) in buildings and Green Buildings, Industrialized Buildings

SECTION -B

Unit-III: Building Bye-laws and Development Control Rules for D Class Municipal Corporations in the Maharashtra State under the provisions of the Maharashtra Regional & Town Planning Act, 1966. Conversion of land to non-agricultural lands, layout for a housing project.Types of public building and their requirements, planning of public building.

Preparing line plans of different public buildings such as schools, commercial market, primary health center, workshop, college building, post-office. Free hand sketching of components of buildings and elevation features of building such as balconies, chajjas, etc.,Staircase planning & drawing.

Unit IV: Concept of line plan, working and submission drawings of the building. Details to be incorporated in the working drawing. Necessity and use of working and submission drawing. Concept of site plan, block plan and layout plan. Importance and details to be incorporated. Concept of foundation plan, importance and use. Developing working and submission drawings for load bearing and framed structures building from the given line plan(Develop plan, elevation, LHSV, RHSV, back side view, section, foundation plan, site plan and their detail). Plumbing ramp, Electric plan.

Books Recommended :

1. Shah, Kale &Patki, Building Planning & Drawing, Tata McGraw-Hill plubication
2. Dr. Kumar Swamy& Rao Swamy, Charotar publications
3. CheryR , Auto cad Pocket reference, BPB Publication.

4CE02 - HYDROLOGY & WATER RESOURCE ENGINEERING

Learning Objectives of Subject:

1. To study the different hydrological parameters.
2. To understand hydrological statistics and design.
3. To characterize and mitigate natural and man-made hazard.
4. To understand the various irrigation systems and its design.

Course outcomes:

At the end of the subject the students will be able -

1. Explain the hydrology and hydrological data.
2. To analyze the hydrological methods for runoff.
3. Evaluate the ground water hydrological problems.
4. Explain the need of irrigation systems and its alternatives.

SECTION – A

Unit I: Introduction - Hydrologic cycle, applications in engineering, sources of data. Precipitation- Forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area- duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).

Unit II: Abstractions from precipitation - evaporation process, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modeling infiltration capacity, classification of infiltration capacities, infiltration indices.

Unit III: Runoff - runoff volume, methods of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph. Ground water and well hydrology - forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

SECTION – B

Unit IV: Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler, pipeline distribution network(PDN) and trickle / drip irrigation.

Unit V: Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Lining of canals, types of lining. Water logging problems, causes, effects and remedies.

Unit VI: Dams and spillways – Earthen dams: Classification, design considerations, selection of suitable site. Estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Economic height of dam, Spillways: components of spillways, types of gates for spillway.

Books Recommended:

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K N Muthreja, Applied Hydrology, Tata Mc-Graw Hill.
3. G L Asawa, Irrigation Engineering, Wiley Eastern

4CE03 SURVEYING

Learning Objectives of Subject:

1. To learn about the term surveying, various instruments and possible error.
2. To learn Linear Measurement methods and way of conduction.
3. To learn about the measurement at elevation and of Directions , contour development process.
4. To understand and learn performing Plane table surveying.

Course Outcomes:

At the end of the course the student will be able to:

1. Define principles of Surveying, Remote Sensing and Geomatics.
2. Describe different instruments, tools, applications and techniques to determine the positions on the surface of the earth, change detection.
3. To perform Liner measurement methods of surveying.
4. Differentiate the techniques for setting out alignments, curves, other layouts, modern survey systems etc.
5. To perform survey at elevation and conduct Plane Table survey.

SECTION-A

Unit I: INTRODUCTION: Geo-informatics- definition, disciplines covered, importance. Field Surveying- definition & objectives; concept of Geoids and reference spheroids, coordinate systems, plane and geodetic surveys. Methods of location of a point- classification of surveys; principles of surveying Errors in measurements- sources, types of errors and their treatment. Random error distribution, accuracy, precision and uncertainty. Surveying instruments- temporary and permanent adjustment concept, principle of reversal. Maps- types, importance, scales/CI, conventional symbols, and generalization; topographic maps projection systems, sheet numbering systems, map layout.

Unit II:LINEAR MEASUREMENTS: Direct and indirect methods; Chain and tape measurements- corrections to tape measurements; Optical methods- tachometers, sub tense bar; Electronic methods- EDMs, total stations.

Unit III: MEASUREMENT OF ELEVATIONS :Various terms; Methods of height determination; Spirit leveling- different types of levels and staves; booking and reduction of data, classification and permissible closing error; profile leveling and cross sectioning; curvature & refraction and collimation errors; reciprocal leveling. Contours- characteristics, uses and methods of contouring.

SECTION – B

UnitIV:MEASUREMENT OF DIRECTIONS: Bearings and angles; Compass surveying- magnetic bearings, declination, local attraction errors and adjustments.

Unit V: TRAVERSING: Purpose and classification of each; Compass and theodolite traverses, theodolites- different types, uses, methods of observation and booking of data, balancing of traverses, computation of coordinates, omitted measurements Gale's traverse table.

Unit VI: PLANE TABLING: Merits and demerits, accessories; orientation and resection; methods of plane tabling; three point problem and solutions; errors in plane tabling, least square principle, Engineering project surveys- requirements and specifications, various stages of survey.

Books Recommended:

1. D. Clarke: Plane and Geodatic Surveying, Volume I & II
2. T.P. Kanetkar& Kulkarni: Surveying & Levelling, Part I & II.
3. B.C. Punmia : Surveying I & II.
4. N.N. Basak : Surveying & Levelling.

4CE04 - GEOTECHNICAL ENGINEERING –I

Learning Objectives of Subject:

1. To understand the various types of soil and its classification.
2. To learn about the Index and Engineering properties of soil.
3. To make one understand the mechanics of compaction and factors affecting the compaction.
4. To understand the concept of permeability and factors affecting to it.
5. To learn about the concept of seepeage discharge and effective, neutral and total stress in soil mass.
6. To make one understand the stress distribution in soil mass& its engineering applications.

Course Outcomes:

At the end of the subject the students will be able –

1. To determine the Index properties and Atterberg limits for soil classification.
2. To understand the mechanics of compaction and quality control in field.
3. To explain permeability of soil and methods of dewatering.
4. To calculate the seepage discharge and design the graded filter.
5. To understand the concept of consolidation and stress distribution in soil mass.
   To calculate the shear strength of different soil.

SECTION - A

Unit- I History of development of soil mechanics, formation of soil, its significance to the field problems. Soilproperties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Index properties of coarse and fine grained soil BIS classification of fine grained & coarse grained soil.

Unit-II Concept of clay mineral, major soil minerals, their structural formation and properties. Mechanics of compaction, factors affecting compaction, Standard and modified Proctor test, their field Determination, zero air void line, concept of wet of optimum, and dry of optimum, different structures of soil, field compaction & their control. CBR test and CBR value for soak and unsoaked conditions.

Unit-III Absorbed water, surface tension, capillarity and its effect on Soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection Permeability, determination of coefficient of permeability laboratory and field methods. Permeability for stratified deposits. Drainage and dewatering of soil and it's various methods.

SECTION – B

Unit-IV Laplace equation, its derivation in Cartesian co-ordinate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design Terzaghi's criteria for graded filter, concept of piping and criteria of stability against piping.

Unit-V A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criteria, Mohr-Coulomb's theory and development of failure envelopes, Unconfined compression test, Laboratory measurement of shear strength for different drainage, conditions by direct shear test, Triaxial test for various drainage conditions, Merits and demerits of various shear strength tests. Concept of pore pressure coefficient shear characteristics of sand, NC and OC clays and partially saturated soil, Influence of soil structure and strain rate on shear strength.

Unit-VI State of stress at a point, stress distribution in soil mass, Boussinesq's theory and its applications, point load, uniformly loaded rectangular and circular area New-mark's chart, its preparation and use, equivalent point load Compression of laterally confined soil, concept of consolidation spring analogy, Terzaghi's theory of one-dimensional consolidation. e-p curve, compression index, swelling index, coefficient of compressibility, Consoledometer-test, determination of Cv Cassagrande's method for determination of pre-consolidation pressure.

Books Recommended:

1) Craig R.F.: Soil Mechanics,
2) Lambe T.W. & Whiteman R.V.: Soil Mechanics, John Wiley and Sons, 1969.
3) Terzaghi K. & Peck R.B.: Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
4) Gulhati S.K.: Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
5) Singh A.: Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
6) Venkataramiah C.: Soil Mechanics and Foundation Engineering.
7) B. M. Das, Advanced Soil Mechanics.
8) S. K. Garg: Soil Mechanics and Foundation Engineering.

4CE05 - STRUCTURAL ANALYSIS- I

Learning Objectives of Subject:

1. To understand the action and corresponding displacement in various type of structural elements.
2. To learn about statically determinate and indeterminate structures.
3. To analyze continuous, cantilever and propped cantilever beams.
4. To learn different analysis methods for analysis of beam, frames and trusses.
5. To learn analysis of 2 Hinge and 3 Hinge arches.

Course outcomes:

At the end of the subject the students will be able -

1. To decide what is required to be analyzed depending upon type of structural element.
2. To know about degree of freedom, Condition of equilibrium and determinacy of element.
3. To understand reason for failure and permissible limits for safety.
4. To apply the knowledge of beam analysis for practical analysis and design purpose.
5. To make application of various analysis methods for actual structural member analysis and design.
6. To know merits for utilization of suspension, 2 hinged and 3 hinged arches.

SECTION – A

Unit-I : 1. Classification of Structures, Concept of statically indeterminate Structures, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.

2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II : 1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.

2. Deflection in determinate trusses.

Unit-III : Influence line diagrams for reactions, bending moment and shear force for determinate beams. Rolling loads on simply supported beams concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION - B

Unit IV : 1. Analysis of Cables Suspension Bridge under Concentrated Load and UDL for Cables over pulleys and Cable provided with saddles.

2. Two & Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit V: Slope deflection method: 1. Analysis of continuous beams with and without sinking of support.

2. Analysis of portal frames without side sway.

Unit VI : Moment Distribution method: 1. Analysis of continuous beams with and without sinking of support.

2. Analysis of portal frames without side sway.

Books Recommended:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II.
2. Jain and Arya, Theory and Analysis of Structures .
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural analysis.

4CE06 BUILDING PLANNING DESIGNING & CAD – LAB

A. SKETCH BOOK :

1. Draw various types of lines, Graphical symbols for materials, doors, windows, sanitary and water supply installations, electrical installations, Abbreviations as per IS 962:1989, Location for bed, sofa, dining table with chairs, wardrobe, kitchen furniture, etc. Free hand sketches of Verandah, lobby, passage, corridor and balconies. Building layout plan with setback lines, sanitary and water supply lines. Loft and Mezzanine floor.

2. Collect one readymade drawing for residential building (1 BHKD or 2BHKD) Read various details shown on drawing. write summary of observations on the drawing itself such as orientation of rooms, placement of doors and windows, wall thicknesses, flooring in rooms and sanitary block, skirting, dado, kitchen platform-size, height etc; room height, chajja projections, staircase-rise, tread, landing etc. Attach these drawings with the sketch book.

3. Draw line plans for five Residential Buildings with minimum three rooms and staircase in each with WC and Bath.

4. Draw line plans for five Public Building- School Building, Primary Health Centre, Hospital Building, Bank, Post Office, Hostel, Canteen and Shopping Complex. Bar & Restaurant and Hotels, Saloon, Bus Station.

B. FULL IMPERIAL SIZE SHEET (A1)

AUTOCAD: Understanding basic concepts such as Absolute, relative & world Co-ordinates, Drawing units, drawing limits, extend, layers, line types, object snapping, and filter.

Drawing entities in AutoCAD/Felix CAD, various drawing commands, use of object snaps & filters, Editing the drawing different editing commands, Dimensioning commands, Text commands, Hatching commands viewing the drawing different views, view ports, zooming in & out, panning, saving & printing in different scales.

Draw sheet no. 1, 2 and 3 drawing in Auto-CAD or similar software.Prepare sheet no. 3 in Pre-DCR software.

1. SHEET NO. 1 : Submission drawing, **to the scale 1:100,** of single storied Load Bearing Residential Building (4 Room) with Flat Roof and staircase showing developed plan, elevation, section passing through Stair or W.C. and Bath, site plan (1:200), **foundation plan and section (1:50),** area statement, schedule of openings , construction notes.

2. SHEET NO. 2 : Submission drawing, to the scale 1:100, of (G+1) Residential Building Framed Structure (2 BHKD) with attached toilet to 1 bedroom showing the position of European type WC pan) showing developed plan, elevation, section passing through staircase, site plan (1:200), foundation plan **and section** (1:50), area statement, schedule of openings. (Also Show the place for Washing machine, WHB, Pooja, store, bed, dining table with chairs, sofa, wardrobe etc.)

3. SHEET NO. 3: Submission drawing of Apartment / Multi storeyed building to the scale 1:100, showing developed plan, elevation, section passing through staircase or W.C. and Bath and Component Drawing of RCC Lintel and Chajjas. Shows detailed enlarge section.

Note: No identical plans and every student must have his/her own plans and drawings.

4CE07 - HYDROLOGY & WATER RESOURCE ENGINEERING - LAB

TERM WORK: Five problems from the following to be worked out by the students, whenever necessary scale drawing on half empirical size must be drawn:

Practical examination shall consist of viva – voce.
1. Fixing control levels of Reservoir from given data.
2. Cross section, plan, L-section of Earth dam showing all components.
3. Drawing of elementary and practical profile of gravity dam.
4. Drawing of diversion weir on permeable foundation.
5. Drawing of ogee spillway with energy dissipaters.
6. Computer Aided design of unlined and lined canal.
7. Drawing of any four canal structure (No design)
8. Technical Field visit.

4CE08 SURVEYING– Lab

List of Practical's in Surveying Lab (Minimum eight practical from the list should be performed)

1. Distance measurement by chain tape and EDM.
2. Finding RL of given point.
3. Profile and cross section leveling for road.
4. Measurement of bearings with prismatic compass.
5. Chain and compass traversing.
6. Local attraction detection- correction of bearings.
7. Measurement of Horizontal and Vertical angles using Theodolite.
8. Theodolite Traversing.
9. Plane table surveying- Radiation, Intersection and Resection method.
10. Engineering Project Surveys.

4CE9 GEOTECHNICAL ENGINEERING I – LAB

List of Practical's in Geotechnical Engineering- I Lab (minimum eight practical from the list should be performed)

Experiments:

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying method.

3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination of Atterbergs limits (LL, PL and SL)
6. Determination of Compaction properties (Standard Proctor Test)
7. Determination of permeability of soil by using falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial list of UU type
11. C.B.R. test. Determination of C.B.R. value by conducting CBR test on soaked sample.
12. Determination of Coefficient of consolidation by conducting consolidation.

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SYLLABUS OF B.E. [MECH.] SEM. III & IV {C.B.C.S.}

Semester-III
3ME01 MATHEMATICS - III

Course Learning Objectives :

1. To provide the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations
2. To understand the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation
3. To provide knowledge to apply False Position, Newton Raphson method to solve nonlinear & polynomial equations, Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations
4. To understand the Gradient, divergent and curl of vector point functions. To find the directional derivatives of scalar point functions. To discuss the Irrotational and solenoidal vector fields. To define line surface and volume integrals.

Course Outcomes :

Students will be able to -

1. Demonstrate the knowledge to solve ordinary Linear Differential equations with constant coefficient and its reducible equation using particular integral and complementary function and apply method of variation of parameter to solve ordinary Linear differential equations
2. Define the Laplace transform and its inverse transform for the basic functions. Locate the Laplace transform of periodic function. Apply the Laplace transform to solve differential equation
3. Apply False Position, Newton Raphson method to solve nonlinear & polynomial equations Apply Gauss Elimination method, Gauss Seidal iterative method, Relaxation method to solve system of linear equations, Apply Eulers method, Runge-Kutta method, Picards method to solve differential equations
4. Define Gradient, divergent and curl of vector point functions. Finds the directional derivatives of scalar point functions. Discuss the Irrotational and solenoidal vector fields. Define line surface and volume integrals

SECTION-A

UNIT-I : Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (10 Hrs)

UNIT-II: Laplace transforms : Definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function. Solution of Linear differential equations. (10 Hrs)

UNIT-III :a) Partial differential equation of first order of following form- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii)f (x,p)=g(y,q); (iv) Pp+Qq=R (Lagranges form); (v) z=px+qy+f (p,q) (Clairaut form)
b) Statistics : Curve fitting by method of least squares (Straight and parabola only), Correlation, Regression.
c) Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (10 Hrs.)

SECTION-B

UNIT-IV: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation), singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

UNIT-V: Numerical Analysis : Solution of algebric and transcendental equations by Newton-Raphson method & method of false position. Solution of system of linear equations by Gauss-Seidal method, Relaxation method. Solution of first order ordinary differential equations by Picard's, modified Euler's, Runge-Kutta and Taylor's method. (10 Hrs.)

UNIT-VI: Vector Calculus :- Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

Books Recommended :-

Text Books:

1. Text book on Applied Engineering Mathematics, Vol. II, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics, B.S Grewal, Himalaya Publishing House.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Book : Advanced Engineering Mathematics, Erwin Kreyzig, John Wiley.

3ME02 MANUFACTURING PROCESSES

Course Learning Objectives :

1. To study the manufacturing processes in sand casting industries, tooling and equipment
2. To study the metal melting process, melting furnaces and defects in casting
3. To study the various types of casting processes
4. To study the mechanical working of metals and allied processes
5. To study the mechanical joining processes and fastenings
6. To study welding processes and surface treatment processes

Course Outcomes :

Students will understand the :

1. basic concept of foundry process and related activities
2. concept of complete sand casting process with advance casting methods
3. fundamentals of welding processes
4. various processes like electroplating, anodizing etc and their importance in industries

SECTION- A

Unit-I : Introduction to manufacturing processes & classification; Introduction to pattern making Pattern materials, pattern making tools, allowances, Types of patterns, functions of patterns, General properties of moulding sands, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making, core prints, core boxes. Sand casting Processes - Basic principle and Terminology of sand casting, design of gating and riser system – by numerical approach. (9Hrs)

Unit-II : Technology of melting and casting - Melting furnaces, crucibles, pit, open hearth, gas fired cupola, cupola operation and electric hearth furnaces, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace.

Defects in castings and its types, Causes and remedies of casting defects. Origin and classification of defects, shaping faults, Inclusion and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Inspection and testing of castings:- Radiography, ultrasonic, Eddy current testing, fluorescent penetrant test. (7 Hrs)

Unit III: Casting processes and their principle of operation and applications permanent mold casting, slush casting, shell molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipment and processes for Gravity, pressure and vacuum casting methods, cleaning of castings, Modernisation & Mechanisation of Foundries. (8 Hrs)

SECTION – B

Unit IV: Mechanical working of metals: Principle of hot and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Shearing operations, tube drawing, wire drawing, spinning, embossing and coining, squeezing and bending operations, rotary swaging, load estimation for bulk forming (forging and drawing), rolling and types of rolling mills. (8 Hrs)

Unit V: Joining processes:- Mechanical joining processes, Mechanical fastening, riveting, soldering, brazing Welding, Types of welding processes-Arc welding: principle and working, Gas welding- principle and working Types and purpose of Electrodes, Electrode coatings(flux). TIG & MIG processes – Working principles and its applications, shielding gases, MIG-Spray transfer and dip transfer processes. (6 Hrs.)

Unit VI: Submerged arc welding & resistance welding :- Heat generation in resistance welding, operational characteristics of resistance welding processes such as spot welding, projection welding, butt welding.
Principle of operation of friction welding, forge welding, plasma arc, thermit welding. Welding defects, Testing and Inspection of welds, Ultrasonic, Electroslag, Electron Beam, laser welding, weldability.
Surface Treatment-Electroplating, electroforming, and iodising, metal spraying, shot peening, polishing, mechanical cleaning. (9 Hrs)

Books Recommended :

Text Books:-

1. Workshop Technology Vol. I by Bawa, Tata Mc-Graw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

References:-

1. Workshop Technology Vol I by Raghuwanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A.Lindberg, PHI Pub 2001.
4. Manufacturing technology Vol. I, by P. N. Rao.

3ME07 MANUFACTURING PROCESSES - LAB

Practices:-

1. Study of safety precautions in workshop practices.
2. Foundary:- Any two of the following jobs Sand preparation and practice in moulding of various types of patterns:- Pattern making - one job, Moulding - one job Casting - one job.
3. Joining Processes :Two composite jobs involving electric welding, gas welding and resistance welding process.
4. One job on Mechanical Working of Metals like piercing / drawing / bending/ embossing/ spinning/ upsetting, etc.

A journal should be prepared and submitted on above term work.

The practical examination shall consist of a job preparation and college assessment should be based upon the jobs, term work and viva examination.

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3ME03 MECHANICS OF MATERIALS

Course Learning Objectives :

1. To develop theoretical basis for stress, strain concept in various components under study
2. To study mechanical behavior of engineering material
3. To familiarize about finding shear force, bending moment, torsion, slope and deflection of various types of beams with different loading conditions
4. To build the necessary background to apply the knowledge of mechanics of materials on engineering applications

Course Outcomes :

Students will be able to -

1. Determine the stress & strain in the member subjected to axial, bending & torsional load
2. To observe different types of material behavior such as elastic, plastic, ductile and brittle
3. Apply SF and BM diagrams to analyse resistance offered by the beam and able to solve practical problems in real world
4. Apply deflection criteria to check the stability of beam

SECTION-A

Unit-I: 1. Mechanical properties: Concept of direct, bending and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, and other metals, factor of safety, stress and strain of bar due to self weight.

2. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only, introduction to theory of elasticity and photoelasticity. (10 Hrs.)

Unit-II: 1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shear force, bending moment and loading intensity.

2. Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section, leaf springs. (7 Hrs.)

Unit-III: 1.Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.

2. Shear stress distribution on beam rectangular and circular cross sections. (7 Hrs.)

SECTION – B

Unit-IV: Thin and thick cylinders and thin spherical shells subjected to internal pressures. (4 Hrs.)

Unit –V: 1. Strain energy under uniaxial tension and compression impact loads and instantaneous stresses.
2. Principal Stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses.
3. Strain energy and resilience : proof resilience, shear resilience, strain energy due to self load (7 Hrs.)

Unit-VI: Deflection in simply supported beam, cantilever beam subjected to point loads, uniformly distributed loads, moments by Macauley's method. (7 Hrs.)

Books Recommended:

Text Books :

1. Ramamruthm : Strength of Materials, Danpat Rai and Sons, New Delhi .
2. R. S. Khurmi: Strength of Material, S. Chand Publication, Delhi.

Reference Books :

1. E.P.Popov : Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young : Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Shames, I. H. : Introduction to Solid Mechanics, Prentice Hall of India, New Delhi
4. Beer and Johston : Mechanics of Materials, McGraw Hill.
5. D. S. Prakash Rao : Strength of Material : A Practical Approach, University Press, Hyderabad.

3ME08 MECHANICS OF MATERIALS - LAB

Practicals:

Minimum Six to Eight out of the following:

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Deflection of springs.

Practical examination shall be viva-voce based on above practical and the syllabus of the course.

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3ME04 ENGINEERING THERMODYNAMICS

Course Learning Objectives :

1. To study the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. To study the laws of thermodynamics and their applications
3. To study the properties of steam, work done and concept of heat transfer
4. To study the air standard cycles

Course Outcomes :

Students will be able to

1. Understand the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. Apply first law of thermodynamics and application of first law to flow and non-flow processes
3. Apply second law of thermodynamics and understand concept of entropy
4. Understand the properties of steam, work done and heat transfer during various thermodynamics processes with steam as working fluid
5. Understand the concept of air standard cycles

SECTION – A

Unit-I: Introduction to basic concepts of thermodynamics, Macroscopic and microscopic approaches, properties of system, state, processes and cycle, thermodynamic equilibrium, types of thermodynamic systems, Temperatures and Zeroth law of thermodynamics, Quasi-static process, Gas Laws and Ideal gas equation of states, gas constant and universal gas constant.
Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams (10 hrs)

Unit-II: First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Application of first law to non-flow processes, Change in internal energy, work done and Heat transfer during various non-flow processes. (7 hrs)

Unit-III: First Law applied to flow processes: Steady state, steady flow process, equation for work done in steady flow process and its representation on P-V diagram, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes. (9 hrs)

SECTION – B

Unit-IV: Second Law of thermodynamics: Limitations of First law, Thermal energy reservoir, heat engines refrigerator and heat pumps, COP and tonne of refrigeration, COP for heat pump and refrigerator, Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, Carnot theorem and its corollary, The thermodynamic temperature scale, Reverse Carnot cycle, Inequality of Clausius.
Introduction to Entropy, availability and irreversibility. Principle of increase of entropy. (8Hrs)
Unit-V: Properties of Steam: Triple point and critical point, Sensible heat, latent heat, superheat and total heat of steam. Wet steam, dryness fraction, Internal energy of steam, External work of evaporation, internal latent hear, Specific volume, enthalpy, internal energy and entropy of steam. T-S diagram Mollier chart, Steam tables and their use. Work done and heat transfer during various thermodynamics processes with steam as working fluid. Throttling of steam, determination of dryness fraction using various calorimeters. (8 Hrs)

Unit VI : Air Standard Cycles: Ottto, diesel, semidiesel, Brayton, Sterling and joule cycles etc., their efficiencies and mean effective pressure, comparison of auto, diesel and duel cycles.
Vapour Cycles:- Rankine and Modified Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram. (No numerical on this unit) (numerical on air standard cycle) (8 Hrs)

BOOKS RECOMMENDED:

Text Books :

1. Engineering Thermodynamic - by P. K. Nag.
2. Fundamentals of Engineering Thermodynamics; R. Yadav;
3. Thermodynamics Basics and Applied: by V. Ganeshan
4. Thermal Engineerirng: by Mahesh M. Rathore.

Reference Books :

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G. J.Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson.

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3ME05 FLUID MECHANICS

Course Learning Objectives :

1. To introduce and explain the fundamentals of Fluid Mechanics used in applications of Hydraulics, Aerodynamics, Gas dynamics, etc.
2. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.
3. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
4. To imbibe basic laws and equations used for analysis of static and dynamic fluids.
5. To inculcate the importance of boundary layer flow and its applications
6. To determine the losses in a flow system, flow through pipes, impact of jet

Course Outcomes :

The student will be able to:

1. identify importance of various fluid properties at rest and in motion
2. derive and apply general governing equations for various fluid flows
3. understand the concept of boundary layer theory and flow separation.
4. calculate energy losses in pipe flow.
5. evaluate the performance characteristics of hydraulic jets

SECTION – A

UNIT-I : 1. Basic properties of fluid such as Density, Specific weight, Specific Volume, Specific gravity, Viscocity of fluid, Surface Tension, Capilarity, vapour pressure & cavitation.

2. pressure & its measurement: Pascals law, Hydrostatic law of pressure & pressure variation in fluid, measurement of pressure by Manometer. (10 Hours)

UNIT-II : 1. Hydrostatic pressure force on plane & curved surfaces. Measurment of total pressure & centre of pressure.

2. Buoyancy & floatation: Concept of buoyancy, centre of buoyancy. Stability of floating body, Metacentre & metacentric height. Condition of equilibrium of floating & sub-merged body. (08 Hours)

UNIT III : 1. Kinematics of fluid flow, Methods of describing fluid motion, Types of flow, rate of flow, streamline, potential line, flow net, velocity & acceleration, continuity equation in three dimensional flow.

2. Dynamics of fluid flow : Eulers equation of motion, Bernoullis equation measurement of fluid flow with venture meter. (08 Hours)

UNIT-IV : Flow through pipes: Losses in pipe, major losses, Darcy's Weisbach equation, monor losses due to sudden enlargement, contraction, entry, exit & pipe fitting. Hydraulic gradient & total energy line, flow through series & parallel pipes, concept of water hammer in pipes. (08 Hours)

UNIT-V : Motion of viscous fluid: Introduction to Laminar & Turbulent flow, Concept of Boundary layer & its type. Drag & Lift force on object. Boundary layer separation, Reynolds number & its significance. (08 Hours)

UNIT-VI : Principal of fluid machinery : Force exerted by fluid jet on plane, curved, stationary & moving vanes. Velocity diagrams, work done & efficiency. (08 Hours)

Books Recommended :-

Text Books:-

1. Fluid Mechanics & Machinery by Modi & Sheth.
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal.
3. Engineering fluid Mechanics by R. K. Rajput.
4. Fluid mechanics & Machinery by CRSP. Ojha, R. Berndtsson.
5. Fluid Mechanics by Strecter; Tata Macgraw Hill.

Reference Books:-

1. R.K.Rajput; Engineering Fluid Mechanics; S. Chand publications.
2. Dr. Mody & Seth; Hydraulics and Fluid Mechanics; Standard book house
3. S. Ramamrutham, Hydraulic, Fluid Mechanics & Fluid Machines, Dhanpatrai publishing company.
4. Strecter, Fluid Mechanics, Tata Mc-Graw Hill.

3ME09 FLUID MECHANICS - LAB

Practical Term Work:-

At least six (6) practicals (study/Trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students :

1. Measurement of fluid pressure by manometer.
2. Determination of metacentric height.
3. Verification of Bernoulli's equation.
4. Determination of co-efficient discharge by Venturimeter.
5. Calculation of Reynolds number for Laminar & Turbulent flow.
6. Determination of co-efficient of friction (Major losses in Pipes) through pipe.
7. Determination of head loss due to sudden enlargement.
8. Determination of head loss due to sudden contraction.
9. Determination of loss of head in bends & in elbows.
10. Verification of momentum equation.

Note :- Practical examination shall consist of oral or Experimentation based on above term work.

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3ME10 Machine Drawing - Lab

Course Learning Objectives :

1. To study the techniques of sectioning and visualizing the objects
2. To imagine and develop the missing views of objects
3. To seek the knowledge of development of surfaces
4. To seek the knowledge of intersection of solid objects
5. To know the conventions for materials and parts used in industries
6. To prepare the drawings for machine assembly

Course Outcomes :

Student will be able to -

1. Demonstrate the techniques of sectioning and visualizing the objects
2. Imagine, understand and sketch the missing views
3. Develop surfaces of objects and apply knowledge during their fabrication
4. Understand the concept of intersection of solid objects
5. Understand and apply the conventions for materials and parts used in industries
6. Prepare detail machine assembly drawings

List of Practicals :

1. Conversion of pictorial view into Sectional Orthographic Projection
2. Missing Views
3. Development of surfaces of Cubes / Prisms / Cylinders / Pyramids / Cones & their cut sections
4. Intersections of Solids – Prism & Prism /Cylinder & Cylinder /Cylinder & Prism / Cone & Prism
5. Conventions for various materials & parts
6. Preparation of detail drawings of simple machine assembly
7. Preparation of assembly drawing of simple machines

Books recommended:

Text Books:

1. Engineering drawing by N.D. Bhatt; Charactor Publications.
2. Machine Drawing by A. M. Bisen; New Edge International publication.
3. Machine Drawing by R. K. Dhawan, S. Chand
4. Machine Drawing by Basant Agrawal, McGraw Hill.
5.

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B.E. (MECHANICAL) SEMESTER FOURTH

4ME01 MATERIAL SCIENCE

Course Learning Objectives:

1. To study the basic concepts of metallurgy and classification of materials
2. To study the process of formation of microstructures of metal materials and composites
3. To study the alloying elements, their effects and applications
4. To study the ferrous and non-ferrous metals and respective alloys
5. To study the various heat treatment processes and their industrial applications
6. To study the mechanical working of metals and process of powder metallurgy

Course Outcomes:

Students will understand the -

1. Basic concepts of metallurgy and types of materials.
2. Iron-Carbon Equilibrium Diagram, critical temperatures, formation of microstructures and they will get the knowledge of alloys.
3. Uses and practical applications of ferrous & non ferrous materials
4. Various heat treatment processes, powder metallurgy and industrial applications.

SECTION - A

UNIT-I: Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, lever rule for phase mixtures. Solidification of pure metals, nucleation and growth, ingot structure, dendritic solidification. (8 Hrs)

UNIT II: Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Microstructure of slowly cooled steel, Estimation of carbon from microstructure, structure property relation, Introduction to composite materials, advantages and applications. (8 Hrs)

UNIT III: **Alloy Steels:** Purpose of alloying, Classification of alloy steels, classification of alloying elements, Effect of alloying elements on eutectoid composition, Eutectoid temperature, and on the S curve, , alloying elements and their effect on properties of steels, OHNS steels, Hadfield'S Manganese steels, High speed steels, their heat treatments and applications, Ferritic, Austenitic and Martensitic stainless steels, their properties and applications, weld decay in stainless steel. (8 Hrs)

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SECTION - B

UNIT IV: Cast irons **:** Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabalizing, Constitution and properties of white, gray, Nodular and Malleable cast irons, their applications, Alloy cast irons.

Non Ferrous Metals and Alloys : Types, Properties and uses of Brasses and Bronzes. Important alloys of Aluminium, Lead, Tin and Zinc, their applications. Bearing materials, Season cracking, precipitation hardening. (8 Hrs)

UNIT V: Principles of Heat Treatment: - Annealing, Normalizing, Tempering Iso-thermal transformation diagrams(S-curve), super imposition of continuous cooling curves on 's' Curve, pearlite, bainite and martenste transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability. (8 Hrs)

UNIT VI: Methods of surface hardening: Carburizing, Nitriding, Cyaniding, Flame and Induction Hardening. Mechanical working of Metals: - Hot and cold working, Relative advantages and disadvantages, study of stress strain curve, Luder's bands, Work hardening, strain Ageing; Recovery, Recrystallization and grain growth. Metallurgical factors affecting various Mechanical working processes, preferred orientation, Deformation mechanisms-Slip& twining, critical resolved shear stress.

Powder Metallurgy: Concept, Methods of Manufacture of metal powders, compaction Process- Single die and double die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T. Advantages, limitations and applications of powder metallurgy. (8 Hrs)

BOOK RECOMMENDED :-

Text Books :-

1. Introduction to physical metallurgy ;Sidney H Avner, TATA Mc-Grawhill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication.
3. Material nScience & Mettalurgy, by V.D. Kodgire. Everest Publication House.

Reference Books:

1. Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Physical metallurgy for engineers, Clarke and Varney, second Edn.,1987.
3. Power metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallugrgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Meallurgy- C Daniel Yesudian, Scitech Publication.

4ME07 MATERIAL SCIENCE - LAB

List of Practicals: - (At least eight (8) practicals out of the following list.)

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.
3. Moulding of specimen for micro-examination.
4. Study of micro structures of Annealed and normalized plain carbon steels.
5. Study of micro structures of alloy steels and H.S.S.
6. Study of micro structures of various cast irons.
7. Study of micro structures of non ferrous metals.(brasses, bronzes)
8. Study of micro structures of hardened and tempered steels.
9. Study of Iron carbon Equilibrium diagram & Allotropic forms of iron.

10. Study different Heat Treatment Process for steel.
11. Study of different surface Hardening processes for steels.
12. Study of effect of alloying elements on the properties of steels.
13. Measurement of hardenability by Jominy end quench test apparatus.
14. Study of hardness tester and conversion of Hardness number
15. Industrial visit to study heat treatment plant.
16. Measurement of particle size, grain size, nodularity, coating thickness etc. by using some software like Metzer Microcam 4.0

Practical Examination:

Note : Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

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4ME02 ENERGY CONVERSION - I

Course Learning Objectives:

1. To study the properties of steam and its behavior for different thermodynamic process.
2. To study different types of boilers, their mountings, accessories, performance of boilers and different efficiencies.
3. To study the various fuel handling and ash handling system in power plant.
4. To study various types of condensers and cooling towers.
5. To study various thermodynamic aspects of flow of steam through nozzle and diffuser.
6. To study flow of steam through steam turbine and concept of compounding.

Course Outcomes:

1. Students will study the concept steam and steam power plant, mounting and accessories.
2. Students will demonstrate the calculation of various efficiency & related parameters.
3. Student will show the adequate knowledge of fuel & ash handling systems.
4. Students will demonstrate the knowledge of condenser & application.
5. Students will understand the concepts of steam nozzles & steam turbine.

SECTION – A

Unit I : Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump. Steam power plant layout, site selection. Boilers: Introduction to water tube and fire tube boilers used in thermal power plants, packaged Boilers, High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings and accessories—devices for improving Boiler efficiency. Principle of fluidized bed combustion. Concept of co-generation. (7 Hrs.)

Unit II : Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximum discharge, efficiency of chimney, reasons for draught loss. Boiler performance:- Boiler rating, boiler power, equivalent evaporation, efficiency. Effect of accessories on boiler efficiency and heat balance. (7 Hrs)

Unit III : CONDENSERS : Need, Types of condensers, quantity of cooling water required. Dalton's law of partial pressure, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance. cooling towers: Natural and mechanical wet type cooling tower.

Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, chocking in nozzles, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no numerical on concept of super saturated flow & Wilson line. (7 Hrs.)

SECTION – B

UNIT IV : Steam Turbines:- Principle of working, Types of steam turbines such as impulse, reaction, axial & radial flow, back pressure & condensing turbines. Compounding. Reheat, regenerative cycles, bleeding. Analysis limited to two stages only. Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blades, Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Height of turbine blades. losses in steam turbines:- blade friction, partial admission, disc friction, gland leakage losses and velocity losses. Governing of steam turbines. (7Hrs)

UNIT V : NUCLEAR POWER:- Fusion, fission, Chain reaction, conversion and breeding in nuclear fission. Components of Nuclear Power Plant such as Reactor, Steam generator, turbine, Moderator, Control Rods etc., Types of nuclear reactors like BWR, PWR, CANDU and liquidized metal cooled thermal reactors. (7 Hrs.)

UNIT VI : Introduction to renewable energy, Wind Energy, solar, fuel cell, bio-gas, MHD, Geothermal, OTEC, tidal power plants, Applications of Non conventional energy. (7 Hours)

RECOMMENDED BOOKS:

Text books :

1. Thermal engineering; Mahesh M Rathore; Tata McGraw-Hill
2. Thermal Engineering R.Yadav; Central publication
3. Non-conventional Energy Sources B. H. Khan Tata McGraw-Hill
4. Non-conventional Energy Sources G. D. Rai.

Reference books:

1. Steam Turbine; Kearton; Oscar Publications.
2. Thermal Power Engineering; Mathur Mehta; Tata McGraw-Hill
3. Power Plant Engineeirng. P. K. Nag
4. Power Plant Engineeirng; R. K. Rajput ; Laxmi Publications
5. Thermal Engineering, P.L.Ballaney; Laxmi Publications.

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4ME03 MANUFACTURING TECHNOLOGY

Course Learning Objectives :

1. To study the mechanics of metal cutting, tool characteristics and cutting forces
2. To study the turning operations using lathe and CNC machines
3. To study the working of drilling and boring machines
4. To study the working of milling and gear cutting machines
5. To study the machining operations using grinding, shaper, planer and slotter machines
6. To study the unconventional machining processes

Course Outcomes :

Students will be able to -

1. Apply the knowledge of theory of metal cutting, tool selection & calculate cutting forces
2. Demonstrate the knowledge of basics of turning operations
3. Understand the drilling and boring operations and working of drilling & boring machines
4. Understand the milling and gear cutting operations and working of respective machines
5. Understand the working of grinding, shaper, planer and slotter machines
6. Understand the knowledge of unconventional machining processes

SECTION – A

UNIT I : Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Calculation of Cutting forces, Machinability, Cutting fluids, Chip thickness ratio, Merchant circle. (8 Hrs)

UNIT II : Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism, Machine tool classification. Numerical approach. Taper turning & Screw cutting & basic concept of CNC. Introduction, working principal & CNC turning operation. (10 Hrs)

UNIT III : a) Drilling operation : Drilling M/cs general purpose, Mass production and special purpose drilling M/cs.
b) Introduction & types of Boring. Boring M/c :- Horizontal, Vertical and jig Boring M/c. Introduction to Broaching and its types, broach terminologies, etc. (8 Hrs)

SECTION - B

UNIT IV : (a) Calculation of machining time for Milling.
(b)Milling M/c :- Types, Types of Milling Cutters, Dividing head, Compound and differential idexing.
c) Gear producing M/cs. (6 Hrs)

UNIT V : a)Grinding Machines: Bench grinders, surface grinders, centreles grinders, types of bonds & Abrasive modification of grinding wheels.
b) Study of various part & Operation of Shaper, Planer, Slotter. (6 Hrs)

UNIT VI : Unconventional Machining Processes:-

a) Mechanical Processes:- Ultrasonic Machining - principle and applications. process parameters; Abrasive and water parameters involved.
b) Thermal processes:- Election Beam Machining – Generation of beam, principle and applications : Laser Beam machining applications : Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications.

c) Electric discharge Machining - Types die-sinking, wire cut EDM, Mechanism of material removal, process parameters, advantages and applications. (8 Hrs)

BOOKS RECOMMENDED :

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.
2. Workshop Technology - By Hajra Choudhaury Vol II.
3. Manufacturing Technology Vol. II P. N. Rao, McGraw Hill Publication

References:-

1. Pandya & Shah, Modern Machining process, Tata McGraw Hill 1998.
2. Workshop Technology, O.P. Khanna, Dhanpatrai & Sons.
3. Workshop Technology - By Raghuwanshi. Vol II.

4ME08 MANUFACTURING TECHNOLOGY - LAB

Practicals:-

1. Demonstration of operations related to lathe, shaper, slotter, drilling & grinding m/cs.
2. One job on lathe covering taper turning and threading.
3. One job on shaping covering plane and inclined surfaces.

The above jobs should include drilling, grinding, tapping etc. Term work should be submitted in the form of journal.

N.B. :- The practical examination shall consists of preparation of practical jobs and assessment by external and internal examiner.

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4ME04 BASIC ELECTRICAL DRIVES AND CONTROL

Course Learning Objectives :

1. To study the working of electrical drives and their components
2. To study the basics of DC motors and their characteristics
3. To study the working of AC motors, Induction motors and concept of braking
4. To study the different speed control methods of A.C. and D.C. motors
5. To study and design of transducers and their applications
6. To study the industrial applications of different drives

Course Outcomes :

Students will be able to -

1. Understand the working of electrical drives and their components
2. Understand the basics of DC motors and their characteristics
3. Understand the working of AC motors, induction motors and concept of braking
4. Understand the different speed control methods of A.C. and D.C. motors
5. Understand the design of transducers and their applications
6. Understand the industrial applications of different drives

SECTION-A

Unit I : Concept of general electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Introduction to mechatronics, Theory and principle of Power Transistor, SCR. **(**8 Hrs**)**

Unit II : Basic characteristics of D.C. motor, Torque equation, Modified speed – Torque characteristics. Starting and braking of Electrical D.C. motors, comparison of mechanical and electrical braking methods. Introduction, Principle, construction and working of Servo motors, stepper motors, Brushless D.C. motors. **(**8 Hrs**)**

Unit III : Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phase Induction motors, applications. Starting and braking of 3 phase induction motors. Classification of single phase induction motors. construction, principle and working and applications. Principle and working of universal motor. **(**8 Hours**)**

SECTION-B

Unit IV : Conventional methods of speed control of A.C. and D.C. motors. Thyristorized stator voltage control of 3 phase induction motor, (v/f) control method, slip-power recovery scheme. Thyristorized armature voltage control of D.C. motors using phase control & Thyristorized chopper. **(**8 Hours**)**

Unit V : Basic principle, construction & applications of sensors and transducers, contact - non- contact type, optical proximity sensors. Switches, contact type, magnet type, electromagnetic type, sound, light, pressure, vibration transducers, Hall effect-sensors A.C./D.C. Tachogenerators. **(**8 Hours**)**

Unit VI: Industrial applications - classes of duty selection of an electric drive for particular applications such as steel mill, paper mill, cement mill, textile mill, sugar mill, electric traction, coal mining, etc. Induction heating, surface hardening & Dielectric heating. **(8 Hours)**

BOOKS RECOMMENDED :

Text Books:

1. A First Course on Electrical Drives - S.K. Pillai.
2. Basic Electrical Technology (Vol. 11) - B.L. Theraja

Reference Books :

1. Drives and Control - N. Dutta
2. Mechatronics - W. Bolton, Addison Wesley, Longman Ltd.
3. A Course in Electrical, Electronics Measurement and Instrumentation, By A.K.Sawhney, Dhanpat Rai & Sons,

4ME09 BASIC ELECTRICAL DRIVES AND CONTROL - LAB

List of Experiments :

Any EIGHT practicals from the following list :

1. To study the Specification of Various Electrical Machines.
2. To study the D.C. Motor Starters.
3. To study the Running and Reversing of D.C. Motor.
4. Speed Measurements using Magnetic Pick-up.
5. To study the Speed reversal of counter Current Breaking of 3-phase Induction Motor.
6. To control the speed of D.C. Motor by a) Armature Control b) Field Control.
7. To perform Load Test on Induction Motor.
8. To study Dynamic/Rheostatic Breaking of D.C. Motor.
9. To study Characteristics of Thyristor.
10. To study the speed -Torque Characteristic of Servo Motor.

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4ME05 HYDRAULIC AND PNEUMATIC SYSTEMS

Course Learning Objectives:

1. To get fundamental background about the hydroelectric power plants
2. To study operation, working principle & performance characteristics of hydraulic turbines
3. To study operation, working principle & performance characteristics of centrifugal pump, reciprocating pump and other hydraulic pumps
4. To study the behavior of compressible fluid flow
5. To study different hydrostatic & hydro kinematics industrial applications

Course Outcomes:

Students will be able to -

1. Demonstrate basic concepts of prime movers and turbines
2. Utilize the knowledge of centrifugal and reciprocating pumps for applications
3. Reveal the importance of other water lifting devices
4. Solve the elementary treatment on compressible fluid flow
5. Understand the concept of hydrostatic and hydrokinetic systems
6. Use the knowledge of hydraulics & pneumatics in developing project work.

SECTION - A

Unit I : Hydraulic Turbines - Theory of impulse and reaction turbines. Pelton, Francis and Kaplan turbines, their construction, classification, analysis, characteristics and governing, draft tube. (10 Hours)

Unit II : Centrifugal pumps :- Basic Theory, classification, construction, operation, characteristics, multistage, NPSH and cavitations in pumps. (7 Hours)

Unit III:

1. Axial flow pump :- Basic theory, construction, & operation.
2. Other water lifting devices :- (a) Air lift pump. (b) Jet Pump. (c) Hydraulic Ram.
3. Computational Fluid Dynamics (CFD)
4. Introduction to CFD: Necessity, limitations, philosophy behind CFD, applications (6 Hours)

SECTION - B

Unit IV : Positive Displacement and other Pumps: Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels. Comparison of centrifugal and reciprocating pumps, performance characteristics. (9 Hours)

Unit V : Compressible fluid flow :- Perfect gas relationship, speed of sound wave, mach number, Isothermal and isotropic flows, shock waves. (8 Hours)

Unit VI : Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic coupling, hydraulic torque converter. (8 Hours)

BOOKS RECOMMENDED :-

Text Books:-

1. CSP Ojha, R. Berndtsson, Fluid mechanics and machinery; Oxford University.
2. Bansal R.K., Fluid mechanics and fluid machines; Laxmi publications.

Reference Books:-

1. Jagdish Lal, Hydraulic machines; Metropolitan Book Co. Pvt. Ltd.
2. Dr. Modi & Seth, Hydraulics and Fluid Mechanics; Standard house book.
3. Sen gupta, Computational fluid dynamics; Pearson Publishers.
4. Sameer sheikh, Iliyas Khan, Treaties on Hydraulics; Pneumatics, R.K. Publication.

4ME10 HYDRAULIC & PNEUMATIC SYSTEMS - LAB

List of Practicals:- At least **SIX** (6) practicals based on following :

1) Trial/Study of Pelton wheel
2) Trial/Study of Francis Turbine
3) Trial/Study of Kaplan Turbine
4) Trial/Study of centrifugal pump
5) Trial/Study of reciprocating pump
6) Trial/Study of axial flow pump
7) Trial/Study of hydraulic ram
8) Trial/Study of multistage pump
9) Trial/Study of special pumps (air lift pump/ jet pump)
10) Trial/Study of Gear pump
10) Any one practical based on CFD software

Note : Practical Examination : Practical examination shall consist of Viva Voce/performance based on above syllabus & practical work.

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SYLLABUS OF SEM. III & IV B.E. (ELECTRONICS & TELECOMMUNICATION ENGG.)

Semester-III

3ETC1 - ENGINEERING MATHEMATICS-III

Course Requisite: 1. (IA1) Engineering Mathematics-I 2. (IB1) Engineering Mathematics-II

Course Objectives:

1. To deal with linear differential equations.
2. Understand Laplace transforms .
3. Introduction to geometry of curves, two and three-dimensional regions and calculus of vector valued functions.
4. To equip students with necessary knowledge and skills to enable them to handle mathematical operations of complex analysis .

5. . Understand the computational details behind certain numerical methods and their convergence.
6. To deal with system of differential and difference equations in the study of electrical/electronic and systems.

Outcomes: After successfully completing the course, the students will be able to

1 . Demonstrate the knowledge of differential equations to solve engineering problems of analog systems.
2 . Apply Laplace transform to solve differential equations.
3. Apply knowledge of vector calculus.
4. Comprehend knowledge of complex analysis in terms of complex variables, harmonic functions and conformal mapping.
5. Apply numerical methods to obtain approximate solutions to mathematical problems.
6. Identify and solve certain forms of partial difference equations as applied to discrete systems.

SECTION - A

Unit-I : Ordinary Differential Equations: - Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (7)

Unit-II: Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Solution of linear differential equations using Laplace transform. (7)

Unit III : Vector Calculus: - Scalar and Vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (without proof), irrotational and solenoidal vector fields. Fourier transforms: Fourier sine and Fourier cosine transforms and integrals . (7)

SECTION- B

Unit IV : Complex Analysis: - Functions of complex variables, Analytic function, CauchyReimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method. Conformal Mappings: Translation, Rotation, Magnification, Inversion and Bilinear Transformation, expansion of function in Taylor's and Laurent's series. (7)

Unit V : Numerical Methods: Solution of Nonlinear and Polynomial Equations : False Position, Newton Raphson Method. Solution of Linear Systems Equations: Gauss Elimination method, Gauss Seidel Iterative Method, Relaxation method Solution of Differential Equations: Euler's method, Runge-Kutta method, Picards method. (7)

Unit VI : (a) Difference Equation:- solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.
(**b) Partial differential equation of first order of following form-** (i) f (p, q) = 0; (ii) f (p, q, z)=0; (iii) f(x, p) = g (y, q); (iv) Pp + Qq =R (Lagrange's Form); (v) Z=px+qy+f(p, q) (Clairaut form) (7)

Text Books:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar. Poona Vidhyarthi Publisher
2. Higher Engineering Mathematics by B.S.Grewal. Khanna Publishers
3. Introduction to method of Numerical Analysis- S. S. Shastry, Second Edition, PHI Pvt. Ltd.,New Delhi.

References:

1. A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
2. Advancing Engg. Mathematics, E.K.Kreyzig, John Wiley
3. Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

3ETC02 - Electronic Devices & circuits Max. Marks: 80

Course Requisite:

1. Engineering Physics

Course Objectives:

1. To understand detail analysis of Electronic devices.
2. To understand use of electronic devices for various applications in Electronic circuits.
3. To analyze various electronic circuits.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Comprehend the knowledge of diode and its applications in rectifier and regulator circuits.
2. Understand basics of BJT, JFET, MOSFET, UJT and their operational parameters.
3. Understand feedback concept, topologies and their applications.
4. Implement and analyze various electronic circuits.

	Subject: Electronic Devices & circuits	L
Unit-1	**PN junction diode:** Formation of p-n junction, biasing the diode, current equation and V-I characteristics of diode, static and dynamic resistance, Analysis of Half Wave Rectifier (HWR), Full Wave Rectifier (FWR), introduction to filters C, L,LC and CLC filters, working of diode as a Switch, Zener diode and its application as voltage regulator.	06
Unit-2	**Waveshaping:** Analysis of RC low pass, and high pass filters for Sinusoidal, Step, Pulse, Square signal, analysis of clipping and clamping circuits using diodes.	06
Unit-3	**Bipolar Junction Transistors:** Operation of PNP and NPN transistor, CB, CE and CC configurations with characteristics and parameters, transistor as a switch, Transistor switching times, dc load line, transistor biasing methods, bias stability, Introduction to voltage divider biased CE amplifiers using h-parameter model.	06
Unit-4	**Feedback amplifiers**: Feedback concept, effects of negative feedback, basic feedback topologies **Sinusoidal oscillators**: Barkhausen's criteria, Hartley, Colpitts, RC Phase shift, Wein bridge and crystal oscillators.	06
Unit-5	**Multistage Amplifiers**: Need of multistage, direct coupled amplifier, RC coupled amplifier, transformer coupled amplifier, emitter follower, Darlington emitter follower, bootstrapping principle (analysis not expected).	06
Unit-6	**JFET:** Theory, construction and characteristics: parameters (μ, gm & rd) **MOSFET**: Theory, construction and characteristics of enhancement & depletion type MOSFET. **UJT:** Theory, construction and characteristics; UJT as relaxation oscillator.	06
	Total	**36**

Text Books:

1. David Bell: Electronic Devices and Circuits, Oxford University Press, 2010.
2. Milliman and Halkias: Integrated Electronics, Tata McGraw Hill, New Delhi.

References:

1. Robert L.Boylestad, "Electronic Devices and Circuit theory", Publ. Pearson Education.
2. Floyd, "Electron Devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.

3ETC06 - ELECTRONIC DEVICES AND CIRCUITS - LAB

Course Requisite:

1. Engineering Physics
2. 3ETC02 Electronic Devices and Circuits

Course Objectives:

1. To verify characteristics of various semiconductor devices.
2. To determine and verify various performance parameters of electronic devices and circuits.
3. To provide basic experimental exposure about operation and applications of electronic devices.

Course Outcomes:

1. Acquiring basics of parameters and operation of various semiconductor devices.
2. Implementation of basic circuits using electronic devices.
3. Verification and analysis of performance of electronic circuits.

List of Experiments :

Experiment No.	Aim of Experiment
Expt - 1	To verify V-I characteristics of p-n junction diode and obtain static and dynamic resistance values.
Expt – 2	To calculate efficiency and ripple factor of Half wave, Full wave and Bridge wave rectifier.
Expt - 3	To study different types of filter circuits and calculate its ripple factor for C-filter.
Expt - 4	To study Zener diode as a voltage regulator.
Expt – 5	To observe the response of RC Low pass circuit for a square wave input for different time Constant i) RC >>T ii) RC = T iii) RC <<T.
Expt - 6	To observe the response of RC High pass circuit for a square wave input for different time Constants i) RC>>T ii) RC = T iii) RC<<T.
Expt – 7	To obtain output characteristics of the clipping circuits for different reference voltages and to verify the responses.
Expt – 8	To study and observe the performance of various clamper circuit.
Expt – 9	To verify characteristics of CE mode of BJT and compute its parameters such as gain(β),input and output Impedance.
Expt – 10	To compare calculate and observe frequency response of oscillations of 3 stage RC phase shift oscillator.
Expt - 11	To compare calculate and observe frequency response of oscillations of RC Wein Bridge oscillator.
Expt – 12	To plot frequency response of RC coupled amplifier and determine its bandwidth.
Expt – 13	To plot frequency response of Transformer coupled amplifier and determine its Bandwidth.
Expt – 14	To sketch the drain and transfer characteristics of n-channel JFET and determine ac drain resistance, trans-conductance and amplification factor
Expt – 15	To sketch V-I characteristics of UJT and determine Intrinsic stand-off ratio
Expt – 16	To analyze the response of Rectifier, Amplifier, Oscillator, using simulation software.

* Minimum 08 experiments should be conducted out of above enlisted.

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3ETC03 - DIGITAL SYSTEM DESIGN Max. Marks: 80

Course Requisite:

1. Engineering Physics

Course Objectives:

1. To study basic concepts of Boolean algebra, number systems and codes.
2. To study techniques of minimization of Boolean expression.
3. To study the formal procedures for the analysis and design of combinational circuits.
4. To study the formal procedures for the analysis and design of sequential circuits.
5. To learn digital logic families, Programmable logic Devices.
6. To learn the semiconductor memories and mapping.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Use Boolean algebra to solve logic functions, minimization techniques, number systems and its conversion, arithmetic functions.
2. Identify, analyze and design combinational and sequential circuits.
3. Understand digital logic families and their characteristics.
4. Use the knowledge of semiconductor memories and mapping of memories, programmable logic devices in digital design.

	Subject: DIGITAL SYSTEM DESIGN	L
Unit-1	**Number systems and codes:-** Number system and their conversions, BCD codes, Octal codes, Hexadecimal codes, Excess-3 code, Gray Code, Arithmetic Operations using 1's complement and 2's complement Introduction, Basic Digital Circuits: AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR.	06
Unit-2	**Logic gates, Boolean Algebra and Minimization Techniques:-** Boolean Algebra, Demorgans Theorem, Simplifications using Boolean Algebra , SOP and POS form, K-map representation and minimization of logical functions upto 4 variables, don't care conditions, Quine McCluskey method.	06
Unit-3	**Combinational logic design using 74XX/54XX MSI chip:-** Adders, Subtractors, 4-bit parallel adder, look ahead carry BCD adder, MUX, DEMUX, Decoders, Encoders, Code Converters, Comparators, Parity Generator/Checker, BCD to 7 segment decoder, combinational logic design using ROM, PLA, PAL.	06
Unit-4	**Flip-flops, Registers and Counters:-** S-R, J-K, Master slave J-K, D-type, T-type. Shift Registers: Mode of operations of shift registers, Universal Shift Register. Counters: Asynchronous and Synchronous counter, up/down counter, MOD-N counter, Ring counter, Johnson counter, Frequency Division Counter.	06
Unit-5	**Logic families and Memories:-** TTL NAND gate, specification noise margin, propagation delay, fan-in, fan-out, tri-state TTL, ECL, CMOS. Semiconductor Memories: - RAM, ROM, EPROM, EEPROM, SRAM, DRAM.	06
Unit-6	**Analysis of Clocked Sequential Networks**:- Moore and Mealy Machine, State table, State Assignment, State Reduction, State Transition diagram, Sequence Generator, Sequence Detector.	06
	Total	**36**

Text Books:

1. M.Morris Mano and M.D.Ciletti, "Digital Design", Pearson Education.
2. R P Jain, "Modern Digital Electronics", TMH.

Reference Books:

1. Wakerly, "Digital Design: Principles and Practices", 3rd edition, Pearson Education, 2004.
2. Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico Publication
3. Lee S.C, "Digital Circuits and Logic Design", PHI
4. Richard S. Sandige, "Modern Digital Design", McGraw-Hill Series in Electrical Engineering.

3ETC07 - DIGITAL SYSTEM DESIGN - Lab

Course Requisite:

1. Engineering Physics lab

Course Objectives:

1. To impart the concepts of digital electronics.
2. To provide students basic experimental experiences in the operation of various digital logic Families.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.
5. To learn Semiconductor memories and mapping.

Course Outcomes:

After successfully completion of the lab course the students will be able to:

1. Apply practically the concepts of digital electronics.
2. Explain the operation and characteristics of various digital logic families.
3. Understand the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits.
6. Design and mapping of various types of memories.

Expt. No.	Experiment List
Expt-1	To study and verify the operation of various digital logic families.
Expt -2	To study and verify the operation of logic gates.
Expt -3	Design and implementation of Adders and Subtractors using logic gates.
Expt -4	Design and implementation of code converters using logic gates.
Expt -5	Design and implementation of multiplexer using logic gates and IC.
Expt -6	Design and implementation of demultiplexer using logic gates and IC.
Expt -7	Design and implementation of code converters using logic gates.
Expt -8	Design and implementation of Magnitude Comparator using logic gates and IC.
Expt -9	Design and implementation of odd/even parity checker /generator using IC.
Expt -10	Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.
Expt -11	Construction and verification of ripple counters.
Expt -12	Design and implementation of 3-bit synchronous up/down counter

* Minimum 08 experiments should be conducted out of above enlisted.

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3ETC04 - ELECTROMAGNETIC WAVES Max. Marks: 80

Course Requisite:

1. Engineering Mathematics-I
2. Engineering Mathematics-II
3. Engineering Mathematics-III

Course Objectives:

The objectives of the course are,

1. To introduce basic mathematical concept of coordinate system and vector integrals.
2. To impart knowledge of the basic concepts of electric fields.
3. To impart knowledge of the basic concepts of magnetic fields.
4. To understand the Maxwell's Equations for Electric & Magnetic Field, Boundary conditions and their interpretation.
5. To introduce concept of propagation of electromagnetic waves in free space, conductors and dielectrics.
6. To understand, analyze and evaluate the radiation of electromagnetic wave from theoretical and practical antennas.

Course Outcomes:

At the end of this course students will demonstrate the ability to :

1. Understand the coordinate systems and vector integrals.
2. Evaluate Electric Field Intensity for different charge distributions.
3. Evaluate Magnetic Field Intensity due to current carrying conductors.
4. Understand scientifically about Maxwell's equations & Boundary conditions.
5. Characterize uniform plane wave & can calculate reflection and transmission coefficient of waves at media interface.
6. Understand principle of radiation and radiation characteristics of theoretical & practical antennas.

	Subject: Electromagnetic Waves	L
Unit-1	**Introduction to Vector analysis:** Coordinate systems, Basics of Vectors: Vector products, Projection of vectors, Gradient, Divergence & Curl, Vector integrals, Divergence Theorem & Stokes Theorem.	06
Unit-2	**Electrostatics:** Introduction to Coulomb's law &Electric Field Intensity, Evaluation of Electric Field Intensity due to point charge, line charge & surface charge distribution. Introduction to Electric Flux, Electric Flux Density, Electrostatic potential, Potential gradient &Electric dipole.	06
Unit-3	**Magnetostatics:** Introduction to Biot Savart's law, Ampere's circuital law, Magnetic Field Intensity (without numericals), Evaluation of Magnetic Field intensity due to infinite, finite & circular current carrying conductors. Introduction to Magnetic Flux, Magnetic Flux Density, Magnetic dipole.	06
Unit-4	**Maxwell Equations & Boundary Conditions:** Derivation of Maxwell's Equations for Electric & Magnetic Field (without numericals). Boundary condition at dielectric-dielectric interface, dielectric-conductor interface &Boundary conditions for magnetic materials interface.	06
Unit-5	**Electromagnetic Wave Propagation:** Uniform plane wave, Propagation of wave, Formulation of wave equation in free space, dielectric &conducting medium, Skin depth, Poynting Theorem, Reflection and refraction of electromagnetic waves with normal incidence at dielectric interface.	06
Unit-6	**Radiation:** Scalar & Vector magnetic potential, Retarded Potential, Radiation of Electromagnetic wave from the Hertzian Dipole ,Quarter wave Monopole and Half-wave Dipole antennas.	06
	Total	**36**

Text Books:

1. William H.Hayt,Jr and John A.Buck., "Engineering Electromagnetics", Tata McGraw-Hill Publishing Ltd.
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India

Reference Books :

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, 2005
2. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997. 4. David Cheng, Electromagnetics, Prentice Hall Course

3ETC05: OBJECT ORIENTED PROGRAMMING Max. Marks: 80

Course Requisite:

4. Computer Programming

Course Objectives:

1. To learn object-oriented concepts and build simple applications using C++ and Java.
2. To understand the basic concepts and techniques which form the object-oriented programming paradigm

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Justify the basic concepts of object-oriented programming such as data types, functions, classes, objects, constructors, inheritance, overloading etc.
2. Design, implement, test, and debug simple programs in C++.
3. Describe how the class mechanism supports encapsulation and information hiding.
4. To know the concept of operator overloading
5. Understand inheritance in C++
6. Design and test the implementation of Java programming concepts

	Subject: OBJECT ORIENTED PROGRAMMING	L
Unit-1	Principles of object-oriented Programming: OOP'S paradigm, basic concept of OOP'S, benefits of OOP'S, Four pillars of OOP, structure of C++ programming, basic data types.	06
Unit-2	User defined data type, derived data type, Abstract data types in C++, operators and control statement, Functionsin C++: Functions, Function over loading, Friend Functions and virtual functions.	06
Unit-3	Classes and objects in C++: Types of classes and its use, concept of object and its implementation, constructor and destructors.	06
Unit-4	Operator and their definition, overloading unary and binary operator, rules for overloading operators, overloading binary operators using friends and string manipulation.	06
Unit-5	Inheritance in C++: Extending classes: Multilevel Inheritance, Multiple inheritances, Hierarchical inheritance, Hybrid inheritance, Virtual base classes and Abstract classes.	06
Unit-6	Introduction to Java programming, JVM, Java programming constructs: variables, primitive data types, identifier, literals, operators, expressions, primitive type conversion and casting, Basics of classes, objects, creating objects, and methods in Java.	06
	Total	**36**

Text Books:

1. E Balagurusamy, "Object Oriented Programming Using C++ and JAVA", Tata McGraw-Hill.
2. E Balagurusamy, "Object Oriented Programming Using C++" ,Tata McGraw-Hill.

Reference Books :

1. Bjarne Stroustrup, "C++ Programming Language", Pearson Education.
2. H.M.Dietel and P.J.Dietel, "Java How to Program" Pearson Education/PHI, Sixth Edition.
3. Robert Lafore, "Object-Oriented Programming in C++ ", Pearson Education India, (4th Edition).
4. Herbert Schildt , "Java : The Complete Reference" Tata McGraw-Hill (7th Edition).
5. Yeshwant Kanetkar "Let us C++", BPB Publications.
6. Dr. N.B. Vekateswarlu, Dr. E.V. Prasad, "Learn Object Oriented Programming Using Java: An UML Based", S. Chand Publication.

3ETC08 : OBJECT ORIENTED PROGRAMMING -LAB.

Course Requisite:

1. Computer Programming
2. 3ETC05 Object Oriented Programming

Course Objectives:

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Design and test the implementation of C++ programming concepts.
3. Design and test the implementation of java programming concepts.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Justify the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism.
2. Design, implement, test, and debug simple programs in an object-oriented programming language.
3. Describe how the class mechanism supports encapsulation and information hiding.
4. Design and test the implementation of C++ and java programming concepts.

List of Experiments :

Experiment No.	Aim of Experiment
Expt - 1	Write a C++ program to swap two variables a) Using third variable b) Without using third variable.
Expt – 2	Write a program in C++ to print the area and perimeter of a rectangle.
Expt - 3	Write a C++ program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
Expt - 4	Develop programs to implement the concepts of classes and object, accessing members: e.g. a. Design an EMPLOYEE class to contain Data members: Employee_Number, Employee_Name, Basic_Salary, All_Allowances, IT, Net_Salary. Member functions: to read the data of an employee, to calculate Net_Salary and to print the values of all the data members.
Expt – 5	Write a program in C++ to implement parameterized constructor and copy constructor.
Expt - 6	Write a C++ program to implement function overloading.
Expt – 7	Write a program in C++ illustrating the use of virtual functions in a class.
Expt – 8	Write a C++ program to overload unary operator for inverting the value of data variable using member function.
Expt – 9	Write a program in C++ to demonstrate multiple inheritances.
Expt – 10	Write a program in C++ to demonstrate multilevel inheritance.
Expt - 11	Write a program in C++ to implement virtual base class.
Expt – 12	Write a java program to Calculate Circle Area.
Expt – 13	Write a program in Java that reads a number in meters, converts it to feet, and displays the result.

* Minimum 08 experiments should be conducted out of above enlisted.

Semester - IV

4ETC02 - ANALOG CIRCUITS Max. Marks: 80

Course Requisite:

1. (3ETC02) Electronic Devices and Circuits

Course Objectives:

1. To understand the basics and internal structure of Op-Amp.
2. To analyze and design linear and non-linear applications of Op-Amp.
3. To understand and design concepts of voltage regulators.
4. To study and synthesize the waveform generators using IC 555 and IC 565.
5. To demonstrate applications of Op-Amp in temperature monitoring.

Course Outcomes:

After successfully completing the course, the students will be able to

1. Perform evaluation of the switching behavior of semiconductor devices.
2. Comprehend the knowledge of basic concepts and performance parameters of Op-Amp.
3. Use Op-Amp for implementation of linear and non-linear applications.
4. Comprehend the knowledge of PLL, its applications and data converters.

	Subject: Analog Circuits	L
Unit-1	**Operational amplifier** Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, frequency response, study of ICuA741, Op-Amp parameters, Inverting and non inverting amplifiers	06
Unit-2	**Linear applications of Op-Amp:** Theory & Design of scaling, summing, differential amplifier, integrator and differentiator, sinusoidal RC oscillators: RC-phase shift, Wein bridge oscillator using IC 741.	06

Unit-3	**Non Linear Applications of Op-Amp:** Theory & Design of Op-amp IC 741 based comparator, zero-crossing detector, window detectors, Schmitt trigger, astable multivibrator as square and triangular wave generator, monostable multivibrator	06
Unit-4	Design of Voltage regulators using IC 723 and LM 317, Design of instrumentation amplifier, bridge amplifier, temperature Controller/indicator using RTD.	06
Unit-5	Introduction to IC 555, IC 555 based design of Astable, Monostable multivibrator and their applications, A to D converters: Successive approximation & Dual Scope, D to A converters : Weighted Register & R-2R Ladder.	06
Unit-6	PLL: Operation of phase lock loop system, transfer characteristics, lock range and capture range, study of PLL IC LM 565 and its applications as AM detector, FM detector, Design of Butterworth first and second order low pass, high pass, all pass filter, design of notch filter.	06
	Total	**36**

Text Books:

1. R.A. Gayakwad, “OP-AMP and Linear Integrated Circuits”, Prentice Hall/ Pearson Education Publications.
2. K R Botkar “Integrated Circuits” Khanna Publications.
3. Sergio Franco, “Design with Linear Integrated Circuits & Op-Amps”,TMH Publications.

References:

1. Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley Intl. Publication.
2. Paul Horowitz, W. Hill, “The art of Electronics”, Cambridge Publications.

4ETC07 – ANALOG CIRCUITS LAB

Course Requisite:

1. (3ET3) Electronic Devices and Circuits.
2. (4ETC02) Analog Circuits

Course Objectives:

1. To verify operation of various wave shaping circuits.
2. To demonstrate linear and non-linear applications of Op-Amp.
3. To analyze multivibrator circuits using BJT and Op-Amp.
4. To understand functions and characteristics of PLL.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Implement wave shaping circuits using passive components, diode and BJT and perform their analysis.
2. Demonstrate linear and non-linear applications of Op-Amp.
3. Implement PLL in certain applications.

List of Experiments :

Experiment No.	Aim of Experiment
Expt - 1	To verify Op-Amp IC 741 as an inverting and non- inverting amplifier with a specific gain value.
Expt – 2	To demonstrate integrator and differentiator circuit using Op-Amp IC 741.
Expt - 3	To verify RC- phase shift oscillator using Op-Amp IC 741.
Expt - 4	To verify Op-Amp IC 741 as a Schmitt trigger and calculate the hysteresis voltage.
Expt – 5	To verify operation of astable multivibrator using Op-Amp IC 741.
Expt - 6	To plot frequency response of first order Butterworth LPF for a specific pass-band gain and cut-off frequency.

Expt – 7 To verify characteristics of PLL.

Expt – 8 Application of PLL as AM detector/FM detector/frequency translator (Any one application)

Expt – 9 Design transistorized series voltage regulator

Expt – 10 Design a low voltage variable regulator to 7 V using IC 723.

Expt - 11 Design of summing amplifier using IC 741.

Expt – 12 Design of Schmitt trigger.

Expt – 13 Design of integrator and differentiator.

Expt – 14 Design of sinusoidal RC phase shift oscillator.

Expt – 15 Design and setup a Wien-bridge oscillator.

Expt – 16 Design the square and triangular wave generator using IC 741.

Expt – 17 Design a Butterworth high pass filter with specifications.

* Minimum 08 experiments should be conducted out of above enlisted.

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4ETC03 - NETWORK THEORY Max. Marks: 80

Course Requisite:

1. Electrical Engineering.
2. Engineering Mathematics.

Course Objectives:

1. To understand fundamental concepts of Node and Mesh analysis for linear circuits.
2. To study Network Theorems for circuit analysis.
3. To study Graph Theory for network analysis.
4. To apply Laplace Transform Technique for analysis of linear circuits.
5. To study Two Port Network parameters.
6. To study Network Functions.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Analyze electrical circuits using Mesh and Node analysis.
2. Apply suitable Network Theorem to analyze electrical circuits.
3. Draw oriented Graph of the network to determine their currents and voltages.
4. To implement the concept of Laplace Transform for electrical circuit analysis.
5. To apply Two-Port network theory for electrical network analysis.
6. To evaluate different Network Functions.

	NETWORK THEORY	L
Unit-1	**Node and Mesh analysis**: Circuit components, assumptions for circuit analysis, Sources of electrical energy, Source transformation, Kirchoff's laws, Node and Mesh analysis, Matrix approach of network containing voltage and current sources and reactances, Network equations for RLC networks.	08
Unit-2	**Network Theorems**: Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Compensation theorem, Tellegen's theorem as applied to AC cicuits.	08
Unit-3	**Graph theory and network equations**: Graph of a network, Trees, cotrees and loops, Incidence matrix, Tie set and Cut set of a network, Analysis of a network using Tie set and Cut set matrix, Network equilibrium equations (without magnetic coupling), Duality.	08

Unit-4	**Network Analysis using Laplace Transform**: Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL and RLC networks with and without initial conditions. Initial and Final value theorems.	08
Unit-5	**Two port networks**: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Inverse transmission parameters, Hybrid and Inverse hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interconnection of two port networks.	08
Unit-6	**Network functions**: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function, Application of network analysis in deriving functions, Time domain behaviour from pole-zero plot, driving point and transfer impedance functions of LC networks.	08
	Total	**48**

Text Book: D. Roy Choudhary, "Networks and Systems", New Age International.

Reference Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall,3rd Edition.
2. Sudhakar A., Shyammohan S. P. “Circuits and Network” ; Tata McGraw-Hill New Delhi, 1994
3. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill education private Limited, New Delhi.
4. Abhijit Chakrabarti, “Circuit theory, Analysis and Synthesis”,Dhanpat Rai and Co. Pub.

4ETC08 - NETWORK THEORY - LAB

Course Objectives:

1. To apply knowledge of Mesh and Node analysis for a given network.
2. To learn various network theorems and apply them to solve networks.
3. To apply knowledge of Two Port network and Network Functions to analyze given network.

Course Outcomes:

After successfully completion of the lab course the students will be able to:

1. To apply knowledge of Mesh and Node analysis for a given network.
2. To apply various network theorems to solve networks.
3. To apply knowledge of Two Port network and Network Functions to analyze given network.

Expt. No.	Experiment List
Expt-1	To verify Node Analysis for electric circuit.
Expt -2	To verify Mesh Analysis for electric circuit.
Expt -3	To verify Superposition theorem for a given network.
Expt -4	To verify Thevenin’s theorem for a given network.
Expt -5	To verify Norton’s theorem for a given network.
Expt -6	To verify Reciprocity theorem for a given network.
Expt -7	To verify Maximum Power Transfer theorem for a given network.
Expt -8	To determine and verify open circuit (Z) Impedance parameters of a given Two Port network.
Expt -9	To determine and verify short circuit (Y) Admittance parameters of a given Two Port network.
Expt -10	To determine and verify Transmission (ABCD) parameters of a given Two Port network.
Expt -11	To determine and verify Hybrid (h) parameters of a given Two Port network.
Expt -12	To find the driving point Impedance for a given network.
Expt -13	To find the Voltage Transfer Ratio for a given network.
Expt -14	To study RLC series circuit using any simulation Tool.
Expt -15	To study RLC parallel circuit using any simulation Tool.

- Minimum 08 experiments should be conducted out of above enlisted.

4ETC04 – SIGNALS AND SYSTEMS Max. Marks: 80

Course Requisite: Engineering Mathematics-III

Course Objectives:

1. Understand the fundamental characteristics of signals and systems.
2. Understand signals and systems in terms of both the time and transform domains.
3. Develop the mathematical skills to solve problems involving convolution and sampling.

Course Outcomes:

After successfully completing the course, students will be able to

1. Understand the continuous time signals and systems mathematically and their classification along with the mathematical operations that can be performed on them.
2. Understand the spectral characteristics of continuous-time periodic signals using Fourier series.
3. Analyze the spectral characteristics of continuous-time aperiodic signals and systems using Fourier Transform.
4. Apply the Laplace transform for analysis of continuous-time systems.
5. Understand the Discrete Time signals and systems mathematically and understand their classification along with the mathematical operations that can be performed on them.
6. Analyze the spectral characteristics of Discrete Time signals and systems using Discrete Time Fourier Transform.

	Subject: Signals and Systems.	L
Unit-1	**Continuous time signals and systems**: Signal Classification, Energy and Power Signal, Signal Operations, Signal models, Even and Odd functions, convolution, System Classification	06
Unit-2	**Continuous-Time Signal Analysis -The Fourier Series:** Periodic Signal Representation by Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Gibbs Phenomenon, Exponential Fourier Series, Magnitude and phase plots of Fourier coefficients.	06
Unit-3	**Continuous-Time Signal Analysis-The Fourier Transform:** Aperiodic Signal Representation by Fourier Integral, Properties of Fourier Transform, Signal Transmission Through LTIC Systems, Signal energy, Inverse Fourier Transform, plotting Fourier Spectrum.	06
Unit-4	**Continuous-Time System Analysis Using Laplace Transform**: Laplace Transform, Region of convergence, Inverse Laplace transforms Application of Laplace transform for determination of solution of differential equation and System realization up to second order, Frequency response of LTIC system.	06
Unit-5	**Time-Domain Analysis of Discrete-Time Signals & Systems:** Signal Operations, Classification of Discrete-Time Systems, Discrete-Time System Equations, System response to Internal condition, Unit Impulse Response, System response to External Input, Classical Solution of Linear Difference Equations.**Sampling and Reconstruction:** Sampling theorem, signal reconstruction spectral.	06
Unit-6	**Fourier Analysis of Discrete-Time Signals:** Discrete-Time Fourier Series (DTFS), Aperiodic Signal Representation by Fourier Integral, Properties of DTFT, Relationship between DTFT & CTFT.	06
	Total	**36**

Text Books:

1. Lathi B. P., “Principles of Linear Systems and Signals” Second Edition (International Version) Oxford University Press.
2. Alan V. Oppenheim & Alan S. Willsky with S. Hamid Nawab, “Signals & Systems” PHI Publication, Second Edition.

Reference Books:

1. Ambardar A., “Analog And Digital Signal Processing”, Thomson Learning-2005.
2. Simon Haykin, Barry Van Veen, “Signals & Systems”, IInd Edition, Wiley Pub.
3. Michael J. Roberts, “Signals and Systems Analysis Using Transform Methods and MATLAB”, Mc Hill Publication.

4ETC09 – SIGNALS AND SYSTEMS - LAB

Course Requisite:

4ETC04 Signals & Systems.

Course Objectives:

1. To use software to visualize analysis of Signals and System.
2. To manipulate the time signals and identify the type of given system.

Course Outcomes:

1. After successful completion of this course, students will be able to
2. Generate different plots and explore results to draw valid conclusions and inferences in Signal Processing.
3. Enable on how to approach for requirement of signal processing and system design using simulation tools.
4. Familiarize with the concepts of sampling.

List of Experiments :

Experiment No.	Aim of Experiment
Expt - 1	Study of Signal Processing Functions used in MATLAB/SCILAB.
Expt – 2	Program to generate standard continuous Time Signals.
Expt - 3	Program to generate standard discrete Time Signals.
Expt - 4	Program to perform basic operations on Signals.
Expt – 5	Program to find Even And Odd parts of a signal.
Expt - 6	Program to check Periodicity of signals.
Expt – 7	Program to find the Energy and Power of a Signal.
Expt – 8	Program to identify a given system as linear/ non-linear, time variance/ invariance property of a given system.
Expt – 9	Program to demonstrate the time domain sampling of band limited signals (Nyquist theorem).
Expt – 10	Program to find Fourier transform of given signal.
Expt - 11	Implement system equation using Simulnk/Xcos to find output of system for different input signals.
Expt – 12	Find unit step response of system described by transfer function using Simulink/Xcos.

* Minimum 08 experiments should be conducted out of above enlisted.

4ETC05 – VALUES & ETHICS (HS) Max. Marks: 80

Course Requisite:

Course Objectives:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society, and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes:

By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship, and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

	Subject: Values & Ethics	L
Unit-1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education** Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validations the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	06
Unit-2	**Understanding Harmony in the Human Being - Harmony in Myself** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity.	06
Unit-3	**Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship Incorporating Universal Human Values in Technical Education (An AICTE Initiative), Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.	06
Unit-4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature, Interconnectedness, and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.	06
Unit-5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct , Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a) Ability to utilize the professional competence for augmenting universal human order b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c) Ability to identify and develop appropriate technologies and management patterns for above production systems.	06
Unit-6	Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations. (6 Hrs) Note: Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.	06
	Total	**36**

Text Books and Teachers Manual :

1. A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Asthana, G.P. Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Asthana, G.P. Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

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B.E. COMPUTER SCIENCE & ENGG. SEM. III & IV

Syllabus of B.E. Sem. III (Computer Science & Engineering)

3 KS01/3IT01/3KE01 ENGINEERING MATHEMATICS-III

Course Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Apply Laplace transform to find solution of linear differential equations. And solve problems related to Fourier Transform
- Compute and interpret the correlation coefficient.
- Compute the Analytic function and Complex Analysis.
- Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and linear differential equations .
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Demonstrate the basic concepts of probability and statistics.
5. Apply the knowledge of Complex Analysis.
6. Apply the knowledge of vector calculus to solve physical problems.

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding commplementary function, the inverse operator, Rules for finding the particular integral, Method of variation of parameters, Cauchy's and Legendre's linear differential equations. (7)

UNIT-II: **Laplace Transform:-** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function . (7)

UNIT-III: **a) Applications of Laplace Transform:-** Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method

b) Fourier Transform:- Definition, standard forms, Fourier transforms, properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals, inverse Fourier transforms.(7)

SECTION-B

UNIT-IV: **a) Partial differential equation** of first order of following form:- (i)f (p,q) = 0; (ii) f (p,q,z) = 0; (iii) f (x, p) = g (y,q); (iv) P p + Qq = R (Lagranges Form); (v) z = px + qy + f(p,q) (Clairauts form)

b) Statistics Curve fitting: Least Square Method, Coefficient of Correlations, Lines of Regression. (7)

UNIT-V: **Complex Analysis: -** Functions of complex variables, Analytic function, Cauchy- conditions, Harmonic function, Harmonic conjugate functions, Milne's Method, conformal mappings (translation, rotation, magnification and bilinear transformation), Expansion of function in Taylor's and Laurent's series. (7)

UNIT–VI: **Vector calculus**:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion Formulae (without proof), line, surface, volume integrals, irrotational Solenoidal Vector fields. (7)

TEXT BOOKS:

1. Elements of Applied Mathematics Vol. II by P. N. Wartikar and J.N. Wartikar,
2. Higher Engg. Mathematics by B.S. Grewal.

REFERENCE BOOKS:

1. Advancing Engg. Mathematics by E.K.Kreyzig.
2. A text book of Differential Calculus by Gorakh Prasad.
3. A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
4. Engineering Mathematics by Ravish R Singh, Mukul Bhatt.

3KS02 DISCRETE STRUCTURE AND GRAPH THEORY

Course Pre-requisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure and Graph Theory by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Perform combinatorial analysis to solve counting problems.
5. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: Foundations: Logic and Proofs (Hours: 7)

Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan's Laws, Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements; Proofs Terminology, Methods, Direct Proofs, Proof by Contraposition and Contradiction;

Unit II: Sets, Functions and Relations (Hours: 7)

Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations; Inverse Functions, Compositions and Graphs of Functions, Important Functions, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Properties of Relations, Combining Relations; n-ary Relations, Operations on n- ary Relations; Representing Relations Using Matrices; Closures, Transitive Closures

Unit III: Number Theory and Induction (Hours: 6)

Division, The Division Algorithm, Modular Arithmetic, Arithmetic Modulo m; Primes, Trial Division, Conjectures and Open Problems About Primes, GCD and LCM, The Euclidean Algorithm, gcds as Linear Combinations; Linear Congruences, The Chinese Remainder Theorem, Fermat's Little Theorem, Pseudoprimes, Primitive Roots and Discrete Logarithms, Applications: Hashing Functions, Mathematical Induction and Examples of Proofs, Mistaken Proofs, Guidelines for Proofs; Strong Induction, Examples of Proofs.

Unit IV: Algebraic Structures (Hours: 7)

Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange's Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations.

Unit V: Counting (Hours: 7)

Basic Counting Principles, Complex Counting Problems, Subtraction and Division Rule, The Pigeonhole Principle, The Generalized Pigeonhole Principle, Applications; Permutations, Combinations, Generating Permutations, Generating Combinations.

Unit VI: Graphs (Hours: 6)

Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits, Hamilton Paths and Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler's Formula, Kuratowski's Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.

Text Book: Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.
2. Norman L. Biggs: Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Seymour Lipschutz and Marc Lars Lipson: Schaum's Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum's Outlines Series, McGraw-Hill.
4. C. L. Liu and D. P. Mohapatra: Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

3KS03 OBJECT ORIENTED PROGRAMMING

Course Pre-requisite: Computer Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.
2. To use the object-oriented paradigm in program design.
3. To Provide programming insight using OOP constructs.
4. To lay a foundation for advanced programming

Course Outcomes : On completion of the course, the students will be able to

1. Apply Object Oriented approach to design software.
2. Implement programs using classes and objects.
3. Specify the forms of inheritance and use them in programs.
4. Analyze polymorphic behaviour of objects.
5. Design and develop GUI programs.
6. Develop Applets for web applications

Unit I: Introduction to Object Oriented Programming (Hours:7)

Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. Java Programming Constructs: Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, ,Flow of Control.

Unit II: Classes and Objects (Hours:7)

Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III:Inheritance, Interfaces and Packages (Hours:6)

Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, Implementing interfaces, Accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type.

Unit IV: Exception handling and Input /Output (Hours:7)

Exception: Introduction, Exception handling Techniques, User-defined exception, Exception Encapsulation and Enrichment. Input/Output: The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: Applets (Hours:7)

Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base() and get Code Base () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: Unit Title: Event Handling (Hours:6)

Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. Abstract Window Toolkit: Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Books:

1. Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.
2. Herbert Schildt: Java Complete References (McGraw Hill)

Reference Books:

1. H.M.Dietel and P.J.Dietel, “Java How to Program” Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java An Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer’s Guide to Java Certification, 3rdEdition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners, (SPD), 2010.

3KS04/3KE04 DATA STRUCTURES

Course Pre-requisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes: On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

Unit I: Introduction to Data Structures (Hours: 7)

Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms.String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit II: Array & Record Structure (Hours: 7)

Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays.Record structures and Matrices.

Unit III: Linked lists (Hours: 6)

Linked lists: Memory Representation of Linked List, traversing a linked list, searching a linked list. Memory allocation & garbage collection.Insertion & deletion operations on linked lists. Header linked lists, Two- way linked lists.

Unit IV: Stack & Queue (Hours: 7)

Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.

Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues.

Unit V: Trees (Hours: 7)

Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heap sort, Path length & Huffman's algorithm.

Unit VI: Graphs & Sorting Algorithms (Hours: 6)

Introduction to Graphs, Memory representation of graphs, Warshalls' algorithm, operations on Graphs, Breadth First Search, Depth First Search.

Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort.

Text Books:

1. Seymour Lipschutz: Data Structures, Schaum's Outline Series, McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.

3KS05 ANALOG& DIGITAL ELECTRONICS

Course Prerequisite: Basic Physics.

Course Objectives:

1. To get the introductory knowledge of PN Junction Diode, Bipolar Junction Transistor, Field Effect Transistor.
2. To understand number systems and conversion between different number systems.
3. To get basics knowledge about digital ICs and digital systems.
4. To study the design of combinational circuits and sequential circuits

Course Outcomes : At the end of course students will able to

1. Explain basic concepts of semiconductor devices and its application.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization technique to obtain minimized expression.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: PN Junction Diode and Bipolar Junction Transistor (Hours: 7)

PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics

Unit II: Field Effect Transistors (Hours: 7)
Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion_Enhancement MOSFET, Comparison of p-channel and n-channel FETs, Introduction to CMOS.

Unit III: Number System (Hours: 6)
Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, r's and (r-1)'s Complements Representation, Subtraction using 1's and 2's Complements, BCD, Gray Code, Excess 3 Code and Alpha numeric codes.

Unit IV: Minimization Techniques (Hours: 7)
Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 5 variable), Limitation of Karnaugh Map, Quine- McCluskey Minimization Technique (up to 5 variable).

Unit V: Combinational Circuits (Hours: 7)
Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Sequential Circuits (Hours: 6)
Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Books:

1. David A. Bell: "Electronic Devices and Circuits", 5e , Oxford University Press.
2. Jain R.P. "Modern Digital Electronics", 3e, TMH.

Reference Books:

1. Millman & Halkies: "Electronic Devices & Circuits", 2e, McGraw Hill.
2. Sedra& Smith: "Microelectronics Circuits", 5e, Oxford University Press.
3. Anand Kumar: "Switching Theory and Logic Design", 3e, PHI Learning Private Limited
4. Wakerly, "Digital Design: Principles and Practices", 3 e, Pearson Education, 2004.

3KS06 OBJECT ORIENTED PROGRAMMING - LAB

Course Pre-requisite: Basic Computer Programming

Course Objectives: Design, implement, test, and debug simple programs in an object-oriented programming language.

1. To develop the knowledge of object-oriented paradigm in the Java programming language.
2. To evaluate classical problems using java programming.
3. To develop software development skills using java programming for real world applications.

Course Outcomes : On completion of the course, the students will be able to

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Interpret the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
3. Build applications in Java by applying concepts like interfaces, packages and exception handling.
4. Make use of Java concepts like API, Applets, AWT.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java**.**
4. Develop a Program to study and implement Selection Statements belonging to Java**.**
5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement concept of Constructor in Java.
9. Develop a program to study and implement concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.

11. Develop a Program on various ways to accept data through keyboard(Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

3KS07 DATA STRUCTURE - LAB

Course Pre-requisite: Basics of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes : On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structure.
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find it's location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list
    (a) Traversing the linked list.
    (b) Insert a node at the front of the linked list.
    (c) Delete a last node of the linked list.
    (d) Searching a Linked list.
9. To study and implement following operations on the doubly linked list.
    (a) Insert a node at the front of the linked list.
    (b) Insert a node at the end of the linked list.
    (c) Delete a last node of the linked list.
    (d) Delete a node before specified position.
10. To study and implement following operations on the circular linked list.
    (a) Insert a node at the end of the linked list.
    (b) Insert a node before specified position.
    (c) Delete a first node of the linked list.
    (d) Delete a node after specified position.
11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.
15. To study and execute Quick sort method.
16. Understand the Tree structure and implement the Pre-order, In-order, post-order traversingoperations on it.
17. Understand the concept of Recursion and write a program to calculate factorial of a numberusing Recursion.
18. Understand the Heap sort and implement it on given data.
19. Understand the Insertion sort and implement it on given data.

20. Understand the Selection sort and implement it on given data.
21. To study and execute Merge sort method.
22. To study and execute Radix sort method.
23. Write a Program to implement the concept of BFS algorithm.
24. Write a Program to implement the concept of DFS algorithm.
25. To study and execute Josephus problem.

3KS08 ANALOG & DIGITAL ELECTRONICS - LAB

Course Pre-requisite: Students should have the knowledge of Basic Physics.

Course Objectives:

1. To impart the concepts of analog and digital electronics practically.
2. To provide students basic experimental experiences in the operation of semiconductor device and Digital ICs.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.

Course Outcomes : After successfully completing the lab, the students will be able to

1. Apply practically the concepts of analog and digital electronics.
2. Explain the operation and characteristics of semiconductor devices.
3. Illustrate the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits

List of Experiments:

This is a sample list of Experiments; **minimum 10 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2. To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3. To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4. To Sketch and Study the input and output characteristics of transistor connected in Common Collector (CC) configuration.
5. To plot static characteristics of FET & calculate its parameters g_m, r_d and μ.
6. To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
7. Study and verify the truth table of half adder and full adder using logic gates.
8. Study and verify the truth table of half subtractor and full subtractor using logic gates
9. To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
10. Implementation of 4×1 multiplexer using logic gates.
11. Implementation and verification of Demultiplexer and Encoder using logic gates.
12. Implementation of 4bit parallel adder using 7483 IC.
13. Design and verify the 4 bit synchronous counter.
14. Design and verify the 4 bit asynchronous counter.
15. Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiments beyond syllabus:

1. Design and Implementation of Op-amp as an inverting amplifier.
2. Design and Implementation of Op-amp as a non-inverting amplifier.
3. To design and find frequency of A stable multi-vibrator using IC 555.

3KS09 C SKILL - LAB - I

Course Prerequisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

Course Outcomes : On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.
14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.
23. Plotting various graphs using Python.
24. Developing basic GUI using Python.
25. Developing web applications using Django framework or Flask

Reference Books :

1. "Core Python Programming", R. NageswaraRao, dreamtech press.
2. "Python Programming A Modular Approach With Graphics, Database, Mobile and WebApplications", SheetalTaneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison-Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey , " Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff/O'Reilly Publishers
6. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India
7. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, "Data Structures and Algorithms in Python", Wiley
8. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher, Revised and Expanded version (Referred by MIT)

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SEMESTER - IV

4KS01 ARTIFICIAL INTELLIGENCE

Course Pre-requisite: Basic concepts of Data Structures, Algorithms, Programming

Course Objectives:

1. To present an overview of Artificial Intelligence (AI) principles and approaches.
2. To understand the historical evolution of Artificial Intelligence.
3. To learn various searching techniques and identify to address a particular problem).

Course Outcomes : On completion of the course, the students will be able to

1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem & efficiently solve them.
3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.

4. Apply AI techniques in applications which involve perception, reasoning and learning.
5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

Unit I: Introduction to AI (Hours: 7)

Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI,

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Problem Solving Through AI (Hours: 7)

Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems

Unit III: Uninformed Search Strategies (Hours: 6)

Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bidirectional Search, Depth Limited Search, Iterative Deepening Depth-First Search

Unit IV: Informed Search Strategies (Hours: 7)

Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis

Unit V: Adversarial Search & Games (Hours: 7)

Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms

Unit VI: Introduction to Knowledge (Hours: 6)

Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by RajendraAkerkar (PHI Learning Pvt. Ltd.)

4KS02 DATA COMMUNICATION AND NETWORKING

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To evaluate the errors using various error detection & correction techniques.
6. To understand network based protocols in data communication and networking.

Course Outcomes : On completion of the course, the students will be able to

1. Describe data communication Components, Networks, Protocols and various topology based network architecture
2. Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
4. Illustrate and realize the data link control and data link protocols.
5. Describe and demonstrate the various Local area networks and the IEEE standards.

Unit I: Introduction to Data Communication (Hours: 7)

Introduction: Data Communication, Components, Networks, Network types: Local Area Network,Wide Area Network, Switching, The Internet, Accessing the Internet, Standards and Administration: Internet Standards, Internet Administration, Network Models:TCP/IP Protocol Suite,TheOSI Model, Transmission media: Introduction, Guided media & Unguided media-Wireless. Switching: Introduction, Circuit Switched Networks, Packet Switching.

Unit II: Data link Layer (Hours: 6)

Data Link Layer: Introduction, Nodes & Links, Services , Two categories of link, Two sub-layers, Error detection and correction: Introduction, Block Coding, Cyclic codes, Checksum, Forward Error Correction, Data link control: DLC services, Data-Link Layer Protocol, HDLC, Point-To-Point Protocol, Media Access Control (MAC): Random Access, Controlled Access, Channelization.

Unit III: Network Layer (Hours: 7)

Introduction to Network layer Network Layer Services: Packetizing, Routing and Forwarding, Other Services Packet Switching: Datagram Approach: Connectionless Service, Virtual-Circuit Approach: Connection-Oriented Service , Network Layer performance: Delay, Throughput, Packet Loss, Congestion Control, IPV4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT), Forwarding of IP packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches

Unit IV: Network Layer Protocol (Hours: 7)

Network Layer Protocols: Internet Protocol (IP),Datagram Format, Fragmentation, Security of IPv4 Datagrams,ICMPV4: Messages, Debugging Tools, ICMP Checksum,Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP,Routing algorithms: Distance Vector routing, Link State Routing, IPV6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering, Transition from IPV4 to IPV6: Strategies, Use of IP Addresses

Unit V: Transport Layer (Hours: 6)

Introduction to Transport layer: Introduction, Transport-Layer Services, Connectionless and Connection-Oriented Protocols, Transport-Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggy backing, User Datagram Protocols: User Datagram, UDP Services, UDP Applications, Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP: SCTP Services, SCTP Features

Unit VI: Application layer (Hours: 7)

Introduction to Application layer: Providing Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication Using UDP, Iterative Communication Using TCP, Concurrent Communication, World wide web and HTTP: World Wide Web, Hyper-Text Transfer Protocol (HTTP) FTP: Two Connections, Control Connection, Data Connection, Security for FTP, Electronic Mail: Architecture, Web-Based Mail, E-Mail Security, Domain Name System (DNS):Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, Security of DNS, Network Management: Introduction. Configuration Management, Fault Management, Performance Management, Security Management, Accounting Management, SNMP: Managers and Agents, Management Components, ASN.1: Language Basics, Data Types, Encoding.

Text Book: Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH).

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber : Data Communication, McGraw Hill
3. J.Freey : Computer Communication & Networks, AEW Press
4. D. Corner: Computer Networks & Internet, Pearson Education.

4KS03 OPERATING SYSTEM

Course Pre-requisite: Discrete Structures, Data Structure, Any programming Language

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

Unit I: Introduction to OS (Hours: 7)
Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit II: Process Scheduling (Hours: 7)
Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization (Hours: 6)
Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management (Hours: 7)
Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: Unit Title: File System (Hours: 7)
File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery

Unit VI: Unit Title: I/O System (Hours:6)
I/O Systems : Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations , Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book : Avi Silberschatz, P.B.Galvin, G.Gagne: “Operating System Concepts” (9/e) John-Wiley & Sons.

Reference Books:

1. A.S.Tanenbaum “Modern Operating Systems” Pearson Education.
2. William Stallings “Operating Systems” Prentice-Hall.
3. D. M. Dhamdhere “Operating Systems” Tata McGraw-Hill.
4. P. Balkrishna Prasad: “Operating Systems” Scitech Publications (I) Pvt. Ltd.

4KS04 MICROPROCESSOR & ASSEMBLY LANGUAGE PROGRAMMING

Course Pre-requisite: Computer Programming and Computer Fundamentals

Course Objectives:

1. To explore 8086 microprocessor and its architecture.
2. To introduce interfacing techniques of 8086 microprocessor.
3. To introduce basics of Internet of Things

Course Outcomes : On completion of the course, the students will be able to

1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
2. Design and Test assembly language programs using 8086 microprocessor instruction set.
3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.
4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
5. Explain the basic concepts of Internet of Things

Unit I: 8086 Architecture (Hours: 7)
8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction Set (Hours: 7)
8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 Instruction Set (Hours: 6)
8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: Subroutines& Macros (Hours: 7)

The 8086 stack segment and stack related instructions. 8086 I/O Address space.Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack.Concept of recursion at assembly program level.8086 Programming using subroutines, recursion and macros.

Unit V: 8086 Interrupt (Hours: 7)

8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. 8086 microprocessor interrupt programming.

Unit VI: Internet of Things (IoT) (Hours: 6)

Internet of things: An overview, IoT conceptual framework, IoT Architectural View, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT.

Text Book:

1. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors & Peripherals, Third Edition (TMH).
2. Raj Kamal: Internet of Things, Architecture and Design Principals, McGraw Hill Education (India) Private Limited

Reference Books:

1. W. A. Triebel& Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor Architecture Programming and Interface (6/e) (PHI)

4KS05 THEORY OF COMPUTATION

Course Pre-requisite: Discrete Mathematics, Data Structures

Course Objectives:

1. To understand different automata theory and its operation.
2. To understand mathematical expressions for the formal languages
3. To study computing machines and comparing different types of computational models
4. To understand the fundamentals of problem decidability and Un-Decidability

Course Outcomes: On completion of the course, the students will be able to

1. To construct finite state machines to solve problems in computing.
2. To write regular expressions for the formal languages.
3. To construct and apply well defined rules for parsing techniques in compiler
4. To construct and analyze Push Down, Turing Machine for formal languages
5. To express the understanding of the Chomsky Hierarchy.
6. To express the understanding of the decidability and un-decidability problems.

Unit I: Finite State Machines (Hours: 8)

Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines. Minimization of Finite Automata. (Construction of Minimum Automaton)

Unit II: Regular Expression and Regular Grammar (Hours: 8)

Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden's Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs(proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

Unit III: Context Free Grammar and Languages (Hours: 8)

Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

Unit IV: Pushdown Automata (Hours: 8)

Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion , Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

Unit V: Turing Machines (Hours: 8)

Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

Unit VI: Decidability and Un-Decidability (Hours: 8)

Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, Post Correspondence Problem, Introduction to Recursive Function Theory

Text Books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation
2. Peter Linz: An Introduction to Formal Languages and Automata

Reference Books:

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra &Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013.

4KS06 DATA COMMUNICATION & NETWORKING LAB

Course Pre-requisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the working principle of various communication protocols
2. To understand and analyze the signal flow in a digital communication system.
3. To analyze error performance of a digital communication system in presence of noise and other interferences.
4. To evaluate the errors using various error detection & correction techniques.
5. To understand network based protocols in data communication and networking.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement Configure various network protocols.
3. Compare IP Address classes of networks

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study various LAN topologies and their creation using network devices, cables and computers. .
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC(Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING / Tracer and Net stat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN(TCP/IP Configuration)

4KS07 OPERATING SYSTEM - LAB

Course Pre-requisite: Basic computer programming

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study Linux Operating System along with its installation.
2. To Study and Execute basic file commands and process related open source Ubuntu commands
    a. Commands to view all executing, block and suspended process.
    b. Command to check and change the priority of process CPU utilization for executing processes.
    c. Commands to check for child process, sub-processes, process tree, abort & end process and all other basics commands related to processes
3. Write a program for multithreading using C.
4. To simulate First Come First Serve & Shortest Job First process scheduling algorithm
5. To simulate Shortest Job First process scheduling algorithm
6. To simulate Preemptive Shortest Job First process scheduling algorithm
7. To implement Round Robin Process scheduling Algorithm
8. To implement Priority Based Process scheduling Algorithm
9. To implement and analyze multi-level queue scheduling algorithm
10. To implement the following file allocation strategies.
11. To simulate paging technique of memory management.
12. To implement theFIFO page replacement policy
13. To implement the LRU page replacement policy
14. To implement the optimalpage replacement policy
15. To simulate producer-consumer problem using semaphores.
16. To implement Dining-Philosophers problem to deal with concurrency control mechanism.
17. To implement contiguous memory allocation strategies to detect fragmentation using: First Fit, Best Fit and Worst Fit.
18. To implement FCFS Disk Scheduling algorithm
19. To implement SCAN Disk Scheduling algorithm
20. To implement C-SCAN Disk Scheduling algorithm
21. To simulate Bankers algorithm for deadlock avoidance
22. To implement following memory management techniques
    Implement MVT and MFT where memory block size is 100 for 5 processes. Enter no. of blocks for each process and calculate internal fragmentation.
23. To simulate LFU page replacement algorithms
24. To simulate the Single level directory file organization techniques.
25. To Simulate bankers algorithm for Dead Lock Avoidance (Banker‘s Algorithm)

4KS08 MICROPROCESSOR & ASSEMBLY LANG. PROG. - LAB

Course Pre-requisite: Computer Programming, Number System

Course Objectives: In this lab student will learn about’ Microprocessor and Interfacing’ in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals**.**

Course Outcomes On completion of the course, the students will be able to

1. Analyze the internal workings of the microprocessor
2. Design and develop programs in Assembly Language Programming
3. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
4. Design and Test assembly language programs using 8086 microprocessor instruction set.
5. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language
6. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Installation and Introduction of TASM Assembler.
2. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
3. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
4. Write a program for multiplication of two 8-bits numbers.
5. Write a program for division of two 8-bits numbers
6. Write a program to check whether a given number is even or odd.
7. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
8. Write a program to check whether a given number is positive or negative.
9. Write a program to find greatest of two 8-bits signed &unsigned numbers.
10. Block Transfer Program
11. Write a program to find Factorial of a number using loop instruction.

12. Write a program to find cube of a given number using Subroutine.
13. Write a program to find square of a given number using Subroutine.
14. Write a program to find square of a given number using Macro.
15. Write a program to find whether the string is palindrome or not.
16. To convert BCD Number Program
17. Write a program to perform Reverse of the String
18. Write a program to transfer 10-bytes from one memory bank to another memory bank.
19. Program for sorting an array for 8086 microprocessor.
20. To write an assembly language program to arrange the given numbers in descending order.
21. Program for searching for a number/character in a string for 8086 microprocessor.

4KS09 C-SKILL-LAB II

Course Pre-requisite: Basic knowledge of scripting language, Programming language.Basic understanding of Electronic concepts.

Course Objectives: To develop an ability to design and implement static and dynamic website and to develop embedded systems with the help of Raspberry Pi/Ardino.

Course Outcomes : On completion of the course, a student will be able to

1. Develop client server program and web applications
2. Make use of project-based experience for web application development.
3. Create embedded systems using Raspberry Pi/Ardino

List of Experiments:

This is a sample list of experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to PHP and configure it to work with Apache Web Server.
2. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
3. Create your class timetable using table tag.
4. Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
5. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
6. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
7. Develop a JavaScript to display today's date.
8. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
9. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
10. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a PHP program to display a digital clock which displays the current time of the server.
12. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix.
13. Write a PHP program to sort the student records which are stored in the database using selection sort.
14. Study and Install IDE of Arduino and different types of Arduino.
15. Write program using Arduino IDE for Blink LED.
16. Write Program for RGB LED using Arduino.
17. Study the Temperature sensor and write a Program for monitor temperature using Arduino.
18. Study and Implement RFID, NFC using Arduino. • Study and implement MQTT protocol using Arduino.
19. Study and Configure Raspberry Pi.
20. WAP for LED blink using Raspberry Pi.
21. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
22. Create Smart Plugs with Arduino and Raspberry Pi.
23. Interfacing digital sensors with raspberry pi.
24. Creating a webpage to control I-O devices, Reading data from sensor and passing to web page.
25. Implement a program to access Analog sensor via wifi with HTML Web server.

SYLLABUS OF B.E. SEM. III & IV [COMPUTER ENGINEERING] (C.B.C.S.)
Semester-III

3KE02 DISCRETE MATHEMATICS

Course Prerequisite: Basic knowledge of Mathematics

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Discrete Structure and Graph Theory by being able to do each of the following:

1. Use mathematically correct terminology and notation.
2. Construct correct direct and indirect proofs.
3. Use division into cases in a proof.
4. Apply logical reasoning to solve a variety of problems.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
3. Classify algebraic structure for a given mathematical problem.
4. Perform combinatorial analysis to solve counting problems.
5. Develop the given problem as graph net works and solve with techniques of graph theory

Unit I: Foundations: Logic and Proofs

Propositions, Truth Tables, Compound Propositions, Logical Operators, Logic and Bit Operations; Logical Equivalences, De Morgan's Laws, Predicates, Quantifiers: Restricted Domains, Precedence, Logical Equivalences; Rules of Inference for Propositional Logic, Use to Build Arguments, Resolution, Combination for Propositions and Quantified Statements; Proofs Terminology, Methods, Direct Proofs, Proof by Contraposition and Contradiction. **(Hours 7)**

Unit II: Sets, Functions and Relations

Introduction, Venn Diagrams, Subsets, Size of a Set, Power Sets, Cartesian Products, Set Notation with Quantifiers, Truth Sets and Quantifiers, Set Operations; Inverse Functions, Compositions and Graphs of Functions, Important Functions, Partial Functions; Sequences, Recurrence Relations, Special Integer Sequences, Summations; Countable Sets, An Uncountable Set; Functions as Relations, Relations on a Set, Properties of Relations, Combining Relations; n-ary Relations, Operations on n- ary Relations; Representing Relations Using Matrices; Closures, Transitive Closures. **(Hours 7)**

Unit III: Number Theory and Induction

Division, The Division Algorithm, Modular Arithmetic, Arithmetic Modulo m; Primes, Trial Division, Conjectures and Open Problems About Primes, GCD and LCM, The Euclidean Algorithm, gcds as Linear Combinations; Linear Congruences, The Chinese Remainder Theorem, Fermat's Little Theorem, Pseudoprimes, Primitive Roots and Discrete Logarithms, Applications: Hashing Functions, Mathematical Induction and Examples of Proofs, Mistaken Proofs, Guidelines for Proofs; Strong Induction, Examples of Proofs. **(Hours 6)**

Unit IV: Algebraic Structures

Algebraic Systems: Examples and General Properties; Semigroups and Monoids: Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids; Groups: Definitions, Subgroups and Homomorphisms, Cosets and Lagrange's Theorem, Normal Subgroups, algebraic Systems with Two Binary Operations. **(Hours 7)**

Unit V: Counting

Basic Counting Principles, Complex Counting Problems, Subtraction and Division Rule, The Pigeonhole Principle, The Generalized Pigeonhole Principle, Applications; Permutations, Combinations, Generating Permutations, Generating Combinations. **(Hours 6)**

Unit VI: Graphs

Graph Models; Basic Terminology, Special Simple Graphs, Bipartite Graphs, Matchings, Applications of Special Types of Graphs, New Graphs from Old; Graph Representation, Adjacency and Incidence Matrices, Isomorphism of Graphs, Determining Isomorphism; Paths, Connectedness in Undirected Graphs and Directed Graphs, Paths and Isomorphism, Counting Paths Between Vertices; Euler Paths and Circuits, Hamilton Paths and Circuits, Applications of Hamilton Circuits; Planar Graphs: Euler's Formula, Kuratowski's Theorem; Graph Coloring: Introduction, Applications of Graph Colorings.

Text Book: Kenneth H. Rosen: Discrete Mathematics and Its Applications, 7th Edition, McGraw-Hill.

Reference Books:

1. J. P. Tremblay and R. Manohar: Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill Edition, McGraw-Hill.
2. Norman L. Biggs: Discrete Mathematics, 2nd Edition, Oxford University Press.
3. Seymour Lipschutz and Marc Lars Lipson: Schaum's Outline of Theory and Problems of Discrete Mathematics, 3rd Edition, Schaum's Outlines Series, McGraw-Hill.
4. C. L. Liu and D. P. Mohapatra: Elements of Discrete Mathematics: A Computer Oriented Approach, 3rd Edition, Tata McGraw-Hill, McGraw-Hill.

3KE03 PROGRAMMING METHODOLOGY

Course Prerequisite: Computer Programming

Course Objectives:

1. To explore the principles of Object Oriented Programming (OOP) such as data abstraction, encapsulation, inheritance and polymorphism.
2. To use the object-oriented paradigm in program design.
3. To Provide programming insight using OOP constructs.
4. To lay a foundation for advanced programming

Course Outcomes: On completion of the course, the students will be able to

1. Apply Object Oriented approach to design software.
2. Implement programs using classes and objects.
3. Specify the forms of inheritance and use them in programs.
4. Analyze polymorphic behaviour of objects.
5. Design and develop GUI programs.
6. Develop Applets for web applications

Unit I: Introduction to Object Oriented Programming:

Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. Java Programming Constructs: Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, ,Flow of Control. **(Hours: 7)**

Unit II: Classes and Objects:

Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments. **(Hours: 6)**

Unit III: Inheritance, Interfaces and Packages

Inheritance: Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class. Interfaces: Defining interfaces, Implementing interfaces, Accessing interface variables, Extending interfaces. Packages: Packages, java.lang package, Enum type. **(Hours: 7)**

Unit IV: Exception handling and Input / Output

Exception: Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. Input/Output: The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package. **(Hours: 7)**

Unit V: Applets

Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, getDocumentBase() and getCodeBase () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics. **(Hours: 7)**

Unit VI: Event Handling

Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. Abstract Window Toolkit: Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar. **(Hours: 6)**

Text Books:

1. SachinMalhotra and SaurabhChoudhary: Programming in Java, Oxford University Press 2010.
2. Herbert Schildt: Java Complete References (McGraw Hill)

Reference Books:

1. H.M.Dietel and P.J.Dietel, “Java How to Program” Pearson Education/PHI, Sixth Edition.
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Dr. R. NageswaraRao: Core Java An Integrated Approach (Dreamtech)
4. Khalid Mughal: A Programmer’s Guide to Java Certification, 3rdEdition (Pearson)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KE04 / 3KS04 DATA STRUCTURES

Course Prerequisite: Fundamentals of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes: On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structures
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain.

Unit I: Introduction to Data Structures

Introduction to Data structures, Data Structure Operations, Algorithmic Notation, Complexity of algorithms.String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. **(Hours: 7)**

Unit II: Array & Record Structure

Linear arrays : Memory Representation of arrays, traversing linear arrays, insertion & deletion operations, Bubble sort, Linear search and Binary search algorithms. Multi dimensional arrays, Pointer arrays.Record structures and Matrices. **(Hours: 7)**

Unit III: Linked lists

Linked lists: Memory Representation of Linked List, traversing a linked list, searching a linked list. Memory allocation & garbage collection.Insertion & deletion operations on linked lists. Header linked lists, Two- way linked lists. **(Hours: 6)**

Unit IV: Stack & Queue)

Stacks: Sequential Memory Representation of Stack, Arithmetic expressions: Polish notation. Quick sort, Recursion, Tower of Hanoi.

Queues: Sequential Memory Representation of Queue, DeQueue, Priority queues. **(Hours: 7)**

Unit V: Trees

Introduction to Trees, Binary trees, Memory Representation of Binary Tree, Traversing binary trees, Header nodes, Binary Search Tree, Heap and heapsort, Path length & Huffman's algorithm.

(Hours:7)

Unit VI: Graphs & Sorting Algorithms

Introduction to Graphs, Memory representation of graphs, Warshalls' algorithm, operations on Graphs, Breadth First Search, Depth First Search

Sorting : Insertion Sort, Selection Sort, Radix sort, Merge Sort. **(Hours: 6)**

Text Books:

1. SeymourLipschutz: Data Structures ,Schaum's Outline Series,McGraw-Hill, International Editions.
2. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.

Reference Books:

1. Ellis Horowitz, SartajSahni: Fundamentals of Data Structures, CBSPublications.
2. Data Structure Using C, Balagurusamy.
3. Standish: Data Structures in Java, Pearson Education.

3KE05 ANALOG ELECTRONICS & DIGITAL LOGIC DESIGN

Course Pre-requisite: Basic Physics.

Course Objectives:

1. To get the introductory knowledge of PN Junction Diode, Bipolar Junction Transistor, Field Effect Transistor.
2. To understand number systems and conversion between different number systems.
3. To get basics knowledge about digital ICs and digital systems.
4. To study the design of combinational circuits and sequential circuits.

Course Outcomes: At the end of course students will able to

1. Explain basic concepts of semiconductor devices and its application.
2. Compare different Number System and basics of conversion of number systems.
3. Realize different minimization technique to obtain minimized expression.
4. Design Combinational Circuits.
5. Design and Develop Sequential Circuits.

Unit I: PN Junction Diode and Bipolar Junction Transistor (Hours: 7)
PN-Junction Diode, Characteristics and Parameters, BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common- Collector Characteristics

Unit II: Field Effect Transistors (Hours: 7)
Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion_Enhancement MOSFET, Comparison of p-channel and n-channel FETs, Introduction to CMOS.

Unit III: Number System (Hours: 6)
Binary Number System, Signed and unsigned Number, Octal Number System, Hexadecimal Number System, Conversions between Number Systems, r's and (r-1)'s Complements Representation, Subtraction using 1's and 2's Complements, BCD, Gray Code, Excess 3 Code and Alpha numeric codes.

Unit IV: Minimization Techniques (Hours: 7)
Logic Gates, Boolean Algebra, Logic Operation, Axioms and Laws of Boolean Algebra, Reducing Boolean Expression, Boolean Functions and their representation, SOP Form, POS Form, Karnaugh Map (up to 5 variable), Limitation of Karnaugh Map, Quine- McCluskey Minimization Technique (up to 5 variable).

Unit V: Combinational Circuits (Hours: 7)
Introduction, Design Procedure, Adders, Subtractors, Binary Parallel Adder, 4 Bit Parallel Subtractor, Look-ahead-carry Adder, BCD adder, BCD Subtractor, Multiplexer, De-multiplexer, Decoder, Encoder, Comparator, Parity bit Generator/Checkers, Boolean Expression Implementation using these ICs.

Unit VI: Sequential Circuits (Hours: 6)
Flip-flops: S-R, J-K, Master slave J-K, D-type, T-type, Flip flop Excitation Table, Conversion of Flip Flops, Registers: SISO, SIPO, PISO, PIPO, Universal Shift Register. Counters: Asynchronous and Synchronous counter, Up/Down counter, MOD-N counter, Ring counter, Johnson counter.

Text Books:

1. David A. Bell: "Electronic Devices and Circuits", 5e , Oxford University Press.
2. Jain R.P. "Modern Digital Electronics", 3e, TMH.

Reference Books:

1. Millman & Halkies: "Electronic Devices & Circuits", 2e, McGraw Hill.
2. Sedra & Smith: "Microelectronics Circuits", 5e, Oxford University Press.
3. Anand Kumar: "Switching Theory and Logic Design", 3e, PHI Learning Private Limited
4. Wakerly, "Digital Design: Principles and Practices", 3 e, Pearson Education, 2004.

3KE06 PROGRAMMING METHODOLOGY - LAB

Course Prerequisite: Basic Computer Programming

Course Objectives: Design, implement, test, and debug simple programs in an object-oriented programming language.

1. To develop the knowledge of object-oriented paradigm in the Java programming language.
2. To evaluate classical problems using java programming.
3. To develop software development skills using java programming for real world applications.

Course Outcomes : On completion of the course, the students will be able to

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Interpret the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism
3. Build applications in Java by applying concepts like interfaces, packages and exception handling.
4. Make use of Java concepts like API, Applets, AWT.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to Object Oriented Programming and installation of JDK. Write a program to print a message "Hello World..."
2. Develop a program to explain use of Operators in java.
3. Develop a Program to study and implement Looping Statements belonging to Java**.**
4. Develop a Program to study and implement Selection Statements belonging to Java**.**
5. Develop a program to study and implement some Pyramid.
6. Develop a program to demonstrate the concept of Class, Method and Object.
7. Develop a program to study and implement the concept of Method Overloading.
8. Develop a program to study and implement concept of Constructor in Java.
9. Develop a program to study and implement concept of Constructor Overloading in Java.
10. Develop a program to study and implement the Array in Java.
11. Develop a Program on various ways to accept data through keyboard(Command Line Argument)
12. Develop a program to study and implement the concept of Inheritance.
13. Develop a program to study and implement the concept of Method Overriding.
14. Develop a program to study and implement the Abstract Class.
15. Develop a program to study and implement the concept of Interface in Java.
16. Develop a program to study and implement Exception Handling Mechanism in Java.
17. Develop a program to study and implement Java I/O.
18. Develop a program to study and implement simple Applet in java.
19. Develop a program on Applet to demonstrate Graphics, Font and Color class.
20. Develop a Program on passing parameters to applets
21. Develop a Program to create GUI application without event handling using AWT controls
22. Develop a Program to create GUI application with event handling using AWT controls
23. Develop a program on Multithreading
24. Develop a Program to create GUI application with event handling using Swing controls
25. Mini Project based on content of the syllabus. (Group of 2-3 students)

3KE07 DATA STRUCTURE - LAB

Course Prerequisite: Basics of programming Language & Logic Building Skills

Course Objectives:

1. To understand the linear and nonlinear data Structures and its memory representations.
2. To perform different operations on data structures such as insertion, deletion, searching and traversing.
3. To understand various data searching and sorting methods with its complexity.
4. To introduce various techniques for representation of the data in the real world.

Course Outcomes : On completion of the course, the students will be able to

1. Apply various linear and nonlinear data structure.
2. Demonstrate operations like insertion, deletion, searching and traversing on various data structures
3. Examine the usage of various structures in approaching the problem solution.
4. Choose appropriate data structure for specified problem domain

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write a program to find out largest number from the array and also find it's location.
2. Write a program to traverse an array and find the sum and average of data elements from an array.
3. Write a Program to a) insert an element in an array b)delete an element from an array.
4. To study and execute the Linear search method
5. To study and execute the Binary Search method
6. To study and execute the Pattern matching Algorithms(Slow and Fast)
7. To study and execute Bubble sort method.
8. To study and implement various operations on singly linked list
   (a) Traversing the linked list.
   (b) Insert a node at the front of the linked list.
   (c) Delete a last node of the linked list.
   (d) Searching a Linked list.

9. To study and implement following operations on the doubly linked list.
    (e) Insert a node at the front of the linked list.
    (f) Insert a node at the end of the linked list.
    (g) Delete a last node of the linked list.
    (h) Delete a node before specified position.
10. To study and implement following operations on the circular linked list.
    (e) Insert a node at the end of the linked list.
    (f) Insert a node before specified position.
    (g) Delete a first node of the linked list.
    (h) Delete a node after specified position.
11. Understand the stack structure and execute the push, pop operation on it.
12. Understand the Queue structure and execute the insertion, deletion operation on it.
13. Formulate and demonstrate Transforming Infix Expressions to Postfix Expression using Stack.
14. Formulate and demonstrate the Evaluation of Postfix Expression using Stack.
15. To study and execute Quick sort method.
16. Understand the Tree structure and implement the Pre-order, In-order, post-order traversing operations on it.
17. Understand the concept of Recursion and write a program to calculate factorial of a number using Recursion.
18. Understand the Heap sort and implement it on given data.
19. Understand the Insertion sort and implement it on given data.
20. Understand the Selection sort and implement it on given data.
21. To study and execute Merge sort method.
22. To study and execute Radix sort method.
23. Write a Program to implement the concept of BFS algorithm.
24. Write a Program to implement the concept of DFS algorithm.
25. To study and execute Josephus problem.

3KE08 ANALOG ELECTRONICS & DIGITAL LOGIC DESIGN - LAB

Course Prerequisite: Basic Physics.

Course Objectives:

1. To impart the concepts of analog and digital electronics practically.
2. To provide students basic experimental experiences in the operation of semiconductor device and Digital ICs.
3. To learn the operation of various logic gates and their implementation using digital IC's.
4. To learn the realization of various combinational and sequential circuits.

Course Outcomes : After successfully completing the lab, the students will be able to

1. Apply practically the concepts of analog and digital electronics.
2. Explain the operation and characteristics of semiconductor devices.
3. Illustrate the operation of various logic gates and their implementation using digital IC's.
4. Design and implement various combinational logic circuits.
5. Design and implement various sequential logic circuits

List of Experiments:

This is a sample list of Experiments; **minimum 10 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study V-I characteristics of a PN Junction diode in Forward and Reverse bias.
2. To Sketch and Study the input and output characteristics of transistor connected in Common Emitter (CE) configuration..
3. To Sketch and Study the input and output characteristics of transistor connected in Common Base (CB) configuration
4. To Sketch and Study the input and output characteristics of transistor connected in Common Collector (CC) configuration.
5. To plot static characteristics of FET & calculate its parameters g_m, r_d and μ.
6. To implement Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7410, 7411, 7420, 7427, 7432, 7486).
7. Study and verify the truth table of half adder and full adder using logic gates.
8. Study and verify the truth table of half subtractor and full subtractor using logic gates
9. To compare two 4 bits number and verify the output using 4-bit comparator IC 7485.
10. Implementation of 4×1 multiplexer using logic gates.
11. Implementation and verification of Demultiplexer and Encoder using logic gates.
12. Implementation of 4bit parallel adder using 7483 IC.

13. Design and verify the 4 bit synchronous counter.
14. Design and verify the 4 bit asynchronous counter.
15. Verification of truth table of SR, JK, T and D Flip Flops.

List of Experiment beyond syllabus:

1. Design and Implementation of Op-amp as an inverting amplifier.
2. Design and Implementation of Op-amp as a non-inverting amplifier.
3. To design and find frequency of A stable multi-vibrator using IC 555.

3KE09 C-SKILL-LAB I

Course Pre-requisite: Basic knowledge of any Programming Language

Course Objectives:

1. To be able to program design with functions using Python.
2. To understand data and information processing techniques.
3. To understand to Design a program to solve the problems.
4. To be able to access database using python programming.
5. To be able to design web applications using python programming.

Course Outcomes: On completion of the course, the students will be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Interpret different Decision Making statements, Functions, Object oriented programming in Python
3. Summarize different File handling operations
4. Explain how to design GUI Applications in Python and evaluate different database operations
5. Develop applications using Django framework or Flask

List of Experiments:

This is a sample list of experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Write python program to store data in list and then try to print them.
2. Write python program to print list of numbers using range and for loop
3. Write python program to store strings in list and then print them.
4. Write python program in which an function is defined and calling that function prints Hello World.
5. Write a python script to print the current date in the following format “Sun May 29 02:26:23 IST 2017”
6. Write a program to create, append, and remove lists in python.
7. Write a program to create, concatenate and print a string and accessing sub-string from a given string.
8. Write a program to demonstrate working with tuples in python.
9. Write a program to demonstrate working with dictionaries in python.
10. Write a python program to find largest of three numbers.
11. Write python program in which an function(with single string parameter) is defined and calling that function prints the string parameters given to function.
12. Write python program in which an class is define, then create object of that class and call simple print function define in class.
13. Write a Python script that prints prime numbers less than 20.
14. Write a python program to find factorial of a number using Recursion.
15. Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
16. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.
17. Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
18. Write a Python class to convert an integer to a roman numeral.
19. Write a Python class to implement pow(x, n)
20. Write a Python class to reverse a string word by word.
21. Accessing and working with databases using Python.
22. Create data frame from .csv files and operations on it.
23. Plotting various graphs using Python.
24. Developing basic GUI using Python.
25. Developing web applications using Django framework or Flask

Reference Books :

1. “Core Python Programming”, R. NageswaraRao, dreamtech press.
2. “Python Programming A Modular Approach With Graphics, Database, Mobile and Web Applications”, Sheetal Taneja, Naveen Kumar, Pearson.
3. Python Web Development with Django By Jeff Forcier, Paul Bissex, Wesley J Chun, Addison-Wesley Professional.
4. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning
5. Allen B. Downey , “ Think Python: How to Think Like a Computer Scientist”, Second Edition, Shroff/O’Reilly Publishers
6. John V Guttag. “Introduction to Computation and Programming Using Python”, Prentice Hall of India.

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SEMESTER IV

4KE01 ARTIFICIAL INTELLIGENCE

Course Prerequisite: Basic concepts of Data Structures, Algorithms, Programming

Course Objectives:

1. To present an overview of Artificial Intelligence (AI) principles and approaches.
2. To understand the historical evolution of Artificial Intelligence.
3. To learn various searching techniques and identify to address a particular problem).

Course Outcomes : On completion of the course, the students will be able to

1. Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
2. Formulate problems as state space search problem & efficiently solve them.
3. Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.
4. Apply AI techniques in applications which involve perception, reasoning and learning.
5. Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

Unit I: Introduction to AI (Hours: 7)

Introduction : What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Risks and Benefits of AI,

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents

Unit II: Problem Solving Through AI (Hours: 7)

Introduction, Representation the AI Problems, Production System, Algorithm of Problem Solving, Examples of AI Problems, Nature of AI Problems

Unit III: Uninformed Search Strategies (Hours: 6)

Problem-Solving Agents, Example Problems, Search Algorithms, **Uninformed Search Strategies**: Breadth-First Search, Uniform-Cost Search, Depth First Search, Bidirectional Search, Depth Limited Search, Iterative Deepening Depth-First Search

Unit IV: Informed Search Strategies (Hours: 7)

Basic Concept of Heuristic Search and Knowledge, Designing of Heuristic Function, **Heuristic Search Strategies:** Generate-And-Test, Best-First Search, Problem Reduction, Hill Climbing, Constraint Satisfaction, Means-Ends-Analysis

Unit V: Adversarial Search & Games (Hours: 7)

Game Theory, Optimal Decisions in Games, Mini-Max Search, Alpha Beta Pruning, Additional Refinements, Monte Carlo Tree Search, Stochastic Games, Partially Observable Games, Limitations of Game Search Algorithms

Unit VI: Introduction to Knowledge (Hours: 6)

Introduction, Types of Knowledge, Knowledge Representation, Knowledge Storage, Knowledge Acquisition, Knowledge Organization and Management, Basic Concepts of Knowledge Engineering

Text Books:

1. Artificial Intelligence: A Modern Approach by Stuart Russell & Peter Norvig (Pearson - 4th Ed.)
2. Artificial Intelligence by Ela Kumar (IK International Publishing House Pvt. Ltd.)

Reference Books:

1. Artificial Intelligence by Elaine Rich and Kevin Knight (Tata McGraw Hill - 3rd Ed.)
2. A First Course in Artificial Intelligence by Deepak Khemani (Tata McGraw Hill - 1st Ed.)
3. Artificial Intelligence and Expert Systems by Patterson (PHI)
4. Introduction to Artificial Intelligence by RajendraAkerkar (PHI Learning Pvt. Ltd.)

4KE02 COMPUTER NETWORKS

Course Prerequisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the building blocks of digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. To understand and analyze the signal flow in a digital communication system
4. To analyze error performance of a digital communication system in presence of noise and other interferences.
5. To evaluate the errors using various error detection & correction techniques.
6. To understand network based protocols in data communication and networking.

Course Outcomes: On completion of the course, the students will be able to

1. Describe data communication Components, Networks, Protocols and various topology based network architecture
2. Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
3. Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
4. Illustrate and realize the data link control and data link protocols.
5. Describe and demonstrate the various Local area networks and the IEEE standards.

Unit I: Introduction to Data Communication (Hours: 7)

Introduction: Data Communication, Components, Networks, Network types: Local Area Network,Wide Area Network, Switching, The Internet, Accessing the Internet, Standards and Administration: Internet Standards, Internet Administration, Network Models:TCP/IP Protocol Suite,TheOSI Model, Transmission media: Introduction, Guided media & Unguided media-Wireless. Switching: Introduction, Circuit Switched Networks, Packet Switching.

Unit II: Data link Layer (Hours: 6)

Data Link Layer: Introduction, Nodes & Links, Services , Two categories of link, Two sub-layers, Error detection and correction: Introduction, Block Coding, Cyclic codes, Checksum, Forward Error Correction, Data link control: DLC services, Data-Link Layer Protocol, HDLC, Point-To-Point Protocol, Media Access Control (MAC): Random Access, Controlled Access, Channelization.

Unit III: Network Layer (Hours: 7)

Introduction to Network layer Network Layer Services: Packetizing, Routing and Forwarding, Other Services Packet Switching: Datagram Approach: Connectionless Service, Virtual-Circuit Approach: Connection-Oriented Service , Network Layer performance: Delay, Throughput, Packet Loss, Congestion Control, IPV4 Address: Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT), Forwarding of IP packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches

Unit IV: Unit Title: Network Layer Protocol (Hours: 7)

Network Layer Protocols: Internet Protocol (IP),Datagram Format, Fragmentation, Security of IPv4 Datagrams,ICMPV4: Messages, Debugging Tools, ICMP Checksum, Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP, Routing algorithms: Distance Vector routing, Link State Routing, IPV6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering, Transition from IPV4 to IPV6: Strategies, Use of IP Addresses

Unit V: Unit Title: Transport Layer (Hours: 6)

Introduction to Transport layer: Introduction, Transport-Layer Services, Connectionless and Connection-Oriented Protocols, Transport-Layer Protocols: Simple Protocol, Stop-and-Wait Protocol, Go-Back-N Protocol (GBN), Selective-Repeat Protocol, Bidirectional Protocols: Piggybacking,User Datagram Protocols: User Datagram, UDP Services, UDP Applications,Transmission Control Protocol: TCP Services, TCP Features , Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control, TCP Congestion Control, TCP Timers, Options, SCTP: SCTP Services, SCTP Features

Unit VI: Unit Title: Application layer (Hours: 7)

Introduction to Application layer:Providing Services, Application-Layer Paradigms, Client-Server Programming: Application Programming Interface, Using Services of the Transport Layer, Iterative Communication Using UDP, Iterative Communication Using TCP, Concurrent Communication, World wide web and HTTP: World Wide Web, Hyper-Text Transfer Protocol (HTTP) FTP: Two Connections, Control Connection, Data Connection, Security for FTP, Electronic Mail: Architecture, Web-Based Mail, E-Mail Security, Domain Name System (DNS):Name Space, DNS in the Internet, Resolution, Caching, Resource Records, DNS Messages, Registrars, Security of DNS, Network Management: Introduction. Configuration Management, Fault Management, Performance Management, Security Management, Accounting Management, SNMP: Managers and Agents, Management Components, ASN.1: Language Basics, Data Types, Encoding.

Text Book: Behrouz A. Forouzan: Data Communication and Networking, (5/e) (TMH

Reference Books:

1. William Stallings: Data & Computer Communications, 6/e, Pearson Education
2. William L. Schweber : Data Communication, McGraw Hill
3. J.Freey : Computer Communication & Networks, AEW Press
4. D. Corner: Computer Networks & Internet, Pearson Education.

4KE03 OPERATING SYSTEM

Course Pre-requisite: Discrete Structures, Data Structure, Any programming Language

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

Unit I: Introduction to OS : (Hours: 7)

Introduction: Operating System definition, OS Evolution, Components and Services, Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multithreading Models, Threading Issues, Java Threads

Unit II: Process Scheduling (Hours: 7)

Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue Scheduling

Unit III: Process Synchronization (Hours: 6)

Process Synchronization Basics: The Critical-Section Problem, Synchronization Hardware, Semaphores, Monitors, Deadlocks: Definition & Characterization, Deadlocks Prevention, Avoidance, Detection and Recovery from Deadlock

Unit IV: Memory Management (Hours: 7)

Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation, Virtual Memory Management: Background, Demand paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing

Unit V: Unit Title: File System (Hours: 7)

File-System Interface; Directory Structure, File-System Mounting, File Sharing &Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management. File Recovery

Unit VI: Unit Title: I/O System (Hours : 6)

I/O Systems : Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O to Hardware Operations , Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure.

Text Book : Avi Silberschatz, P.B.Galvin, G.Gagne: “Operating System Concepts” (9/e) John-Wiley & Sons.

Reference Books:

1. A.S.Tanenbaum “Modern Operating Systems” Pearson Education.
2. William Stallings “Operating Systems” Prentice-Hall.
3. D. M. Dhamdhere “Operating Systems” Tata McGraw-Hill.
4. P. Balkrishna Prasad: “Operating Systems” Scitech Publications (I) Pvt.

4KE04 MICROPROCESSOR & INTERFACING

Course Pre-requisite: Computer Programming and Number System

Course Objectives:

1. To explore 8086 microprocessor and its architecture.
2. To introduce interfacing techniques of 8086 microprocessor.
3. To introduce basics of Internet of Things

Course Outcomes : On completion of the course, the students will be able to

1. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
2. Design and Test assembly language programs using 8086 microprocessor instruction set.
3. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language.
4. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
5. Explain the basic concepts of Internet of Things

Unit I: 8086 Architecture (Hours: 7)
8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction Set (Hours: 7)
8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 Instruction Set (Hours: 6)
8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: Subroutines& Macros (Hours: 7)
The 8086 stack segment and stack related instructions. 8086 I/O Address space.Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack.Concept of recursion at assembly program level.8086 Programming using subroutines, recursion and macros.

Unit V: 8086 Interrupt (Hours: 7)
8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. 8086 microprocessor interrupt programming.

Unit VI: Internet of Things (IoT) (Hours: 6)
Internet of things: An overview, IoT conceptual framework, IoT Architectural View, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT.

Text Books:
1. A. K. Ray & K. M. Bhurchandi: Advanced Microprocessors & Peripherals, Third Edition (TMH).
2. Raj Kamal: Internet of Things, Architecture and Design Principals, McGraw Hill Education (India) Pvt Ltd

Reference Books:
1. W. A. Triebel& Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor Architecture Programming and Interface (6/e) (PHI)

4KE05 THEORY OF COMPUTATION

Course Pre-requisite: Discrete Mathematics, Data Structures

Course Objectives:
1. To understand different automata theory and its operation.
2. To understand mathematical expressions for the formal languages
3. To study computing machines and comparing different types of computational models
4. To understand the fundamentals of problem decidability and Un-Decidability

Course Outcomes : On completion of the course, the students will be able to
1. To construct finite state machines to solve problems in computing.
2. To write regular expressions for the formal languages.
3. To construct and apply well defined rules for parsing techniques in compiler
4. To construct and analyze Push Down, Turing Machine for formal languages
5. To express the understanding of the Chomsky Hierarchy.
6. To express the understanding of the decidability and un-decidability problems.

Unit I: Finite State Machines (Hours: 8)
Alphabet, String, Formal and Natural Language, Operations, Definition and Design DFA (Deterministic Finite Automata), NFA (Non Deterministic Finite Automata), Equivalence of NFA and DFA: Conversion of NFA into DFA, Conversion of NFA with epsilon moves to NFA, Minimization Of DFA, Definition and Construction of Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines. Minimization of Finite Automata. (Construction of Minimum Automaton)

Unit II: Regular Expression and Regular Grammar (Hours: 8)
Definition and Identities of Regular Expressions, Construction of Regular Expression of the given Language, Construction of Language from the RE, Conversion of FA to RE using Arden's Theorem, Inter-conversion RE to FA, Pumping Lemma for RL, Closure properties of RLs(proofs not required), Regular grammar, Equivalence of RG (RLG and LLG) and FA.

Unit III: Context Free Grammar and Languages (Hours: 8)
Introduction, Formal Definition of Grammar, Notations, Derivation Process: Leftmost Derivation, Rightmost Derivation, Derivation Trees, Construction of Context-Free Grammars and Languages, Pumping Lemma for CFL, Simplification of CFG, Normal Forms (CNF and GNF), Chomsky Hierarchy.

Unit IV: Pushdown Automata (Hours: 8)

Introduction and Definition of PDA, Construction of PDA, Acceptance of CFL, Equivalence of CFL and PDA: Inter-conversion , Introduction of DCFL and DPDA, Enumeration of properties of CFL, Context Sensitive Language, Linear Bounded Automata.

Unit V: Turing Machines (Hours: 8)

Formal definition of a Turing Machine, Design of TM, Computable Functions, Church's hypothesis, Counter machine, Variants of Turing Machines: Multi-tape Turing machines, Universal Turing Machine.

Unit VI: Decidability and Un-Decidability (Hours: 8)

Decidability of Problems, Halting Problem of TM, Un-Decidability: Recursive enumerable language, Properties of recursive & non-recursive enumerable languages, Post Correspondence Problem, Introduction to Recursive Function Theory.

Text Books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation.
2. Peter Linz: An Introduction to Formal Languages and Automata.

Reference Books:

1. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
2. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, McGraw Hill,2010
3. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation
4. Mishra &Chandrashekharan: Theory of Computation
5. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press, 2011.
6. VivekKulkarni : Theory of Computation, OUP India, 2013

4KE06 COMPUTER NETWORK - LAB

Course Pre-requisite: Computer and Data Communication Requirements

Course Objectives:

1. To understand the working principle of various communication protocols
2. To understand and analyze the signal flow in a digital communication system.
3. To analyze error performance of a digital communication system in presence of noise and other interferences.
4. To evaluate the errors using various error detection & correction techniques.
5. To understand network based protocols in data communication and networking.

Course Outcomes : On completion of the course, the students will be able to

1. Analyze performance of various communication protocols
2. Implement Configure various network protocols.
3. Compare IP Address classes of networks.

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. To study various LAN topologies and their creation using network devices, cables and computers. .
2. To connect the computers in Local Area Network.
3. Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.
4. Write a program of bit stuffing used by Data Link Layer
5. Write a program to implement CRC(Cyclic Redundancy Check)
6. Write a program to implement Checksum
7. Write a program to implement Sliding window
8. Configure Internet connection and use IP-Config, PING / Tracer and Net stat utilities to debug the network issues.
9. Configuration of TCP/IP Protocols in Windows and Linux.
10. Transfer files between systems in LAN using FTP Configuration, install Print server in a LAN and share the printer in a network.
11. Write a C Program to determine if the IP Address is in Class A, B, C, D, or E
12. Write a C Program to translate Dotted Decimal IP Address into 32 Bit Address.
13. Configure Host IP, Subnet Mask and Default Gateway in a System in LAN(TCP/IP Configuration)

4KE07 OPERATING SYSTEM - LAB

Course Pre-requisite: Basic computer programming

Course Objectives:

1. To make students aware of the kernel and shell structure of the operating systems.
2. To make students aware of the purpose, structure and functions of operating systems
3. To equip students with understanding of the various scheduling algorithms in OS.
4. To make students aware of understanding of memory management in different OS.

Course Outcomes : On completion of the course, the students will be able to

1. Explain memory management issues like external fragmentation, internal fragmentation.
2. Illustrate multithreading and its significance.
3. List various protection and security mechanisms of OS.
4. Analyze and solve the scheduling algorithms.
5. Analyze the deadlock situation and resolve it.
6. Compare various types of operating systems

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

4KE08 MICROPROCESSOR & INTERFACING - LAB

Course Pre-requisite: Computer Programming, Number System

Course Objectives: In this lab student will learn about' Microprocessor and Interfacing' in regards to digital computer, microprocessor architecture, programming with 8086 microprocessor and different peripherals**.**

Course Outcomes : On completion of the course, the students will be able to

1. Analyze the internal workings of the microprocessor
2. Design and develop programs in Assembly Language Programming
3. Describe 8086 microprocessor and its architecture; also understand instruction processing during the fetch-decode-execute cycle.
4. Design and Test assembly language programs using 8086 microprocessor instruction set.
5. Demonstrate the implementation of standard programming constructs, including control structures and functions, in assembly language
6. Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor

List of Experiments:

This is a sample list of Experiments; **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Installation and Introduction of TASM Assembler.
2. Write a program for addition of two 8-bits numbers and two 16-bits numbers.
3. Write a program for subtraction of two 8-bits numbers and two 16-bits numbers.
4. Write a program for multiplication of two 8-bits numbers.
5. Write a program for division of two 8-bits numbers
6. Write a program to check whether a given number is even or odd.
7. Write a program to demonstrate Logical Group and Shift Rotate Instructions.
8. Write a program to check whether a given number is positive or negative.
9. Write a program to find greatest of two 8-bits signed &unsigned numbers.
10. Block Transfer Program
11. Write a program to find Factorial of a number using loop instruction.
12. Write a program to find cube of a given number using Subroutine.
13. Write a program to find square of a given number using Subroutine.
14. Write a program to find square of a given number using Macro.
15. Write a program to find whether the string is palindrome or not.
16. To convert BCD Number Program
17. Write a program to perform Reverse of the String
18. Write a program to transfer 10-bytes from one memory bank to another memory bank.
19. Program for sorting an array for 8086 microprocessor.
20. To write an assembly language program to arrange the given numbers in descending order.
21. Program for searching for a number/character in a string for 8086 microprocessor.

4KE09 C-SKILL-LAB II

Course Pre-requisite: Basic knowledge of scripting language, Programming language, Basic understanding of Electronic concepts.

Course Objectives: To develop an ability to design and implement static and dynamic website and to develop embedded systems with the help of Raspberry Pi/Ardino.

Course Outcomes : On completion of the course, a student will be able to

1. Develop client server program and web applications
2. Make use of project-based experience for web application development.
3. Create embedded systems using Raspberry Pi/Ardino

List of Experiments:

This is a sample list of Experiments, **minimum 12 experiments** are to be performed covering the entire syllabus. At least two experiments should be beyond syllabi based on learning of syllabi (Apply)

1. Introduction to PHP and configure it to work with Apache Web Server.
2. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
3. Create your class timetable using table tag.
4. Create user Student feedback form (use textbox, text area , checkbox, radio button, select box etc.)
5. Create your resume using HTML tags also experiment with colors, text , link , size and also other tags you studied.
6. Design a web page of your home town with an attractive background color, text color, an Image, font etc. (use internal CSS).
7. Develop a JavaScript to display today's date.
8. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
9. Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country, its capital should be printed next to the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
10. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
11. Write a PHP program to display a digital clock which displays the current time of the server.
12. Write the PHP programs to do the following: a. Implement simple calculator operations. b. Find the transpose of a matrix.
13. Write a PHP program to sort the student records which are stored in the database using selection sort.
14. Study and Install IDE of Arduino and different types of Arduino.
15. Write program using Arduino IDE for Blink LED.
16. Write Program for RGB LED using Arduino.
17. Study the Temperature sensor and write a Program for monitor temperature using Arduino.
18. Study and Implement RFID, NFC using Arduino. • Study and implement MQTT protocol using Arduino.
19. Study and Configure Raspberry Pi.
20. WAP for LED blink using Raspberry Pi.
21. Study and Implement Zigbee Protocol using Arduino / Raspberry Pi.
22. Create Smart Plugs with Arduino and Raspberry Pi.
23. Interfacing digital sensors with raspberry pi.
24. Creating a webpage to control I-O devices, Reading data from sensor and passing to web page.
25. Implement a program to access Analog sensor via wifi with HTML Web server.

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SYLLABUS OF B.E. SEM. III & IV (I.T.) [C.B.C.S.]

Semester-III

3IT01/3KS01/3KE01 ENGINEERING MATHEMATICS-III

Course Objectives:-

- Find general solutions of linear differential equations with constant coefficients using the roots of the auxiliary equation.
- Calculate the Laplace Transform of basic functions using the definition.
- Apply Laplace transform to find solution of linear differential equations. And solve problems related to Fourier Transform
- Compute and interpret the correlation coefficient.
- Compute the Analytic function and Complex Analysis.
- Perform vector differentiation and integration to analyze the vector fields and apply to compute line, surface and volume integrals.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and linear differential equations .
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Demonstrate the basic concepts of probability and statistics.
5. Apply the knowledge of Complex Analysis.
6. Apply the knowledge of vector calculus to solve physical problems.

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding commplementary function, the inverse operator, Rules for finding the particular integral, Method of variation of parameters, Cauchy's and Legendre's linear differential equations. (7)

UNIT-II: **Laplace Transform:-** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function . (7)

UNIT-III: **a) Applications of Laplace Transform:-** Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method

b) Fourier Transform:- Definition, standard forms, Fourier transforms, properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals, inverse Fourier transforms.(7)

SECTION-B

UNIT-IV: **a) Partial differential equation** of first order of following form:- (i)f (p,q) = 0; (ii) f (p,q,z) = 0; (iii) f (x, p) = g (y,q); (iv) P p + Qq = R (Lagranges Form); (v) z = px + qy + f(p,q) (Clairauts form)

b) Statistics Curve fitting: Least Square Method, Coefficient of Correlations, Lines of Regression. (7)

UNIT-V: **Complex Analysis: -** Functions of complex variables, Analytic function, Cauchy- conditions, Harmonic function, Harmonic conjugate functions, Milne's Method, conformal mappings (translation, rotation, magnification and bilinear transformation), Expansion of function in Taylor's and Laurent's series. (7)

UNIT–VI: **Vector calculus**:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion Formulae (without proof), line, surface, volume integrals, irrotational Solenoidal Vector fields. (7)

Text Books:

1. Elements of Applied Mathematics Vol. II by P. N. Wartikar and J.N. Wartikar,
2. Higher Engg. Mathematics by B.S. Grewal.

Reference Books:

1. Advancing Engg. Mathematics by E.K.Kreyzig.
2. A text book of Differential Calculus by Gorakh Prasad.
3. A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
4. Engineering Mathematics by Ravish R Singh, Mukul Bhatt.

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3IT02 Discrete Structure & Graph Theory

Course Objectives:

- Increase Critical thinking and analytical problem-solving skills and awareness of computer related ethics to discrete Mathematical Logic.
- Apply appropriate discrete mathematical concepts and operations to interpret data and to solve problems.
- Identify problem and analyze it in terms of its significant parts and the information needed to solve problems based on sets, relation, function and recursion.
- Formulate and evaluate possible solutions to problem and select the chosen solution based on Boolean algebra.
- Construct graphs and trees, interpret them, and draw appropriate conclusion.

Course Outcomes:

After successfully completing the course, the students will be able to:

- Identify basic terminology of Mathematical Logic, Theory of inference & Predicate calculus.
- Identify, illustrate, and solve engineering problems on the basis of set theory.
- Identify and Design an Algebraic Structures and groups
- Examine and formulate the concept of Lattices & Boolean Algebra to solve engineering problems.
- Design and interpret data using graphs, trees and related algorithms.

UNIT I : Mathematical Logic : Statements & Notation , Connectives , Normal forms , The Theory of Inference for the Statement Calculus , Predicate Calculus , The Inference Theory of the Predicate Calculus.

UNIT II: Set Theory : Basic concepts of Set Theory , Representation of Discrete Structure, Relation and ordering, Functions , Recursion.

UNIT III : Algebraic Structures : Algebraic Systems , Semi groups and Monoids , Grammars and Languages, Polish expression & their compilation , Groups , Semi groups, Application of Residue Arithmetic to Computers.

UNIT IV: Lattice & Boolean Algebra: Lattices as Partially Ordered Sets, Boolean Algebra, Boolean Functions, Representation of Boolean Functions , Minimization of Boolean Functions.

UNIT V: Graph Theory: Basic concepts of Graph Theory , Paths, Reachability & Connectedness, Matrix representation of graphs , Storage Representation and Manipulation of Graphs, Coloring Graphs.

UNIT VI: Trees, Tree Searching, Minimal spanning trees, Simple Precedence Grammars, , rooted tree, expression tree, B tree, Distance between spanning trees of a graph. PERT and Related Techniques.

Text Book : J.P.Trembley, R.Manohar :"Discrete Mathematical Structures with Application to Computer Science" 1988 (Tata McGraw Hill)

REFERENCE BOOKS:

1 G Shankar Rao, "Discrete Mathematical Structures", New Age International, 2002 ISBN:81-224-1424-9.
2 Kenneth H. Rosen, " Discrete Mathematics and its Applications", 7th Edition, McGraw Hill Edition.
3. S.K. Chakraborty & B.K.Sarkar ;"Discrete Mathematics" OXFORD.
4. Bernard Kolman,Robert C.Busby, Sharon Ross: "Discrete Mathematical Structures" Third Edition PHI.

3IT03 OBJECT ORIENTED PROGRAMMING

Course Objectives:

- Study of the basic concepts of Java such as operators, classes, objects, inheritance, packages and exception handling.
- Study of concepts like enumerations, generics, logging, API, assertions, Applets, AWT.
- Preparing the students to learn Object Oriented Programming Methodology.

Course Outcomes:

- Apply Object Oriented approach to design software.
- Implement programs using classes and objects.
- Specify the forms of inheritance and use them in programs.
- Analyze polymorphic behavior of objects.
- Design and develop GUI programs.
- Develop Applets for web applications

Unit I: Introduction to Object Oriented Programming: Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. **Java Programming Constructs:** Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, Flow of Control.

Unit II: Classes and Objects: Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: Inheritance: Inheritance vs. Aggregation, Polymorphism, Method Overloading Method Overriding, super keyword, final keyword, Abstract class. **Interfaces, Packages and Enumeration:** Interface, Packages, java.lang package, Enum type.

Unit IV: Exception: Introduction, Exception handling Techniques, User-defined exception, Exception Encapsulation and Enrichment. **Input/ Output:** The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: Applets: Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base () and get Code Base() methods.

Unit VI: Event Handling: Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. **Abstract Window Toolkit:** Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Text field and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Book: Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.

Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)
4. Liang: A text Book of Java Programming, (PHI).

3IT04 ASSEMBLY LANGUAGE PROGRAMMING

Course Objectives :

1. Able to understand the architecture and organization of microprocessor 8086/8088 .
2. Able to understand different addressing modes & instruction format of 8086 & apply in 8086 programming.
3. Able to understand instruction set, control flow instruction and apply the fundamentals of assembly level programming of microprocessor through use of any Open Source Software.(TASM,NASM etc.)
4. Able to understand stack, subroutine. Recursion & apply in 8086 programming.

Course Outcomes ;

After successful completion of this course the student will be able to

1. To draw and explain internal architecture of 8086 with its register organization.
2. Able apply instruction format 7 addressing modes in 8086 programming.
3. Able to apply control flow instruction in 8086 programming through use of any Open Source Software.(TASM,NASM etc.)
4. Able to apply stack & subroutine concept in 8086 programming.

Unit I: Microprocessor 8086 architecture-BIU and EU, pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 instructions: logical instructions, Shift and rotate instructions 8086 programming: 8086 flag register and Flag control instructions control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

Unit IV: Stack and Subroutines,8086 stack segment and stack related instructions. 8086 I/O Address space, Subroutines and related instructions, parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly Program level. 8086 programming using subroutines, recursion and macros.

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation.

Unit VI: 8086 Interrupt Mechanism, types and priority , Interrupt vector table, Interrupt Instructions, External hardware-interrupt interface signals & interrupts sequence. Programmable Interrupt Controller 8259: Block & pin diagram, internal architecture, Software interrupts, Nonmaskable interrupt, Internal Interrupt functions.

Text Book: Avtar Singh & Walter A. Triebel: The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware, and Applications, PHI, 2003.

References:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall
3. D. V. Hall: Microprocessors and Interfacing, TMH.

3IT05 ANALOG AND DIGITAL ELECTRONICS

Course Objectives :

- To understand the basic operation and applications of analog devices such as BJT and JFET
- To introduce analog ICs like Op-Amp and Timer
- To study and develop skills to design basic combinational and Sequential logic circuits
- To lay foundation for understanding computer architecture and organization

Course Outcomes :

On completion of the course learner will be able to-

- Understand the basic applications of BJT.
- Get acquainted with analog ICs like Op-Amp IC-741 and Timer IC-555
- Discriminate the working of sinusoidal and non-sinusoidal waveform generators.
- Apply the concept of K-map to simplify logic expressions.
- Design and implement Combinational circuits
- Explore the applications of Sequential circuits

UNIT I:

Introduction to Analog Circuits: Transistor as an amplifier. Need of biasing, Potential divider bias circuit, Faithful amplification of CE amplifier, Transistor as an electronic switch, Construction and working of JFET.

UNIT II:

Operational Amplifier: Block diagram of Op-Amp, ideal Op-Amp parameters. Applications of op-amp: Inverting & Non-Inverting Amplifier, Voltage follower, Summing Amplifier, Subtractor, Comparator.

UNIT III:

Wave Generators:

Transistorized Oscillators: Barkhausen Criterion, R-C Phase Shift Oscillator, Transistor crystal oscillator Timer IC 555: Block diagram**,** working, Astable multivibrator, Monostable multivibrator.

UNIT IV: Introduction to Digital Circuits: Logic gates, Standard logic expression forms, SOP, POS, Logic expression realization & minimization using K-map (upto 4 variables only). Half Adder, Full Adder, Half subtractor, Full subtractor.

UNIT V: Logic Circuits: Difference between Combinational and Sequential circuits, Code convertors (BCD, Excess-3 and Gray), Multiplexers, De-multiplexers and Decoders.

Flip Flops: SR flip-flop, JK flip-flop, D flip-flop and T flip-flop.

UNIT VI: Sequential Circuits: Difference between Asynchronous & Synchronous sequential circuits, Asynchronous counters, Mod counter, Up-Counter, Down-Counter. Working of shift Registers, SISO, SIPO, PISO and PIPO. Application of Shift Register as a Ring Counter.

Text Books:

1. V.K.Mehta, Rohit Mehta: Principles of Electronics (S.CHAND)
2. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)
3. Jain R.P. Modern Digital Electronics (TMH)

Reference Books:

1. N.N.Bhargava, D.C.Kulshreshtha, S.C.Gupta: Basic Electronics & Linear circuits, (TTTI)
2. S. Salivahanan: Electronics Devices & circuits, Third Edition
3. John P. Hayes: Introduction to Digital Logic Design{Pearson)
4. Anand Kumar: Fundamentals of Digital Circuits (PHI)

3IT06 OBJECT ORIENTED PROGRAMMING - LAB

Practical based on the syllabus of Object Oriented Programming (3IT03)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Object Oriented Programming (3IT03)

1. Write a program to demonstrate various data-types used in java and also perform the type casting.
2. Demonstrate the use of this keyword in java.

3. Write a program in java to demonstrate various OOP'S (Inheritance, Polymorphism, and Abstraction) concepts in java.
4. Create User defined Packages in Java
5. Write a program in java to set the priority of thread in order.
6. Demonstrate the strings are immutable in java and create mutable strings in java.
7. Write a program in java which demonstrates the exception caught because of invalid input.
8. Write java program to create a registration form using AWT.
9. Write a Java program to demonstrate the use of AWT components namely buttons, labels, text boxes, menus with event handling.
10. Write a program in java to copy certain text of one file to another newly created file in java using java I/O operations.
11. Write a program in java to connect java to oracle or MySql Database using JDBC drivers
12. Demonstrate the various List interfaces in java.
13. Write a program in java to show use of generic classes and methods

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

3IT07 ASSEMBLY LANGUAGE PROGRAMMING - LAB

Practical based on the syllabus of Assembly Language Programming (3IT04)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Assembly Language Programming (3IT04). Study experiments are highly discouraged.

1. Executing various debugging commands.
2. Write a program to manipulate the two given operands with general arithmetic operators +, -, *, /
3. Write a program in TASM to store given a number XY i.e. 0X in BX register and 0Y in CX register
4. Program for block transfer from one segment to another segment
5. Write a program in TASM to find out no. of positive and negative numbers from a given series of a signed no.
6. Program to sort the given array in ascending and descending order.
7. Program for Addition/Subtraction of 2 numbers using FAR/NEAR procedure
8. Program to find out Factorial of any given number using recursive procedure.
9. Program to add two BCD numbers.
10. Program for BCD to HEX conversion.
11. Program for HEX to BCD conversion.
12. Program to display System Date/Time.
13. Program to find whether no. is Prime or not.
14. Execute various commands on 8086 Microprocessor Trainer kit.

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

3IT08 ANALOG & DIGITAL ELECTRONICS - LAB

Practical based on the syllabus of Analog & Digital Electronics (3IT05)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Analog & Digital Circuits (3IT05)

1) To study the input and output characteristics of transistor connected in Common Emitter (CE) configuration.
2) Implementation of Op-amp as an inverting amplifier.
3) Implementation of Op-amp as a non-inverting amplifier.
4) Study of Astable Multivibrator using IC 555 and find the frequency of output square wave.
5) To study and verify the Truth Table of different Logic gates using TTL ICs (7400, 7402, 7404, 7408, 7427, 7432, 7486 etc.).
6) Study and verify the truth table of Half adder and Full adder using logic gates.
7) Study and verify the truth table of Half Subtractor and Full Subtractor using logic gates
8) Implementation of 4bit parallel adder using IC-7483 .

9) Study the working of Multiplexer using one of the ICs like 74151A, 74152, 74153, 74157.
10) Study the working of De-Multiplexer and Decoder using one of the ICs like74138,74154,74156
11) Study the working and Verification of truth table of SR, JK, T and D Flip Flops.
12) Implementation of 3 bit asynchronous counter using JK Flip Flop.
13) Implementation of 3 bit Shift Register using D Flip Flop.

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

3IT09 COMPUTER SKILL LAB - I

This practical lab must cover the following aspects for Python:

1. Basics for python programming that consists of the study of various data types in Python, implementation of control structures and loops, functions (pre-defined and user defined), file handling commands and functions.
2. The lab must also cover the concepts related to networking using python.
3. OOP concepts study and its programming using python libraries.
4. The lab must cover the part of UI deigning using python (Django, Flask, etc.).
5. The plotting of graphs using various libraries such as (matplotlib, seaborn, etc.).
6. The lab must also give a brief introduction regarding the a concept of machine learning or a learning algorithm implementation.
7. An introduction to the data science track can be given by conducting and including an experiment on data manipulation using (Numpy, Pandas, etc.)

The following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on Python, R etc.

1. To study the various data types in Python.
2. To study dictionaries, data frames and tuples in Python
3. To study the control structures and loops in Python.
4. To study the various Functions (pre-defined and User Defined) in Python.
5. To study the various File handling and i/o in Python.
6. To study the concepts related to Networking in Python.
7. To study various OOP concepts using Python.
8. To study UI design using various libraries in Python.
9. To Study Plotting of Graphs using the various libraries in Python.
10. To study basic data manipulation using Python Libraries.
11. To study a learning algorithm using Python.
12. Mini Project (based on all the above mentioned concepts)

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

SEMESTER - IV

4IT01 COMPUTER ORGANIZATION & ARCHITECTURE

Course Objectives :

- How Computer Systems work & the basic principles.
- Instruction Level Architecture and Instruction Execution.
- The current state of art in memory system design.
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism.
- To impart the knowledge on micro programming.
- Concepts of advanced pipelining techniques.

Course outcomes :

- Ability to understand the basic structure of computer including functional units, addressing modes, stacks, queues, subroutines, etc.
- Ability to understand the basic processing unit of computer, execution of a complete instruction.
- Ability to understand about input/output organization of computer including interrupt, DMA, buses, interfaces, etc.
- Ability to understand the concepts of RAM, ROM, cache memory, virtual memory.
- Ability to understand number representation, Booth's algorithm, different peripheral devices.

Unit-I Basic structure of computer: hardware & software, program sequencing. concept of memory locations & address. Main memory operation. instructions & instruction sequencing. Addressing modes. basic I/O operations. Stacks. queues & subroutines.

Unit-II Processing Unit: fundamental concepts. execution of a complete instruction. hardwired control, performance consideration. Micro-programmed control; microinstructions.

Unit-III I/O organization: accessing I/O devices, interrupts, direct memory access, bus arbitration: centralized and distributed. I/O hardware: processor bus (Synchronous & Asynchronous).

Unit-IV Memory Unit: basic concepts, semiconductor RAM memories, internal organization, static & dynamic RAMs, ROMs. speed, size & cost considerations.

Unit-V Cache memories: performance considerations. Virtual memories, address translation. Multiprocessor: The Use of Multiprocessors, Symmetric Multiprocessor and Clusters.

Unit-VI Arithmetic; number representation. Design of fast adders, signed addition and subtraction. Multiplication of positive numbers, sequential multiplication, fast multiplication, Booths' algorithm for multiplication, integer division, restoring and non-restoring division.

Text-Books:

1. "Computer Organization" 5th Edition by V.Carl Hamacher & S.Zaky, McGraw-Hill (ISE).
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.

References:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw-Hill.
3. Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.
4. "Structured Computer Organization", 5th Edition by Tenanbaum A.S., Pearson Education.

4IT02 DATA COMMUNICATION & NETWORKING

Course Objectives :

- To understand the fundamental concepts of computer networking.
- To familiarize the students with basic taxonomy and terminology of data communication.
- To introduce the students to advanced networking concept and network reference models.
- To lay foundation for understanding the students to network design, simulation, modeling and analysis.

Course Outcomes :

- On completion of the course learner will be able to-
- Understand the principles and fundamental concept of computer networks.
- Understand and explain data communication system with its techniques and applications.
- Identify various error detection and correction techniques in data transmission.
- Evaluating the network addresses and learning routing mechanism protocols.
- Design TCP connection and analyze upper OSI layer functions and services.
- Explore the network design and its applications to digital world.

UNIT-I: Introduction (Hours: 06)

Types of Network; Network Topologies; OSI Vs TCP\IP Model; Network Devices: Bridge, Switch, Router; Transmission Medium: Guided media, Unguided media; Time and Frequency Domain, Types of Signals: Analog, Digital, Composite, Periodic, Aperiodic Signal.

UNIT-II: Data Encoding and Multiplexing (Hours: 06)

Data conversions: Digital-to-Digital, Analog-to-Digital, Digital-to-Analog; Configuring DTE-DCE Interface, Manchester and Differential Manchester encoding; Shannon Capacity; Multiplexing: FDM, WDM, TDM; Multiplexing Application: Mobile Telephone System.

UNIT-III: Data Link Layer (Hours: 06)

Design Issues: Services to Network Layer, Framing, Flow control; Error Control: Parity Bits, Hamming Code, Cyclic Redundancy Check (CRC); Data Link Protocols: Synchronous and Asynchronous Protocols, CSMA/CD, WAN Connectivity Protocols: PPP and HDLC.

UNIT-IV: Addressing and Routing (Hours: 06)

Switching Techniques, IPv4 Addressing Scheme, IPv6 addressing Overview, Subnetting, Evaluating Network Address by router, Routing Protocols: Distance Vector, Link State; Ethernet Networks: Token Ring, FDDI.

UNIT-V: Networking and Services (Hours: 06)

Transport Layer Services, TCP/UDP Protocols, TCP Segment, TCP Connection, Upper OSI Layers: Session Layer, Presentation Layer, Application Layer functions and services.

UNIT-VI: Network Design and Applications (Hours: 06)

Network Layout, Network Design Metrics, Network design traceability, WWW, DNS, Voice over IP; Introduction and Comparison of mobile network system and its applications: 2G, 3G, 4G.

Text Books:

1. Fourauzan B., "Data Communications and Networking", 5th Edition, Tata McGraw-Hill, Publications.
2. Andrew S. Tenenbaum, “Computer Networks”, PHI, ISBN 81-203-2175-8.

Reference Books:

1. William Stallings, “Data & Computer Communications”, (6/e) Pearson Education.
2. Wehrle, Klaus, Gunes, Mesut, Gross, James, "Modeling and Tools for Network Simulation", Springer, ISBN: 978-3-642-12330-6
3. J.Freey, “Computer Communication & Networks”, AEW Press.
4. Bhushan Trivedi, “Computer Networks” OXFORD.

4IT03 OPERATING SYSTEM

Course Objectives :

- To introduce basic concepts and different types of operating systems, concept of process and thread.
- To understand the scheduling of processes and concurrency control with synchronization
- To understand the concept deadlock and basic Memory Management
- To understand Virtual Memory management concepts.
- To understand the concept of File System management.
- To understand the concept of Disk Management, Scheduling and Protection and Security.

Course Outcomes :

- Fundamental understanding of the role of Operating Systems, concept of a process and thread.
- To apply the concept of process scheduling and concurrency control to different scenarios.
- To understand and apply the concept deadlock and basic Memory Management
- To realize virtual memory management schemes.
- To realize the concept of File system management.
- To understand and apply the concept of Disk Management, Scheduling and Protection and Security.

Unit I :

Introduction: Operating System (OS definition),OS Evolution, OS Services, Process Concept ,Process Scheduling ,Operations on Processes, Cooperating & Inter-process Communication, Threads: Multithreading Models, Threading Issues ,Java Threads. (6 Hrs)

Unit II : CPU Scheduling: Concepts, Scheduling Criteria, Scheduling Algorithms, Process Synch.: The Critical Section Problem ,Synchronization Hardware, Semaphores, Monitors. (6 Hrs)

Unit III : Deadlocks: Definition& Characterization. Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. Memory Management: Background, Swapping, Contiguous Memory Allocation schemes ,Paging, Segmentation. (6 Hrs)

Unit IV : Virtual Memory: Background, Demand Paging, Process Creation, Page Replacement policies, Allocation of Frames, Thrashing. (6 Hrs)

Unit V : File-System Interface: Directory Structure, File-System Mounting, File Sharing, Protection, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods Free-Space Management, File Recovery. (6 Hrs)

Unit VI: I/O Systems: Overview, I/O Hardware, Application I/O Interface , Kernel I/O Subsystem, Transforming I/O to Hardware Operations. Disk Scheduling ,Disk Management ,Swap-Space Management ,RAID Structure. (6 Hrs)

Text Book:
Avi Silberschatz, P.B.Galvin, G.Gagne: "Operating System Concepts" (6th Edn) John Wiley & Sons Publication.

Reference Books:

1. A.S Tanenbaum "Modern Operating Systems" Pearson Education.
2. William Stallings "Operating Systems" Prentice-Hall.
3. D M Dhamdhere "Operating Systems" Tata McGraw-Hill.

4IT04 DATA STRUCTURE

Course Objectives :

- To understand the role of Data Structure in memory management
- To acquire knowledge of different types of data structures like: array, types of array, linked list, stacks, queues, trees, and their memory representation
- To learn the fundamental concept of data structure and emphasize the importance of it in developing and implementing efficient algorithms
- To analyze complexity of algorithms in terms of time and memory space
- To Understand data structure, types of data structure and their common applications
- To study the use of algorithms to perform the operations on data structure such as traversing, insertion, deletion, searching, sorting and merging
- To understand importance and applications of linear and non-linear data structure
- To obtained knowledge and skill of Sorting Methods such as: Bubble Sort, Quick Sort, Merge Sort, Selection Sort and Bucket Sort
- To Learn and acquire knowledge about the use of Tree and Graph in applications

Course Outcomes :

- Define fundamental features of array, linked-list, stack, queue, tree and graph
- Write the algorithms to perform various operations such as: Search, Insertion, Deletion, Sort etc
- Implement algorithms for various operations on linear and non-linear data structure
- Classify the linear data structures such as Array, Linked-List, Stack, Queue and non-linear data Structures such as Tree and Graph with their applications
- Implement linear data structures: Array, Linked-list, Stack, Queue using suitable language C,C++
- Implement non-linear data structure: Tree, Graph using C or C++
- know different types of sorting methods and their algorithms
- Choose appropriate algorithm for Searching 9: Perform operations of traverse, insertion, deletion.

UNIT I :
Algorithms and Linear Data Structure: Array Introduction: Data, Data Structure and their types. Algorithm and their Complexity, String processing operations, Pattern matching algorithms: fast and slow. Array: Types of array, memory representation of array, Algorithm and operations on Array: traversing, searching, insertion, deletion. Applications (7 Hrs)

UNIT II:
Algorithms and Linear Data Structure: Linked List (LL) Linked List: Features, Representation of Linked List in memory using array, Types of LL, Algorithms and operations onto LL: traversing, insertion, deletion, searching & their implementation, Applications (5 Hrs)

UNIT III
Linear Data Structure: Stack and Queue Stack: Definition, Memory representation of Stacks using array and Linked List. Operations on to Stack: Push and Pop. Stack Applications: Recursion, Solve arithmetic expressions, tower of Hanoi etc. Queue: Definition, Memory representation of Queue using array and Linked List, Types of queue, Operations on queues: Traversing, Insertion, Deletion, Searching. Applications (6 Hrs)

UNIT IV
Sorting, Sorting Methods and its Algorithms Simple Sorting Algorithms, Bubble Sort, Quick Sort, Insertion Sort, Selection Sort, Heap Sort, Merge Sort, Bucket Sort and their Applications. (6 Hrs)

UNIT V :
Non-Linear Data Structure: Tree Trees: Terminology, Types, Binary trees and their representation in memory, traversing in binary trees using stacks. Binary Search Trees, searching, inserting and deleting nodes in binary trees, Heap tree, Path length & Huffman's algorithm, Spanning Trees, Basic concepts of Kruskal's and Prim's Algorithm, B+ tree. (6 Hrs)

UNIT VI :
Non-Linear Data Structure: Graph Graph: Definitions, Sequential and Linked-list representation of Graphs, Warshalls' algorithm, Bridges in graph, Johnsons algorithm. Graph Traversals: Breadth First Search, Depth First Search, Topological Sort, Shortest Path Algorithms: Unweighted Shortest Paths, Basic concepts of Dijkstra's Algorithm. (6 Hrs)

Text Books:

1. Mark Allen Weiss, 'Data Structures and Algorithm Analysis in C++', 3/e, Florida International University, ISBN 0-321-37531-9
2. Seymour Lipschutz, 'Theory & Problems of Data Structures', Schaum's Outline Series (Mc Graw-Hill) International Editions.

Reference Books:

1. John Hubbard: 'Schaum's Outline DataStructure with C++', ISBN-13: 978-0071353458
2. Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, 'An Introduction to Data Structures With Applications', (McGraw-Hill Computer Science Series), ISBN-13: 978-0070651579
3. Ellis Horowitz, Sartaj Sahni, Rajasekaran , 'Computer Algorithms/C++', 2nd edition, 2019.

4 IT 05 SOCIAL SCIENCES & ENGINEERING ECONOMICS

SECTION - A

Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy. (8)

Unit II : Indian Parliament : Composition and powers, President of India : Election and Powers. Council of Ministers and Prime Minister (8)

Unit III : Impact of Science and Technology on culture and Civilization. Human Society: Community Groups. Marriage and Family: Functions, Types and problems. (8)

SECTION - B

Unit IV: Production : Factors of production, Laws of return, Forms of Business Organisation. (8)

Unit V : Banking : Functions of Central and Commercial Banks. Introduction to GST, Market : Forms, perfect, imperfect competition and monopoly. (8)

Unit VI: Nature and scope of Economics : Special significance of Economics to Engineers. Economics of Development : Meaning, Characteristics of under development, obstacles to Economic growth and vicious circle of poverty. (8)

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. C N Shankar Rao: Sociology, S.Chand and Co.
3. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
4. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
5. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
6. E.Kuper : Economics of W.R. Development, McGraw Hill Co.,
7. Brij Kishore Sharma. : The Constitution of India, PHI.
8. Mahajan : The Constitution of India, S.Chand, New Delhi.
9. Maclaver and Page : Principle of Sociology.
10. Davis K. : Human Society
11. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
12. Dhingra I.C. : Indian Economy
13. Jemes L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

4IT06 DATA COMMUNICATION & NETWORKING - LAB

Practical based on the syllabus of Data Communication & Networking (4IT02)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Data Communication & Networking Lab (4IT02)

1. To study computer Networks and Its topology.
2. To study and implement digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion
3. To implement and check flow control in DLL
4. To Study and Implement Asynchronous Protocols
5. To Study and Implement synchronous Protocols
6. To implement packet switching in network
7. To implement Circuit switching in network
8. To Demonstrate and study working of various networking devices like switch,router etc

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

IT07 OPERATING SYSTEM - LAB

Practical based on the syllabus of Operating System (4IT03)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Operating System (4IT03)

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

1. To study basics of shell programming.
2. To study the creation of process using fork system call.
3. To implement FCFS scheduling algorithm.
4. To implement SJF scheduling algorithm.
5. To implement Priority scheduling algorithm.
6. To implement Round Robin scheduling algorithm.
7. To implement Best Fit algorithm of memory management.
8. To implement First Fit algorithm of memory management.
9. To implement FCFS disk scheduling algorithm.
10. To implement SCAN disk scheduling algorithm.
11. To implement the process synchronization using semaphore concept.

4IT08 DATA STRUCTURE - LAB

Practical based on the syllabus of Data Structure (4IT04)

Following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on the syllabus of Data Structure (4IT04)

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

1. Program to implement Bubble Sort.
2. Program to implement Linear Search & Binary Search
3. Program to perform various operations on Linked List.
4. Program to perform various operations on Stack.
5. Program to reverse the elements in the stack using recursion.
6. Program to perform various operations on Queue.
7. Program to convert a given infix expression into its postfix Equivalent.
8. Program to create a binary search tree of characters.
9. Programs for implementing the following sorting methods to arrange a list of integers in ascending order:
    a. Insertion Sort
    b. Selection Sort
10. Program to implement graph traversal algorithms:
    a) Depth first traversal b) Breadth first traversal

4IT09 COMPUTER SKILL LAB - II

The following list is an indicative list and the subject teacher is free to design his/her own list of experiments based on Raspberry Pi with Adrino etc.

1 Familiarization with Raspberry Pi and perform necessary software installation.
2 To interface LED with Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3 To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4 To interface DHT11 sensor with Raspberry Pi and write a program to print temperature and humidity readings.
5 To interface OLED with Raspberry Pi and write a program to print temperature and humidity readings on it.
6 To interface Bluetooth with Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
7 To interface Bluetooth with Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
8 Write a program on Raspberry Pi to upload temperature and humidity data to thingspeak cloud.
9 Write a program on Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.
10 To install MariaDB database on Raspberry Pi and perform basic SQL queries.
11 Connect to MariaDB through Python 3 program
12 Explore Scientific Python 3 ecosystem and perform image processing with NumPy and Matplotlib

Students are advised to explore the Virtual Labs Developed by Ministry of Human Resource Development Government of India available at http://www.vlab.co.in/broad-area-computer-science-and-engineering

REFERENCE BOOKS:

1) "Raspberry Pi by Example"by Ashwin Pajankar: PACKT PUBLICATIONS
2) "Raspberry Pi Amazing Projects " by Ashwin Pajankar: PACKT PUBLICATIONS
3) "20 Easy Raspberry Pi Projects: Toys, Tools, Gadgets, and More!" By : Rui Santos , Sara Santos No Starch Press
4) " IoT Fundamental" by Devid Hanes Publishers: CISCO
5) "Raspberry Pi Cookbook for Python Programmers" by Tim Cox Publishers: PACKT

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SYLLABUS FOR BE ELECTRICAL ENGINEERING / (ELECTRICAL &ELECTRONICS ENGINEERING) / ELECTRICAL ENGINEERING (ELECTRONICS & POWER) SEMESTER PATTERN CHOICE BASED CREDIT GRADE SYSTEM

3EE01 /3 EP01 /3EX01 ENGINEERING MATHEMATICS - III

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Apply Z Transform to solve of various Linear Difference equations with constant coefficients.
5. Apply the knowledge of vector calculus to solve physical problems.
6. Demonstrate the basic concepts of probability and statistics.

SECTION-A

UNIT-I:

Ordinary Differential Equations: - Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. Applications to electrical circuits. (7)

UNIT-II:

Laplace Transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Laplace transform of Periodic Function, Impulse Function, Unit Step Function. Solution of linear differential equation using Laplace transform. (7)

UNIT-III:

a) Partial differential equation of first order and first degree of following type-

(i) f (p, q) = 0; (ii) f (p, q, z)=0; (iii) f (p, q, x, y) = 0; (iv) Pp + Qq =R (Lagrange's Form); (v) Clairaut form Z = px + qy + f(p, q)

b) Fourier transforms- Definition, standard forms, inverse Fourier transform Fourier sine and Fourier cosine transforms and integrals. (7)

SECTION-B

UNIT-IV:

a) Difference Equation:- solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.

b) Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z- transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (7)

UNIT-V:

Vector Calculus: - Scalar and Vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (without proof), Irrotational and Solenoidal vector fields, Line Integral, Stokes and Divergence Theorem. (7)

UNIT-VI:

Statistics & Probability: Axioms, conditional probability, Bay's theorem, mathematical expectations, probability distributions: Binomial, Poisson and Normal. (7)

Books Recommended:

1. Elements of Applied Mathematics by P. N. Wartikar and J. N. Wartikar
2. Advancing Engineering Mathematics by E. K. Kreyzig.
3. Advance Engineering Mathematics by B. S. Grewal
4. Integral Transforms by Goyal & Gupta.
5. Statistical Methods by S.G. Gupta

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3EE02/3 EP02/3EX02 ELECTRICAL CIRCUIT ANALYSIS

Course Outcomes:

After completing this course studentwill be able to:

1. Analyze electric and magnetic circuits using basic circuital laws
2. Analyze the circuit using Network simplification theorems.
3. Solve circuit problems using concepts of electric network topology.
4. Evaluate transient response of different circuits using Laplace transform
5. Evaluate two-port network parameters and network functions

Unit I:

a] Terminal Element Relationships: V-I relationship for Dependent &Independent , Voltage and Current Sources., Source Transformations. Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, super node analysis, mesh analysis, super mesh analysis.

Unit II:

Network Theorems: Superposition theorem, Thevenin'stheorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorem

Unit III :

Graph Theory and Network Equation:-Graph of a network, Trees and loops, Tie-set and cut set matrix of a network, Network equilibrium equations, duality-network transformation.

Unit IV:

a] **Transformation of a Circuit into s-domain:** LaplaceTransformed equivalent of inductance, capacitance and mutual inductance, Impedance and admittance in the transform domain, Node Analysis and Mesh Analysis of the transformed circuit. Complete Solution ofLinear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-for step Inputs. Natural Response, Transient Response, Determination of initial conditions.

Unit V :

Two Port Networks: Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interrelationship between parameters, Interconnection of two port networks , Input impedance in terms of two port network parameters, Output impedance, Image impedance.

Unit VI :

Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function. Applications of network analysis in driving network functions, positive real functions, driving point and transfer impedance function.

Text Book: Network Analysis, M.E. Van Valkenburg, PHI, 2005.

Reference Books:

1. Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, OxfordUniversity Press, 2010.
2. Circuit and Network Analysis, SudhakarShyammohan, Tata Mc Graw Hill, 2005.
3. Network Analysis, P. Ramesh babu, SciTech Publications, Chennai, 2009.

3EE03/3 EP03/3EX03 ELECTRICAL MACHINE - I

Course Outcomes:

After Completing this course, students will be able to:

1. Explain the construction and working of DC Machines.
2. Illustrate the different Characteristics, types, their applications and parallel Operation of D.C. Generators.
3. Demonstrate the various characteristics, starting, speed control and braking operation on DC motors
4. Analyze the performance of DC machines by conducting the various tests on it.
5. Determine the parameters of equivalent circuits, performance parameters of single phase transformer and merits & demerits of autotransformer
6. Explain the construction, working, different connections, applications and testing of three phase transformer.

Unit I :
D.C. Machines: Construction, Principle of Operation, EMF Equation, Torque Equation. Armature winding – Lap, wave, single layer, double layer. Armature Reaction and commutation, method of improving commutation.

Unit II :
D.C. Generators: Types, Characteristics and Applications of D. C. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D. C. Generators as per Indian standard.

Unit III :
D.C. Motors: Types, Characteristics & Modified Characteristics, Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.

Unit IV :
Single phase Transformer: Working Operation, EMF Equation, and separation of core losses in to its component. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard. Single phase Autotransformer: - construction, working, merits, demerits and its application.

Unit V :
Three Phase Transformer: Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, Heat run test, load test, magnetic balance, vector group test on three phase transformer.

Unit VI :
Three Phase Transformer: Three-winding transformer, On load & Off load tap changers, Scott Connection, Power transformer and Distribution transformer. Waveforms of no load current & inrush current phenomenon.

Text Book:
Electrical Machines by D P Kothari & I J Nagrath Published by Tata McGraw-Hill Book Comp. New Delhi.

Reference Books:
1) C. Dawes: Electrical Engineering, Vol.I: Direct current (IV Edition), (McGraw Hill Book Company)
2) H. Cotton: Advance Electrical Technology, (Wheeler publication)
3) Indian Standard Guide for testing DC Machine. IS: 9320-1979, (Indian Standards Institution, New Delhi.)
4) Indian Standard Specification for safety transformer. IS: 1416-1972, (Indian Standards Institution, New Delhi.)

3EE04/3 EP04 – ENERGY RESOURCES AND GENERATION

Course Outcomes:
A student, on completion of this course, will be able to:
1. Explain the operation of Thermal, Hydro, Nuclear and Diesel power plants.
2. Summarize solar energy conversion, solar radiation measuring instruments, wind energy conversion and their applications.
3. Outline the principle and operation of fuel cells, ocean & tidal energy conversion, and other non-conventional energy resources.
4. Determine the various factorsand curves related to electrical load & generating plant.

Unit I:
Conventional and non conventional energy sources, Indian Energy Scenario.
Thermal and hydro power plant: Layout of Thermal power plant, Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, ash &coal handling plant, advantages & disadvantages
Layout of Hydro power plant, classification of hydro power plant according to available head, nature of load, functions of different components and their working, mini and micro hydro-electric power generation, advantages & disadvantages.

Unit II :
Nuclear and Diesel power plant: nuclear fission and fusion, Layout of Nuclear power plant, Selection of site, Functions of different components of nuclear plant, types of nuclear reactors , advantages & disadvantages of different nuclear reactors, nuclear waste disposal., safety measures.
Layout of Diesel power plant, functions of different components of diesel plant, advantages & disadvantages.

Unit III :
Solar Energy and its measurement: Solar cell, array & module, Solar constants, solar radiation at earth's surface, Solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, types of solar collectors, energy balance equation and collector efficiency.

Unit IV:
a]Fuel cells: Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cell system.

b]Wind energy :Basic principle of wind energy conversion, wind data and energy estimation, selection of site ,basic components of wind energy conversion system ,classification of WEC systems ,generating system, applications of wind energy.

Unit V :
Ocean, Tidal & Other non-conventional energy resources: Ocean energy resources, ocean energy routes, ocean thermal energy conversion, basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in single and double basin tidal system,. Operating principles of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste.

Unit VI :
Load-Generation factors: connected load, maximum demand, demand factor, load factor, diversity factors, plant capacity and utilization factor, types of loads, load curve, chronological load curve, load duration curve, energy load curve, energy duration curve, load survey, base load and peak load station.

Text Book: Generation of electrical energy by B.R.Gupta, Eurasia Publishing House, New Delhi.

Reference Books:

1. Non conventional energy resources. By G.D.Rai, Khanna Publishers New Delhi
2. Solar energy by S.P.Sukhatme Tata McGraw Hill Publication
3. Principles of Power System by V.K.Mehta, S.Chand publication.
4. Conventional energy technology by S.B.Pandya, Tata McGraw Hill Publication.

3EE05/3 EP05ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:
After successfully completing the course, the students will be able to :

1. Demonstrate the knowledge of semiconductor physics and PN Junction Diode
2. Analyze the rectifier and regulator circuits.
3. Analyze the operational parameters of BJT
4. Analyze various multistage amplifier circuits
5. Demonstrate the knowledge of JFET, MOSFET, UJT and their operational parameters

UNIT-I:
P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current , drift current, mobility and resistivity, generation and recombination of carriers, PN junction diode , zener diode, zener diode as voltage regulator, Numericals based on voltage regulator (line and load regulation, Numericals based on resistivity, conductivity, mass action law)

UNIT-II:
Half wave, full wave center tapped full wave and bridge rectifier. Filters-C, LC and their analysis, clipping and clamping, Numericals based on clipping and clamping

UNIT-III:
Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-IV

Study of typical transistor amplifier circuits i) Emitter follower, ii) Darlington emitter follower. iii) Bootstrap emitter follower, iv) RC coupled amplifier, v) Transformer coupled amplifier, vi) Cascaded amplifier, vii) Direct coupled amplifier, viii) Cascade stage.

UNIT-V :

FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm &Rds), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

UNIT-VI :

Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

Text Book: Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011.

Reference Books:

1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press
2. Microelectronic Circuits 5/3 – Sedranad Smith Oxford University Press
3. Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3EE06/3 EP06/3EX06 ELECTRICAL CIRCUIT ANALYSIS LAB

Minimum eight experiments based on the syllabus content of 3EP02 Electrical Circuit Analysis. The intensive list of experiment is given below.

1. Verification of output response of series R-C circuit for step input
2. Study of dot convention and determination of
   A) Mutual inductance
   B) Coupling coefficient of b transformer
3. Verification of Mesh and Node analysis.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of reciprocity theorem.
8. Study of Milliman's theorem& verification.
9. Verification of Norton's theorem.
10. Determination of ABCD parametersT-network &Π-network.
11. Study of Tie set and Cut set schedule for a given network.
12. MATLAB simulation for o/p verification of any theorem.
13. Determination of Z and Y parameter.
14. Determination of hybrid parameter.

3EE07/3 EP07/3EX07 ELECTRICAL MACHINES - I LAB.

Minimum eight experiments based on the syllabus content of 3EP03Electrical Machines – I.

The indicative list of experiments is given below.

1. Plot the OCC of DC generator and find its critical resistance and critical speed.
2. To study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.
5. Speed Control of DC Shunt motor by armature control & Field Control method.
6. Perform the direct load test on DC series/shunt/compound motor to plot its performance characteristics, and determine its efficiency and speed regulation.
7. Conduct the Swinburn's test on DC machine to estimate its performance at any desired load condition.
8. Conduct the Hopkinson's test on DC Machine to analyze its performance.
9. Perform Electric Braking Operation on DC shunt Motor.
10. Conduct the Polarity test and Ratio test on transformer
11. Calculate the Equivalent circuit parameters of single-phase transformer by performing OC & SC test on itand determine its efficiency and voltage regulation.

12. Perform the direct load test on single phase/three phase transformer and determine its efficiency and voltage regulation.
13. Conduct back to back test (Sumpner's test)on two single phase transformers and determine the temperature rise.
14. Conduct the magnetic balance test on three phase transformer.
15. Conduct the vector group test on three phase transformer.
16. Conversion of three phase to two phase supply system using Scott Connection
17. Capture the waveform of inrush current of single phase/three phase transformer using DSO.

Reference:

S.G.Tarnekar, P.K.Kharbanda, S.B.Bodkhe, S.D.Naik and D.J.Dahigaonkar"Laboratory Courses in Electrical Engineering", S. Chand & Co. New Delhi, 2013.

3EE08/3 EP08/3EX08 ELECTRONIC DEVICES & CIRCUITS LAB

Minimum eight experiments based on the syllabus content of 3EP05Electronic Devices & Circuits. The intensive list of experiment is given below.

1. To study and verify V-I characteristics of semiconductor diode
2. To study and verify V-I characteristics of Zener diode.
3. To verify the performance of half wave rectifier circuit with and without filter.
4. To verify the performance of full wave bridge rectifier circuit and determination of load regulation.
5. To verify the performance of Zener voltage regulator.
6. To verify characteristics of bipolar junction transistor
7. To study and perform C-E amplifier gain with variation of load resistance.
8. To study and verify the characteristics of FET
9. To study UJT as a relaxation oscillator
10. To study phase shift oscillator & determine frequency of oscillation
11. To study characteristics of MOSFT
12. To study clipper circuits using diodes
13. To study clamper circuits using diodes
14. To study and verify operation of cascade amplifiers
15. To verify operation of transistor as a switch

3EE09/3 EP09/3EX09 ELECTRICAL TECHNOLOGY - LAB

Perform minimum Eight practicals / demonstration from the following list and prepare the report as a term work for this laboratory.

1. Introduction to standard symbols used in wiring diagrams
2. Introduction to different wiring accessories.
3. Demonstration of different types of wirings eg. Domestic wiring, commercial wiring, Industrial wiring.
4. Connection of Staircase wiring, Godown wiring, fluorescent lamp. Ceiling fan, air cooler etc
5. Domestic wiring diagrams
6. Connections of switch board, MCB and energy meter
7. Testing and electrical Maintenance of domestic appliances like lamps, electric iron, heater, geyser, air cooler, fan, microwave-oven, induction heater, etc.
8. Insulation resistance and earth resistance measurement
9. Conduct the load survey for domestic/commercial /Industrial consumers
10. Illumination system Design (selection of type and number of lamps required for any location)
11. Calculation of Energy bill for LT & HT consumers.
12. Safety precautions while working with electrical system
13. Demonstration of first aid treatment after getting electric shock.
14. Study of various components of solar power plant.
15. Design calculation of small capacity roof top solar power plant

SEMESTER – IV

4EE01/4EP01/4EX01 ELECTROMAGNETIC FIELDS

Course outcomes :

At the end of the course the student should be able to:

1. Demonstrate the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field.
4. Apply Maxwell's equation in different forms (differential and integral) to diverse engineering problems.

Unit I :
Review of Vector Analysis: Cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculus. Line integral and multiple integrals. Gauss theorem.

Unit II :
Electrostatics: Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III :
Electrostatics fields in dielectrics: electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

Unit IV :
Magnetic fields: Biot-Savart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar magnetic potential, electric current, J vector..

Unit V
Magnetic fields in materials: magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI :
Maxwell equations and wave equations: Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration Poynting vector

Text Book: "Engineering Electromagnetics", by Hayt W.H. Tata Mc-Graw Hill publication

Reference Books:

1. Electromagnetic fields by TVS Arun Murthy S Chand & Co
2. Principles and applications of Electromagnetic fields by Plansycollin , Mc-Graw Hill Books Co.
3. Foundations of electromagnetic theory by John Reitz, Addison Wesley Pub Co.
4. Basic electromagnetic field by Herbert Neelf, Harber International education
5. Introduction to electromagnetic, Derucy and Johnson, Mc-Graw Hill Books Co.

4EE02/4EP02/4EX02 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Outcomes:

A student completing this course, should be able to:

1. Classify the various measuring instruments like PMMC, MI, Electrodynamometer, and Induction type instruments for measurement of current, voltage, power, and energy.
2. Demonstrate the construction & working of Instrument Transformers and special purpose meters.
3. Analyze various methods for measurement of resistance, inductance, and capacitance using AC/DC bridges.
4. Explain the working of various Digital measuring instruments.
5. Explain the generalized Instrumentation system & working of different transducers.

Unit-I: Analog Instruments - Classification of measuring instrument, Different torques in measuring instrument, Analog Ammeter, Voltmeter, Electrodynamic type Construction, ,theory of operation, torque equation, errors, merits and demerits of each type.

Unit II : Wattmeter and Energy meter-Construction, theory of operation, torque equation, errors, merits and demerits of each type.
Analysis of three phase balanced load:- Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.

Unit III : Instrument transformers- C.T.and P.T., Importance, theory and construction, phasor diagram, causes of errors, testing, and applications.
Special Instruments- Frequency meter, Power factor meter, Phase sequence indicator, Synchroscope and Stroboscope.

Unit IV: Measurement of circuit parameters- Different methods of measurement of low, medium, high value of resistance, sensitivity and accuracy of different methods. AC and DC bridges, Wheat -stone, Kelvin, Maxwell ,Wein , Hay , De-Sauty ,Schering , Owen , Anderson's bridge.

Unit V:
Digital methods of measurements, Introduction to A/D, D/A techniques , F/V and V/F conversion techniques , Digital voltmeter (DVM), ammeter, wattmeter, multi-meter and Electronic energy meter, Sources of error, Inherent error in digital meters.

Unit VI:
Generalized Instrumentation system- characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Force and torque transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers. Elastic-members (Bellows, Bourdon tube, Diaphragm)

Text Book: A.K. Sawhney, 'Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai& Co (P) L

Reference Books:

1. E.W.Golding&F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler& Co.
2. Albert D. Helfrick& William D. Cooper, 'Modern Electronic Instrumentation & Measurement Techniques', Prentice Hall of India, .
3. Joseph. J. Carr, 'Elements of Electronic Instrumentation & Measurements', III edition, Pearson Education.
4. Bouwens, A.J., "Digital Instrumentation", McGraw Hill.

4EP03 CONTROL SYSTEMS

Course Outcomes:

After completing this course, student will be able to:

1. Demonstrate the fundamental concepts of automatic Control and mathematical modeling of the Systems.
2. Determine the transfer function of control system components.
3. Analyze the time response of various systems and performance of controllers.
4. Evaluate the stability of linear systems using various methods.

Unit I : Introduction to automatic control
Open loop and closed loop system, servo-mechanisms, mathematical modeling of physical systems, transfer functions, block diagrams and signal flow graphs. Effect of feedback on sensitivity to parameter variation and reduction of the noise.

Unit II : Control System Components
Electrical / Electro-mechanical components such as A.C./D.C. servomotors, stepper motors, synchros, potentiometers, tacho-generators, encoders, their functional analysis and operating characteristics and their application.

Unit III: Time response analysis:

Time response of first and second order systems to standard inputs. Time response specifications, types of system, error analysis, error coefficients, steady state errors, dynamic error series. Approximate methods for higher order system, proportional, derivative and integral control.

Unit IV: Stability
Stability of control systems, characteristics equation, impulse response, Routh-Hurwitz stability criterion, relative stability. Root Locus: construction of root locus, determination of roots from root locus conditions on variable parameter for stability, effect of addition of poles and zeros.

Unit V: Frequency response methods
Frequency response of linear system, specification, Logarithmic frequency response (Bode) plots from transfer function for various systems. Polar plots for various systems. Estimation of approximate transfer functions from the frequency response.

Unit VI: Stability analysis from frequency response : Gain margin and Phase margin; Stability analysis from Bode plots. Nyquist criterion, Nyquist plots and stability analysis.

Books Recommended:

Text Book: Nagrath I.J., Gopal M.: Control System Engineering, Wiley Eastern.

Reference Books:

1. Control Engineering, D.Ganesh Rao, k. Chennavenkatesh, 2010, PEARSON
2. Ogata K.: Modern Control Systems, Prentice Hall of India.
3. Control Systems by K.R.Varmah TMH edition 2010
4. Linear Control Systems, Ashfaq Hussain, Haroon Ashfaq, Dhanpat Rai & co.

4EP04 NUMERICAL METHODS & OPTIMIZATION TECHNIQUES

Course Outcome:
After completing this course students will be able to

1. Solve linear and Simultaneous Equations with the help of Numerical Methods.
2. Apply various Numerical methods to fit the curve.
3. Solve Numerical differentiation, integration, and Differential Equations.
4. Solve linear, non linear and dynamic optimization problem by various methods.
5. Determine the optimum scheduling by using CPM and PERT.

Unit I:
(a)Absolute, relative and percentage errors and analysis, Solution of Algebraic and Transcendental equations: Bisection Method, False Position method, Newton Raphson methods, Successive approximation method

(b) **Solution of Simultaneous Algebraic Equations**: matrix inverse method, Gauss elimination method,Iterative method-Jacobi's Method, Gauss Seidel Method; Eigen values of a matrix.

Unit II:
(a) Curve fitting by Least Square Method, Correlations and Regression.

(b) Newton's forward and backward interpolation method, Newton's Divided Difference Method, Lagrange's Interpolation method, Interpolation with Cubic Splines.

Unit III:
Numerical differentiation by Taylor series method, Maximum and minimum values, Numerical Integration by Trapezoidal, Simpsons one third and three eight rules, Numerical solution to differential equations by Taylor Series, Euler's method, RungeKutta second and fourth order methods

Unit IV:
Basics of Optimization Techniques, Linear programming - standard form, definitions and theorems, graphical method, simplex method, two phase simplex method, balanced and unbalanced transportation problems.

Unit V:
Non linear programming: unimodal function, Fibonancci search method and golden section method, Steepest descent method, conjugate gradient method, unconstraint optimization, direct search method.

Unit VI:
Dynamic programming: multistage decision processes, principle of optimality, sub optimization, calculus and tabular method of solution, conversion of final value problem into initial value problem.

CPM and PERT: introduction, Network representation of project, critical path, Probability of completion of project, optimum scheduling by CPM, crashing of project.

Books Recommended:

Text Books:
1. Introductory Methods of Numerical Analysis; S. S. Sastry (PHI)
2. Engineering Optimization – Theory & Practice; S. S. Rao (New Age International Pvt. Ltd.)

Reference Books:

1. Mathematical Statistics by J. N. Kapoor, Tata McGraw Hill Pub. Co. Ltd
2. Numerical Methods in Engineering and Science; B. S. Grewal (Khanna Publishers)
3. PERT and CPM- Principles & Application; L. S. Srinath (Affiliated East-West press pvt. Ltd)
4. Optimization for Engineering Design - Algorithms and Examples byKalyan Moy Deb, PHI Pub.

4EE04/ 4EP05 /4EX04 ANALOG AND DIGITAL CIRCUITS

Course Outcomes:

After completing the course, students will be able to

1. Explain the principles of operational amplifiers, parameters of op-amp
2. Illustrate the linear and nonlinear applications of op-amp
3. Demonstrate the knowledge of Voltage regulator and Timer ICs
4. Describe the working of Logic families andtheir applications.
5. Demonstrate the knowledge of combinational and sequential circuits and its application

Unit I:
Introduction to IC's: Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amp, Measurement of op-amp parameter.

Unit II:
Linear and Non-linear Application of Op-amp: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder subtractor, op amp as a log and antilog amplifier

Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps.

Unit III:
Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78XX, 79XX and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, a stable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

Unit IV: Basic Logic Circuits : Logic gate characteristics, NMOS inverter, propagation delay, NMOS logic gate, CMOS inverter, CMOS logic gates, BJT inverter, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V:
Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder

Unit VI:
Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters

Books Recommended:-

Text Book: Millman, Microelectronics, 2nd Ed., McGraw Hill.

Reference Books:

1. Gayakwad, Op-Amp & LLG, 2nd Ed.
2. Malvino& Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.
3. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EE07/ 4EP06 /4EX06 ELECTRICAL MEASUREMENTS & INSTRUMENTATION- LAB

Minimum eight experiments based on the syllabus content of 4EP02 Electrical Measurements & Instrumentation. The intensive list of experiment is given below.

1. Measurements of Low resistance by using Kelvin double Bridge.
2. Measurements of Medium resistance by Ammeter Voltmeter method/Wheatstone Bridge
3. Measurement of High resistance by Loss of Charge method.
4. Measurement of Insulation resistance by using Megger

5. Measurement of unknown Inductance using Maxwell Bridge/Hay Bridge/Anderson Bridge
6. Measurement of Unknown Capacitance by Desauty Bridge/Schering Bridge
7. Measurement of frequency using Wien Bridge
8. Extension of range of ammeter using shunt/CT.
9. Extension of range of voltmeter using multiplier/PT.
10. Calibration of Wattmeter by Phantom loading
11. Calibration of energy meter to detect the error in it.
12. Measurement of active & reactive power measurement in 1 phase / 3 phase circuit.
13. Measurement of rotational speed using stroboscope
14. Conversion of non electrical quantity into its equivalent electrical quantity using proper transducer.
15. Compare the accuracy, preciseness, sensitivity of Analog & Digital Measuring Instruments.

4EP07 CONTROL SYSTEM LAB

Minimum eight experiments based on the syllabus content of 4EP03Control System. The intensive list of experiment is given below.

1. Study of Potentiometer
2. Study of A.C. Synchro and its characteristics
3. Determination of Transfer Function of D.C. Generator
4. Determination Of Transfer Function of D.C.Servomotor and Its Characteristics
5. Performance Characteristics of a D.C. Motor Angular Position Control System
6. Determination Of Frequency Response of Given R-C Network
7. Determination Of Transfer Function of A.C. Tacho-Generator
8. Experimental Study Of The Operating Characteristics of a Small Stepper Motor and Its Controller
9. Study Closed Loop PI Controller System and Its Time Response to Different Input.
10. Experimental Study of Position Control of DC Motor using Ardiuno
11. Experimental Study of Time Domain Analysis of Second Order Control System
12. Study AC Position Control System

4EE09/ 4EP08 /4EX08 ANALOG AND DIGITAL CIRCUIT LAB

Minimum eight experiments based on the syllabus content of 4EP05Analog & Digital Circuit. The intensive list of experiment is given below.

1. To Plot Frequency Response Of Non-Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
2. To Plot Frequency Response Of Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
3. To Perform Op-Amp as Differentiator Using IC741 .
4. Design The Circuit for Supplying 5V,25mA As A Low Voltage Regulator Using IC 723
5. Verification Of Truth Table Of Various Logic Gates Using ICs
6. To Study and Verify The Operation Of SR and MS ,JK Flip Flop
7. To Verify The Operation Of Multiplexer Using IC74153.
8. To Design And Verify Function Of Decade Counterusing IC 7490
9. To Verify The Truth Table Of 4 Bit Comparator
10. To Perform Op-Amp As Integrator Using IC741
11. A stable Multi-vibrator Using IC 555timer
12. To Study And Verify The Operation Of Half-Adder And Full-Adder.

4EE10/ 4EP09 /4EX09 ELECTRONIC TECHNOLOGY LAB

Perform Minimum Eight experiments / demonstration based on the following contentand prepare the report as a term work for this laboratory.

- **Study of electronic Components:** Identification of components, name, types, symbol, size, rating and application.
- **Handling Electronic Components:** Finding values and testing (using DMM), test working condition, fault detection.
- **Working with breadboards:** understanding the breadboards for component mounting, working with small circuits on breadboard

- **Soldering:**Soldering skill tips- use of proper soldering Iron, Metal, Flux**,** Cleaning, Tinning etc., mounting components on zero PCB, testing of small circuits mounted on zero PCB. De-soldering of components
- **PCB Layout and design:** Understanding different PCBs, Working on PCB Layout (Software), PCB etching, drilling on PCB, Mounting components on PCB, Working with small circuits on PCB and their testing
- **Electronic circuit Simulation:** Familiarizing with the simulation software, simulation and result validation of simple circuit with software.

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SYLLABUS OF B.E. (ELECTRICAL) SEM. III & IV [C.B.C.S.]

3EE01/3 EP01/3EX01 ENGINEERING MATHEMATICS -III

Course Outcomes:
After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Apply Z Transform to solve of various Linear Difference equations with constant coefficients.
5. Apply the knowledge of vector calculusto solve physical problems.
6. Demonstrate the basic concepts of probability and statistics.

UNIT-I:
(a) **Statistics:**Introduction, Curve fitting by method of least square, change of scale, fitting of straight line and parabola, correlation, regression. Application of statistics to electrical engineering.

(b) **Probability**: Axioms, conditional probability, Bay'stheorem,mathematical expectations, probability distributions:Binomial, Poisson and Normal.Application of probability to electrical engineering.

UNIT-II:
(a)Partial differential equation (PDE)of first order and first degree of following type-

(i) f (p, q) = 0; (ii) f (p, q, z) =0; (iii) f (p, q, x, y) = 0; (iv) Pp + Qq =R (Lagrange's Form); (v) Clairaut form Z = px + qy + f(p, q) . Applications of PDE to electrical circuits.

(b)DifferenceEquation: -Solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.Applications of difference equations to electrical engineering.

UNIT-III:
Laplace Transforms: Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Laplace transform of Periodic Function, Impulse Function, Unit Step Function. Solution of linear differential equation using Laplace transform.

UNIT-IV:
Fourier Transforms- Definition, standard forms, properties of Fourier transform,inverse Fourier transform, Fourier Transform of some basic functions.Fourier transform of Periodic Function, Impulse Function, Unit Step Function.Fourier cosine transforms. Applications of Fourier Transforms in electrical engineering.

UNIT-V:
Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

UNIT-VI:
Vector Calculus: - Scalar and Vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, Line Integral, Stokes and Divergence Theorem. Application of Vector calculus to electromagnetics.

Text Book: Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.

Reference Books:

1. Statistical Methods by S.G. Gupta
2. Advance Engineering Mathematics by B.S.Grewal
3. Integral Transforms by Goyal & Gupta.

3EE02/3 EP02/3EX02 ELECTRICAL CIRCUIT ANALYSIS

Course Outcomes:

After completing this course student twill be able to:

1. Analyze electric and magnetic circuits using basic circuital laws
2. Analyze the circuit using Network simplification theorems.
3. Solve circuit problems using concepts of electric network topology.
4. Evaluate transient response of different circuits using Laplace transform
5. Evaluate two-port network parameters and network functions

Unit I:

[a] Terminal Element Relationships: V-I relationship for Dependent &Independent , Voltage and Current Sources., Source Transformations. Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

[b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, super node analysis, mesh analysis, super mesh analysis.

Unit II:

Network Theorems: Superposition theorem, Thevenin'stheorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorem

Unit III :

Graph Theory and Network Equation:-Graph of a network, Trees and loops, Tie-set and cut set matrix of a network, Network equilibrium equations, duality-network transformation.

Unit IV:

a] **Transformation of a Circuit into s-domain:** LaplaceTransformed equivalent of inductance, capacitance and mutual inductance, Impedance and admittance in the transform domain, Node Analysis and Mesh Analysis of the transformed circuit. Complete Solution ofLinear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-for step Inputs. Natural Response, Transient Response, Determination of initial conditions.

Unit V :

Two Port Networks: Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interrelationship between parameters, Interconnection of two port networks , Input impedance in terms of two port network parameters, Output impedance, Image impedance.

Unit VI :

Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function. Applications of network analysis in driving network functions, positive real functions, driving point and transfer impedance function.

Text Book: Network Analysis, M.E. Van Valkenburg, PHI, 2005.

Reference Books:

1. Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, OxfordUniversity Press, 2010.
2. Circuit and Network Analysis, SudhakarShyammohan, Tata Mc Graw Hill, 2005.
3. Network Analysis, P. Ramesh babu, SciTech Publications, Chennai, 2009.

3EE03/3 EP03/3EX03 ELECTRICAL MACHINES – I

Course Outcomes:

After Completing this course, students will be able to:

1. Explain the construction and working of DC Machines.
2. Illustrate the different Characteristics, types, their applications and parallel Operation of D.C. Generators.
3. Demonstrate the various characteristics, starting, speed control and braking operation on DC motors
4. Analyze the performance of DC machines by conducting the various tests on it.
5. Determine the parameters of equivalent circuits, performance parameters of single phase transformer and merits & demerits of autotransformer
6. Explain the construction, working, different connections, applications and testing of three phase transformer.

Unit I :
D.C. Machines: Construction, Principle of Operation, EMF Equation, Torque Equation. Armature winding – Lap, wave, single layer, double layer. Armature Reaction and commutation, method of improving commutation.

Unit II :
D.C. Generators: Types, Characteristics and Applications of D. C. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D. C. Generators as per Indian standard.

Unit III :
D.C. Motors: Types, Characteristics & Modified Characteristics, Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.

Unit IV :
Single phase Transformer: Working Operation, EMF Equation, and separation of core losses in to its component. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard.

Single phase Autotransformer: - construction, working, merits, demerits and its application.

Unit V :
Three Phase Transformer: Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, Heat run test, load test, magnetic balance, vector group test on three phase transformer.

Unit VI :
Three Phase Transformer: Three-winding transformer, On load & Off load tap changers, Scott Connection, Power transformer and Distribution transformer. Waveforms of no load current & inrush current phenomenon.

Text Book: Electrical Machines by D P Kothari & I J Nagrath TMH. New Delhi.

Reference Books:

1) C. Dawes: Electrical Engineering, Vol.I: Direct current (IV Edition), (McGraw Hill Book Company)
2) H. Cotton: Advance Electrical Technology, (Wheeler publication)
3) Indian Standard Guide for testing DC Machine. IS: 9320-1979, (Indian Standards Institution, New Delhi.)
4) Indian Standard Specification for safety transformer. IS: 1416-1972, (Indian Standards Institution, New Delhi.)

3EE04/3 EP04 ENERGY RESOURCES AND GENERATION

Course Outcomes:
A student, on completion of this course, will be able to:

1. Explain the operation of Thermal, Hydro, Nuclear and Diesel power plants.
2. Summarize solar energy conversion, solar radiation measuring instruments, wind energy conversion and their applications.
3. Outline the principle and operation of fuel cells, ocean & tidal energy conversion, and other non-conventional energy resources.
4. Determine the various factorsand curves related to electrical load & generating plant.

Unit I :
Conventional and non conventional energy sources, Indian Energy Scenario.
Thermal and hydro power plant: Layout of Thermal power plant, Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, ash &coal handling plant, advantages & disadvantages
Layout of Hydro power plant, classification of hydro power plant according to available head, nature of load, functions of different components and their working, mini and micro hydro-electric power generation, advantages & disadvantages.

Unit II :
Nuclear and Diesel power plant: nuclear fission and fusion, Layout of Nuclear power plant, Selection of site, Functions of different components of nuclear plant, types of nuclear reactors , advantages & disadvantages of different nuclear reactors, nuclear waste disposal., safety measures.
Layout of Diesel power plant, functions of different components of diesel plant, advantages & disadvantages.

Unit III :
Solar Energy and its measurement: Solar cell, array & module, Solar constants, solar radiation at earth's surface, Solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, types of solar collectors, energy balance equation and collector efficiency.

Unit IV :
a]Fuel cells: Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cell system.

b]Wind energy :Basic principle of wind energy conversion, wind data and energy estimation, selection of site ,basic components of wind energy conversion system ,classification of WEC systems ,generating system, applications of wind energy.

Unit V :
Ocean, Tidal & Other non-conventional energy resources: Ocean energy resources, ocean energy routes, ocean thermal energy conversion, basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in single and double basin tidal system,. Operating principles of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste.

Unit VI :
Load-Generation factors: connected load, maximum demand, demand factor, load factor, diversity factors, plant capacity and utilization factor, types of loads, load curve, chronological load curve, load duration curve, energy load curve, energy duration curve, load survey, base load and peak load station.

Text Book : Generation of Electrical Energy by B.R.Gupta, Eurasia Publishing House, New Delhi.

Reference Books:

1. Non conventional energy resources. By G.D.Rai, Khanna Publishers New Delhi
2. Solar energy by S.P.Sukhatme Tata McGraw Hill Publication
3. Principles of Power System by V.K.Mehta, S.Chand publication.
4. Conventional energy technology by S.B.Pandya, Tata McGraw Hill Publication.

3EE05/3 EP05ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:

After successfully completing the course, the students will be able to :

1. Demonstrate the knowledge of semiconductor physics and PN Junction Diode
2. Analyze the rectifier and regulator circuits.
3. Analyze the operational parameters of BJT
4. Analyze various multistage amplifier circuits
5. Demonstrate the knowledge of JFET, MOSFET, UJT and their operational parameters

UNIT-I:
P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current , drift current, mobility and resistivity, generation and recombination of carriers, PN junction diode , zener diode, zener diode as voltage regulator, Numericals based on voltage regulator (line and load regulation, Numericals based on resistivity, conductivity, mass action law)

UNIT-II:
Half wave, full wave center tapped full wave and bridge rectifier. Filters-C, LC and their analysis, clipping and clamping, Numericals based on clipping and clamping

UNIT-III:
Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-IV :
Study of typical transistor amplifier circuits i) Emitter follower, ii) Darlington emitter follower. iii) Bootstrap emitter follower, iv) RC coupled amplifier, v) Transformer coupled amplifier, vi) Cascaded amplifier, vii) Direct coupled amplifier, viii) Cascade stage.

UNIT-V :
FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm &Rds), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

UNIT-VI :
Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

Text Book :
Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011.

Reference Books:

1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press
2. Microelectronic Circuits 5/3 – Sedranad Smith Oxford University Press
3. Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

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3EE06/3 EP06/3EX06 ELECTRICAL CIRCUIT ANALYSIS - LAB

Minimum eight experiments based on the syllabus content of 3EE02/3 EP02/3EX02Electrical Circuit Analysis. The intensive list of experiment is given below :

1. Verification of output response of series R-C circuit for step input
2. Study of dot convention and determination of
   A) Mutual inductance
   B) Coupling coefficient of b transformer
3. Verification of Mesh and Node analysis.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of reciprocity theorem.
8. Study of Milliman's theorem& verification.
9. Verification of Norton's theorem.
10. Determination of ABCD parametersT-network &Π-network.
11. Study of Tie set and Cut set schedule for a given network.
12. MATLAB simulation for o/p verification of any theorem.
13. Determination of Z and Yparameter.
14. Determination of hybrid parameter.

3EE07/3 EP07/3EX07 ELECTRICAL MACHINES - I LAB

Minimum eight experiments based on the syllabus content of 3EE03/3 EP03/3EX03Electrical Machines – I.

The indicative list of experiments is given below.

1. Plot the OCC of DC generator and find its critical resistance and critical speed.
2. To study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.
5. Speed Control of DC Shunt motor by armature control & Field Control method.

6. Perform the direct load test on DC series/shunt/compound motor to plot its performance characteristics, and determine its efficiency and speed regulation.
7. Conduct the Swinburn's test on DC machine to estimate its performance at any desired load condition.
8. Conduct the Hopkinson's test on DC Machine to analyze its performance.
9. Perform Electric Braking Operation on DC shunt Motor.
10. Conduct the Polarity test and Ratio test on transformer
11. Calculate the Equivalent circuit parameters of single-phase transformer by performing OC & SC test on itand determine its efficiency and voltage regulation.
12. Perform the direct load test on single phase/three phase transformer and determine its efficiency and voltage regulation.
13. Conduct back to back test (Sumpner's test)on two single phase transformers and determine the temperature rise.
14. Conduct the magnetic balance test on three phase transformer.
15. Conduct the vector group test on three phase transformer.
16. Conversion of three phase to two phase supply system using Scott Connection
17. Capture the waveform of inrush current of single phase/three phase transformer using DSO.

. **Reference:** S.G.Tarnekar, P.K.Kharbanda, S.B.Bodkhe, S.D.Naik and D.J.Dahigaonkar"Laboratory Courses in Electrical Engineering", S. Chand & Co. New Delhi, 2013.

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3EE08/3 EP08/3EX08 ELECTRONIC DEVICES & CIRCUITS - LAB

Minimum eight experiments based on the syllabus content of 3EE05/3 EP05/3EX04Electronic Devices & Circuits. The intensive list of experiment is given below :

1. To study and verify V-I characteristics of semiconductor diode
2. To study and verify V-I characteristics of Zener diode.
3. To verify the performance of half wave rectifier circuit with and without filter.
4. To verify the performance of full wave bridge rectifier circuit and determination of load regulation.
5. To verify the performance of Zener voltage regulator.
6. To verify characteristics of bipolar junction transistor
7. To study and perform C-E amplifier gain with variation of load resistance.
8. To study and verify the characteristics of FET
9. To study UJT as a relaxation oscillator
10. To study phase shift oscillator & determine frequency of oscillation
11. To study characteristics of MOSFT
12. To study clipper circuits using diodes
13. To study clamper circuits using diodes
14. To study and verify operation of cascade amplifiers
15. To verify operation of transistor as a switch

3EE09/3 EP09/3EX09 ELECTRICAL TECHNOLOGY - LAB

Perform **minimum Eight** practicals /demonstrations from the following list and prepare the report as a term work for this laboratory.

1. Introduction to standard symbols used in wiring diagrams
2. Introduction to different wiring accessories.
3. Demonstration of different types of wirings eg. Domestic wiring, commercial wiring, Industrial wiring.
4. Connection of Staircase wiring, Godown wiring, fluorescent lamp. Ceiling fan, air cooler etc
5. Domestic wiring diagrams
6. Connections of switch board, MCB and energy meter
7. Testing and electrical Maintenance of domestic appliances like lamps, electric iron, heater, geyser, air cooler, fan, microwave-oven, induction heater, etc.
8. Insulation resistance and earth resistance measurement
9. Conduct the load survey for domestic/commercial /Industrial consumers
10. Illumination system Design (selection of type and number of lamps required for any location)
11. Calculation of Energy bill for LT & HT consumers.
12. Safety precautions while working with electrical system
13. Demonstration of first aid treatment after getting electric shock.
14. Study of various components of solar power plant.
15. Design calculation of small capacity roof top solar power plant

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SEMESTER IV

4EE01/4EP01/4EX01 ELECTROMAGNETIC FIELDS

Course outcomes :

At the end of the course the student should be able to:

1. Demonstrate the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field.
4. Apply Maxwell's equation in different forms (differential and integral) to diverse engineering problems.

Unit I :
Review of Vector Analysis: Cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculus. Line integral and multiple integrals. Gauss theorem.

Unit II :
Electrostatics: Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III :
Electrostatics fields in dielectrics: electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

Unit IV :
Magnetic fields: Biot-Savart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar magnetic potential, electric current, J vector..

Unit V : Magnetic fields in materials: magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI :
Maxwell equations and wave equations: Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration Poynting vector

BOOKS RECOMMENDED:

Text Book: Engineering Electromagnetics by Hayt W.H. Tata Mc-Graw Hill publication.

Reference Books:

1. Electromagnetic fields by TVS Arun Murthy S Chand & Co

2. Principles and applications of Electromagnetic fields by Plansycollin , Mc-Graw Hill Books Co.

3. Foundations of electromagnetic theory by John Reitz, Addison Wesley Pub Co.

4. Basic electromagnetic field by Herbert Neelf, Harber International education

5. Introduction to electromagnetic, Derucy and Johnson, Mc-Graw Hill Books Co.

4EE02/4EP02/4EX02 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Outcomes:

A student completing this course, should be able to:

Classify the various measuring instruments like PMMC, MI, Electrodynamometer, and Induction type instruments used for measurement of current, voltage, power, and energy.

1. Demonstrate construction & working of Instrument Transformers and special purpose meters.
2. Analyze various methods for measurement of resistance, inductance, capacitance using bridges.
3. Explain the working of various Digital measuring instruments.
4. Explain the generalized Instrumentation system & working of different transducers used for measurement of various non electrical quantities.

Unit-I :
Analog Instruments - Classification of measuring instrument, Different torques in measuring instrument, Analog Ammeter, Voltmeter, Electrodynamic type Construction, ,theory of operation, torque equation, errors, merits and demerits of each type.

Unit II :

Wattmeter and Energy meter-Construction, theory of operation, torque equation, errors, merits and demerits of each type. Analysis of three phase balanced load:- Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.

Unit III :

Instrument transformers- C.T.and P.T., Importance, theory and construction, phasor diagram, causes of errors, testing, and applications. Special Instruments- Frequency meter, Power factor meter, Phase sequence indicator, Synchroscopeand Stroboscope.

Unit IV:
Measurement of circuit parameters- Different methods of measurement of low, medium, high value of resistance, sensitivity and accuracy of different methods. AC and DC bridges, Wheat -stone, Kelvin, Maxwell , Wein , Hay , De-Sauty ,Schering , Owen , Anderson's bridge.

Unit V:
Digital methods of measurements, Introduction to A/D, D/A techniques , F/V and V/F conversion techniques , Digital voltmeter (DVM), ammeter, wattmeter, multimeter and Electronic energy meter, Sources of error, Inherent error in digital meters.

Unit VI:
Generalized Instrumentation system- characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Force and torque transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers. Elastic-members (Bellows, Bourdon tube, Diaphragm)

Text Book: A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpat Rai & Co (P) Ltd.

Reference Books:

1. E.W.Golding&F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler& Co.
2. Albert D. Helfrick& William D. Cooper, 'Modern Electronic Instrumentation & Measurement Techniques', Prentice Hall of India, .
3. Joseph. J. Carr, 'Elements of Electronic Instrumentation & Measurements', III edition, Pearson Education.
4. Bouwens, A.J., "Digital Instrumentation", McGraw Hill

4EE03/4EX03 POWER SYSTEM – I

Course Outcomes:

At the end of the course the student should be able to:

1. Calculate the transmission line parameters like resistance, inductances and capacitances.
2. Explain the various configurations of line conductors and their effects on the line parameters.
3. Estimate the electrical characteristics of transmission lines and hence to evaluate the performance of the lines.
4. Draw the single line diagram of any electrical system.
5. Perform the per unit calculation of any electrical system.
6. Apply knowledge of voltage control and power factor improve methods practically.
7. Perform the load flow or power flow methods to any electrical system.
8. Design HV, EHV lines, insulators used.
9. Evaluate the mechanical parameters of line supports.
10. draw the various underground cable configurations and to calculate their electrical parameters.

Unit I
Transmission line parameters: Calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on capacitance, interference with communication lines.

Unit II
Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal Π and nominal T representations, Ferranti effect, corona phenomenon, effect of corona. Representation of power systems: per unit system and one-line reactance diagrams

Unit III

Voltage control and power factor improvement: Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers.

Unit IV

Load flow studies: Load flow problem, classification of buses, network modelling, Y-bus matrix, load flow equation, Gauss-Seidel and Newton-Raphson methods, and comparison of these methods.

Unit V

Mechanical design: Materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Line supports for LV, HV and EHV, sag calculation.

Unit VI

Underground cables: Material used for conductor & insulation, different types of cables and their manufacture, parameters of underground cable, grading of cable.

Text Book: C.L.Wadhwa, Engineering Electrical Power Systems, , 6th Edition 2010, New Age International Pub.

Reference Books:

1.Power System Engineering by D.P.Kothari, I.J.Nagrath TMH 2nd edition, 9th reprint 2010.
2.Power System Analysis, N.V.Ramana, PEARSON education, 2010.
3.Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, Pearson Education.

4EE04/ 4EP05 /4EX04 ANALOG AND DIGITAL CIRCUITS

Course Outcomes:

After completing the course, students will be able to

1. Explain the principles of operational amplifiers, parameters of op-amp
2. Illustrate the linear and nonlinear applications of op-amp
3. Demonstrate the knowledge of Voltage regulator and Timer ICs
4. Describe the working of Logic families andtheir applications.
5. Demonstrate the knowledge of combinational and sequential circuits and its application

Unit I:

Introduction to IC's: Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amp, Measurement of op-amp parameter.

Unit II:

Linear and Non-linear Application of Op-amp: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder subtractor, op amp as a log and antilog amplifier

Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps.

Unit III:

Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78XX, 79XX and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, a stable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

Unit IV:

Basic Logic Circuits : Logic gate characteristics, NMOS inverter, propagation delay, NMOS logic gate, CMOS inverter, CMOS logic gates, BJT inverter, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V:

Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder

Unit VI:

Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters

Text Book: Millman, Microelectronics, 2nd Ed., McGraw Hill.

Reference Books:

1. Gayakwad, Op-Amp & LLG, 2nd Ed.
2. Malvino& Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.
3. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EE05/4EX05 SIGNALS & SYSTEMS

Course Outcomes:

After completing the course, students will be able to

1. Understand importance and applications of signals and systems
2. Classify Systems into various categories
3. Perform convolution of Analog and Discrete time signals
4. Convert Analog signal into discrete signal by using Sampling Method
5. Apply CTFT,Z-Transform, DTFT, FFT for the analysis of Various Signals and Systems

SECTION-A

Unit-I :

Introduction to Signals and Systems: Signals and Systems, Classification of Signals, Classification of Systems, Some Ideal Signals, Energy and Power Signals, Discretization of Continuous-Time Signals, Analysis of Continuous-Time Systems, Time Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit-II :

Fourier series and Its Properties Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit-III :

Analysis of LTI Discrete-Time Systems: Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

SECTION-B

Unit-IV :

Sampling: Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit-V :

The Z Transform: The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit-VI :

Discrete Fourier Transform and Fast Fourier Transform Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform

Books Recommended:

1. Signals and systems, Oppenheim and Schafer Prentice Hall India of India 2nd Edition 1997

2. Principles of Linear Systems & Signals, 2E (international version) – Lathi B. P. Oxford University Press

3. Signals &Systems, Smarajit Ghosh, PEARSON education, 2006.

4. Signals And Systems , S. Haykin, 2nd Edition, John Wiley And Sons 1999.

5. Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005.

4EE07/ 4EP06 /4EX0 ELECTRICAL MEASUREMENTS & INSTRUMENTATION - LAB

Minimum Eight experiments based on the syllabus content of 4EE02/4EP02/4EX02Electrical Measurements & Instrumentation. The intensive list of experiment is given below.

1. Measurements of Low resistance by using Kelvin double Bridge.
2. Measurements of Medium resistance by Ammeter Voltmeter method/Wheatstone Bridge
3. Measurement of High resistance by Loss of Charge method.
4. Measurement of Insulation resistance by using Megger
5. Measurement of unknown Inductance using Maxwell Bridge/Hay Bridge/Anderson Bridge
6. Measurement of Unknown Capacitance by Desauty Bridge/Schering Bridge
7. Measurement of frequency using Wien Bridge
8. Extension of range of ammeter using shunt/CT.
9. Extension of range of voltmeter using multiplier/PT.
10. Calibration of Wattmeter by Phantom loading
11. Calibration of energy meter to detect the error in it.
12. Measurement of active & reactive power measurement in 1 phase / 3 phase circuit.
13. Measurement of rotational speed using stroboscope
14. Conversion of non electrical quantity into its equivalent electrical quantity using proper transducer.
15. Compare the accuracy, preciseness, sensitivity of Analog & Digital Measuring Instruments.

4EE08/4EX07 POWER SYSTEMS I - LAB

Minimum Eight experiments based on the syllabus content of 4EE03/4EX03 Power System – I

The intensive list of experiment is given below.

1. To study the performance of a transmission line (using a nominal T and π methods).
2. To calculate A,B,C,D parameters for a transmission line by using nominal T method (either using model or simulation).
3. To calculate A,B,C,D parameters for a transmission line by using nominal π method (either using model or simulation).
4. To study skin effect, proximity effect and Ferranti effect in transmission line.
5. To study Corona phenomenon and corona loss and its control in transmission line.
6. To study conversion of single line diagram to impedance diagram and reactance diagram for a typical power system.
7. To draw the circle diagram for a typical power system.
8. Study of a tap changing transformer (ON and OFF load tap changing).
9. Study of static VAR generator and synchronous condenser.
10. Load flow study for a typical power system (A simulation).
11. To study different types of insulators used in power system.
12. To conduct a dry and wet test on a pin type insulator.
13. To conduct a flashover test on a suspension type insulator.
14. To study a horn gap.
15. To study different types of power cables.
16. To study testing of cables.

Note: One may use models, simulation, numerical, drawing sheets or Experimentation for conducting the above experiments.

4EE09/ 4EP08 /4EX08 ANALOG AND DIGITAL CIRCUIT - LAB

Minimum Eight experiments based on the syllabus content of 4EE04/ 4EP05 /4EX04Analog & Digital Circuit. The intensive list of experiment is given below.

1. To Plot Frequency Response Of Non-Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
2. To Plot Frequency Response Of Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
3. To Perform Op-Amp as Differentiator Using IC741 .
4. Design The Circuit for Supplying 5V,25mA As A Low Voltage Regulator Using IC 723
5. Verification Of Truth Table Of Various Logic Gates Using ICs
6. To Study and Verify The Operation Of SR and MS ,JK Flip Flop
7. To Verify The Operation Of Multiplexer Using IC74153.
8. To Design And Verify Function Of Decade Counterusing IC 7490
9. To Verify The Truth Table Of 4 Bit Comparator

10. To Perform Op-Amp As Integrator Using IC741
11. A stable Multi-vibrator Using IC 555timer
12. To Study And Verify The Operation Of Half-Adder And Full-Adder

4EE10/ 4EP09 /4EX09 ELECTRONIC TECHNOLOGY - LAB

Perform **Minimum Eight** experiments / demonstration based on the following contents and prepare the report as a term work for this laboratory.

- **Study of electronic Components:** Identification of components, name, types, symbol, size, rating and application.
- **Handling Electronic Components:** Finding values and testing (using DMM), test working condition, fault detection.
- **Working with breadboards:** understanding the breadboards for component mounting, working with small circuits on breadboard
- **Soldering:**Soldering skill tips- use of proper soldering Iron, Metal, Flux**,** Cleaning, Tinning etc., mounting components on zero PCB, testing of small circuits mounted on zero PCB. De-soldering of components
- **PCB Layout and design:** Understanding different PCBs, Working on PCB Layout (Software), PCB etching, drilling on PCB, Mounting components on PCB, Working with small circuits on PCB and their testing
- **Electronic circuit Simulation:** Familiarizing with the simulation software, simulation and result validation of simple circuit with software.

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SYLLABUS OF SEM. III & IV B.E. (ELECTRICAL & ELECTRONICS ENGG.)

Semester-III

3EE01/3 EP01/3EX01 ENGINEERING MATHEMATICS -III

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the knowledge of differential equations and partial differential equations, applied to electrical engineering systems.
2. Apply Laplace transform to solve differential equations.
3. Demonstrate the use of Fourier Transform to connect the time domain and frequency domain.
4. Apply Z Transform to solve of various Linear Difference equations with constant coefficients.
5. Apply the knowledge of vector calculusto solve physical problems.
6. Demonstrate the basic concepts of probability and statistics.

UNIT-I:

(a) **Statistics:**Introduction, Curve fitting by method of least square, change of scale, fitting of straight line and parabola, correlation, regression. Application of statistics to electrical engineering.

(b) **Probability**: Axioms, conditional probability, Bay'stheorem,mathematical expectations, probability distributions:Binomial, Poisson and Normal.Application of probability to electrical engineering.

UNIT-II:

(a)Partial differential equation (PDE)of first order and first degree of following type-

(i) f (p, q) = 0; (ii) f (p, q, z) =0; (iii) f (p, q, x, y) = 0; (iv) Pp + Qq =R (Lagrange's Form); (v) Clairaut form Z = px + qy + f(p, q) . Applications of PDE to electrical circuits.

(b)DifferenceEquation: -Solution of difference equations of first order, solution of difference equations of higher order with constant coefficient.Applications of difference equations to electrical engineering.

UNIT-III:

Laplace Transforms: Definition, standard forms, properties of Laplace transform, inverse Laplace transform, Laplace transform of some basic functions, initial and final value theorem, convolution theorem, Laplace transform of Periodic Function, Impulse Function, Unit Step Function. Solution of linear differential equation using Laplace transform.

UNIT-IV:

Fourier Transforms- Definition, standard forms, properties of Fourier transform,inverse Fourier transform, Fourier Transform of some basic functions.Fourier transform of Periodic Function, Impulse Function, Unit Step Function.Fourier cosine transforms. Applications of Fourier Transforms in electrical engineering.

UNIT-V:

Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

UNIT-VI: Vector Calculus: - Scalar and Vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, Line Integral, Stokes and Divergence Theorem. Application of Vector calculus to electromagnetics.

Text Book: Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.

Reference Books:

1. Statistical Methods by S.G. Gupta
2. Advance Engineering Mathematics by B.S.Grewal
3. Integral Transforms by Goyal & Gupta.

3EE02/3 EP02/3EX02 ELECTRICAL CIRCUIT ANALYSIS

Course Outcomes:

After completing this course studentwill be able to:

1. Analyze electric and magnetic circuits using basic circuital laws
2. Analyze the circuit using Network simplification theorems.
3. Solve circuit problems using concepts of electric network topology.
4. Evaluate transient response of different circuits using Laplace transform
5. Evaluate two-port network parameters and network functions

Unit I:

a] Terminal Element Relationships: V-I relationship for Dependent &Independent , Voltage and Current Sources., Source Transformations. Source Functions: unit impulse, unit step, unit ramp and interrelationship, sinusoidal input, generalized exponential input.

Magnetic Circuits: concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, Analysis of series and parallel magnetic circuits.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, super node analysis, mesh analysis, super mesh analysis.

Unit II:

Network Theorems: Superposition theorem, Thevenin'stheorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Millman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorem

Unit III :

Graph Theory and Network Equation:-Graph of a network, Trees and loops, Tie-set and cut set matrix of a network, Network equilibrium equations, duality-network transformation.

Unit IV:

a] **Transformation of a Circuit into s-domain:** LaplaceTransformed equivalent of inductance, capacitance and mutual inductance, Impedance and admittance in the transform domain, Node Analysis and Mesh Analysis of the transformed circuit. Complete Solution ofLinear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-for step Inputs. Natural Response, Transient Response, Determination of initial conditions.

Unit V :

Two Port Networks: Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Hybrid parameters, Condition for reciprocity and symmetry of a two port network, Interrelationship between parameters, Interconnection of two port networks , Input impedance in terms of two port network parameters, Output impedance, Image impedance.

Unit VI :

Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function. Applications of network analysis in driving network functions, positive real functions, driving point and transfer impedance function.

Text Book: Network Analysis, M.E. Van Valkenburg, PHI, 2005.

Reference Books:

1. Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, OxfordUniversity Press, 2010.
2. Circuit and Network Analysis, SudhakarShyammohan, Tata Mc Graw Hill, 2005.
3. Network Analysis, P. Ramesh babu, SciTech Publications, Chennai, 2009.

3EE03/3 EP03/3EX03 -ELECTRICAL MACHINE - I

Course Outcomes:

After Completing this course, students will be able to:

1. Explain the construction and working of DC Machines.
2. Illustrate the different Characteristics, types, their applications and parallel Operation of D.C. Generators.
3. Demonstrate the various characteristics, starting, speed control and braking operation on DC motors
4. Analyze the performance of DC machines by conducting the various tests on it.
5. Determine the parameters of equivalent circuits, performance parameters of single phase transformer and merits & demerits of autotransformer
6. Explain the construction, working, different connections, applications and testing of three phase transformer.

Unit I

D.C. Machines: Construction, Principle of Operation, EMF Equation, Torque Equation. Armature winding – Lap, wave, single layer, double layer. Armature Reaction and commutation, method of improving commutation.

Unit II

D.C. Generators: Types, Characteristics and Applications of D. C. Generators, Parallel Operation of D.C. Generators, Introduction to testing of D. C. Generators as per Indian standard.

Unit III

D.C. Motors: Types, Characteristics & Modified Characteristics, Applications of D.C. Motors. Starting, Electric Braking, Speed Control of DC Motors. Losses, efficiency and testing of DC Motors.

Unit IV

Single phase Transformer: Working Operation, EMF Equation, and separation of core losses in to its component. Equivalent Circuit, Parallel Operation. Open Circuit, Short Circuit & Sumpner's test on transformer as per Indian standard.

Single phase Autotransformer: - construction, working, merits, demerits and its application.

Unit V : Three Phase Transformer: Construction, Working, Types, connections, vector group connections, open delta Connection, OC, SC, Heat run test, load test, magnetic balance, vector group test on three phase transformer.

Unit VI :

Three Phase Transformer: Three-winding transformer, On load & Off load tap changers, Scott Connection, Power transformer and Distribution transformer. Waveforms of no load current & inrush current phenomenon.

Text Book: Electrical Machines by D P Kothari & I J Nagrath, Tata McGraw-Hill , New Delhi.

Reference Books:

1) C. Dawes: Electrical Engineering, Vol.I: Direct current (IV Edition), (McGraw Hill Book Company)
2) H. Cotton: Advance Electrical Technology, (Wheeler publication)
3) Indian Standard Guide for testing DC Machine. IS: 9320-1979, (Indian Standards Institution, New Delhi.)
4) Indian Standard Specification for safety transformer. IS: 1416-1972, (Indian Standards Institution, New Delhi.)

3EX04 ELECTRONIC DEVICES AND CIRCUITS

Course Outcomes:
After successfully completingthecourse, thestudents will be ableto

1. Demonstrate the knowledge of semiconductor physics and PN Junction Diode
2. Analyze the rectifier and regulator circuits.
3. Analyze the operational parameters of BJT
4. Analyze various multistage amplifier circuits
5. Demonstrate the knowledge of JFET, MOSFET, UJT and their operational parameters

UNIT-I:
P-N Junction diode theory, Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current , drift current, mobility and resistivity, generation and recombination of carriers, PN junction diode , zener diode, zener diode as voltage regulator, Numericals based on voltage regulator (line and load regulation, Numericals based on resistivity, conductivity, mass action law)

UNIT-II: Half wave, full wave center tapped full wave and bridge rectifier. Filters-C, LC and their analysis, clipping and clamping, Numericals based on clipping and clamping

UNIT-III:
Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-IV
Study of typical transistor amplifier circuits i) Emitter follower, ii) Darlington emitter follower. iii) Bootstrap emitter follower, iv) RC coupled amplifier, v) Transformer coupled amplifier, vi) Cascaded amplifier, vii) Direct coupled amplifier, viii) Cascade stage.

UNIT-V :
FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm &Rds), Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

UNIT-VI :
Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

Text Book:
Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011

Reference Books:

1. Electronic Devices and Circuits 5/e – David Bell Oxford University Press
2. Microelectronic Circuits 5/3 – Sedranad Smith Oxford University Press
3. Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3EX05 ELECTRONIC COMMUNICATION THEORY

Course Outcomes:
After successfully completing the course, the students will be able to

- Understand different types of communication noise
- Perform the signal analysis and transformation
- Understand the concept of wave propagation and RF transmission lines
- get acquaint with basic Antenna Theory

SECTION-A

Unit I: Signal and Noise : Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic, Frequency response, bandwidth, bandwidth requirement for different types of signals such as telephone speech, music and video. External and Internal noise, signal to noise ratio, noise figure, noise factor measurement, equivalent noise Temperature.

Unit II: Signal Analysis : Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density.

Unit III: Probability and Random Signal Theory: Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions.

SECTION-B

Unit IV: Wave Propagation : Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading.

Unit V: RF Transmission Lines : Parallel and coaxial transmission line, equivalent circuit of transmission line, standing wave, characteristic(shunt) impedance, quarter wave and half wave length transform.

Unit VI: Antenna Basics & Types of Antenna : Principle of radiation, antenna power gain, beam width, polarization, bandwidth and radiation resistance, Isotropic radiator, Resonant antenna: Half wave, Folded dipole antenna, Non resonant antenna, antenna arrays, parasitic reflector, parasitic director, design of yagi-uda antenna (up to 5 elements) Long, wire, helical, rhombic, discone, log periodic, loop antenna, low, medium and high frequency antenna.

Text Books:

(1) Kennedy G.: "Electronic Communication System" Tata Mc-Graw Hill Co., NewDelhi (Third Edition)
(2) SimonHaykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

Reference Books :

(1) CollinsDennis,Collins John "Electronic Communications" (PHI)
(2) B. P. Lathi : " Modern Digital and Analog Communication systems" 3rd Edition, Oxford Uni. Press, New Delhi.
(3) Taub and Schilling D.L. : Principles of Communication Systems, McHill Co, Tokyo, 1994 (2/e.)

3EE06/3 EP06/3EX06 ELECTRICAL CIRCUIT ANALYSIS LAB

Minimum eight experiments based on the syllabus content of 3EE02/3 EP02/3EX02Electrical Circuit Analysis. The intensive list of experiment is given below.

1. Verification of output response of series R-C circuit for step input
2. Study of dot convention and determination of
   A) Mutual inductance
   B) Coupling coefficient of b transformer
3. Verification of Mesh and Node analysis.
4. Verification of Superposition theorem.
5. Verification of Thevenin's theorem.
6. Verification of Maximum Power Transfer theorem.
7. Verification of reciprocity theorem.
8. Study of Milliman's theorem& verification.
9. Verification of Norton's theorem.
10. Determination of ABCD parametersT-network &Π-network.
11. Study of Tie set and Cut set schedule for a given network.
12. MATLAB simulation for o/p verification of any theorem.
13. Determination of Z and Yparameter.
14. Determination of hybrid parameter.

3EE07/3 EP07/3EX07 ELECTRICAL MACHINES - I LAB

Minimum eight experiments based on the syllabus content of 3EX03Electrical Machines – I.

The indicative list of experiments is given below.

1. Plot the OCC of DC generator and find its critical resistance and critical speed.
2. To study the build-up of DC shunt generator, calculate critical resistance at different speeds.
3. Plot/Compare: External, Internal Characteristics of DC Shunt/series/compound generator.
4. Calculate the efficiency and voltage regulation of DC generator by the direct load test.
5. Speed Control of DC Shunt motor by armature control & Field Control method.

6. Perform the direct load test on DC series/shunt/compound motor to plot its performance characteristics, and determine its efficiency and speed regulation.
7. Conduct the Swinburn's test on DC machine to estimate its performance at any desired load condition.
8. Conduct the Hopkinson's test on DC Machine to analyze its performance.
9. Perform Electric Braking Operation on DC shunt Motor.
10. Conduct the Polarity test and Ratio test on transformer
11. Calculate the Equivalent circuit parameters of single-phase transformer by performing OC & SC test on itand determine its efficiency and voltage regulation.
12. Perform the direct load test on single phase/three phase transformer and determine its efficiency and voltage regulation.
13. Conduct back to back test (Sumpner's test)on two single phase transformers and determine the temperature rise.
14. Conduct the magnetic balance test on three phase transformer.
15. Conduct the vector group test on three phase transformer.
16. Conversion of three phase to two phase supply system using Scott Connection
17. Capture the waveform of inrush current of single phase/three phase transformer using DSO.

Reference:

S.G.Tarnekar, P.K.Kharbanda, S.B.Bodkhe, S.D.Naik and D.J.Dahigaonkar"Laboratory Courses in Electrical Engineering", S. Chand & Co. New Delhi, 2013.

3EE08/3 EP08/3EX08 ELECTRONIC DEVICES & CIRCUITS LAB

Minimum eight experiments based on the syllabus content of 3EE05/3 EP05/3EX04 Electronic Devices & Circuits. The intensive list of experiment is given below.

1. To study and verify V-I characteristics of semiconductor diode
2. To study and verify V-I characteristics of Zener diode.
3. To verify the performance of half wave rectifier circuit with and without filter.
4. To verify the performance of full wave bridge rectifier circuit and determination of load regulation.
5. To verify the performance of Zener voltage regulator.
6. To verify characteristics of bipolar junction transistor
7. To study and perform C-E amplifier gain with variation of load resistance.
8. To study and verify the characteristics of FET
9. To study UJT as a relaxation oscillator
10. To study phase shift oscillator & determine frequency of oscillation
11. To study characteristics of MOSFT
12. To study clipper circuits using diodes
13. To study clamper circuits using diodes
14. To study and verify operation of cascade amplifiers
15. To verify operation of transistor as a switch

3EE09/3 EP09/3EX09 ELECTRICAL TECHNOLOGY LAB

Perform minimum Eight practicals / demonstration from the following list and prepare the report as a term work for this laboratory.

1. Introduction to standard symbols used in wiring diagrams
2. Introduction to different wiring accessories.
3. Demonstration of different types of wirings eg. Domestic wiring, commercial wiring, Industrial wiring.
4. Connection of Staircase wiring, Godown wiring, fluorescent lamp. Ceiling fan, air cooler etc
5. Domestic wiring diagrams
6. Connections of switch board, MCB and energy meter
7. Testing and electrical Maintenance of domestic appliances like lamps, electric iron, heater, geyser, air cooler, fan, microwave-oven, induction heater, etc.
8. Insulation resistance and earth resistance measurement
9. Conduct the load survey for domestic/commercial /Industrial consumers
10. Illumination system Design (selection of type and number of lamps required for any location)
11. Calculation of Energy bill for LT & HT consumers.
12. Safety precautions while working with electrical system
13. Demonstration of first aid treatment after getting electric shock.
14. Study of various components of solar power plant.
15. Design calculation of small capacity roof top solar power plant

SEMESTER – IV

4EE01/4EP01/4EX01 ELECTROMAGNETIC FIELDS

Course outcomes :

At the end of the course the student should be able to:

1. Demonstrate the basic mathematical concepts related to electromagnetic vector fields.
2. Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
3. Apply the principles of magneto statics to the solutions of problems relating to magnetic field.
4. Apply Maxwell's equation in different forms (differential and integral) to diverse engineering problems.

Unit I : Review of Vector Analysis: Cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculus. Line integral and multiple integrals. Gauss theorem.

Unit II : Electrostatics: Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III : Electrostatics fields in dielectrics: electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

Unit IV : Magnetic fields: Biot-Savart law, Ampere's law in integral and differential form. Continuity equation, time of relaxation. Vector and Scalar magnetic potential, electric current, J vector..

Unit V : Magnetic fields in materials: magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI : Maxwell equations and wave equations: Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration Poynting vector

Books Recommended:

Text Book: Engineering Electro- magnetics by Hayt W.H. Tata Mc-Graw Hill publication

Reference Books:

1. Electromagnetic fields by TVS Arun Murthy S Chand & Co
2. Principles and applications of Electromagnetic fields by Plansycollin , Mc-Graw Hill Books Co.
3. Foundations of electromagnetic theory by John Reitz, Addison Wesley Pub Co.
4. Basic electromagnetic field by Herbert Neelf, Harber International education
5. Introduction to electromagnetic, Derucy and Johnson, Mc-Graw Hill Books Co.

4EE02/4EP02/4EX02 ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Course Outcomes:

A student completing this course, should be able to:

1. Classify the various measuring instruments like PMMC, MI, Electrodynamometer, and Induction type instruments for measurement of current, voltage, power, and energy.
2. Demonstrate the construction & working of Instrument Transformers/special purpose meters.
3. Analyze various methods for measurement of resistance, inductance, capacitance using bridges.
4. Explain the working of various Digital measuring instruments.
5. Explain the generalized Instrumentation system & working of different transducers used for measurement of various non electrical quantities.

Unit-I :
Analog Instruments - Classification of measuring instrument, Different torques in measuring instrument, Analog Ammeter, Voltmeter, Electrodynamic type Construction, ,theory of operation, torque equation, errors, merits and demerits of each type.

Unit II : Wattmeter and Energy meter-Construction, theory of operation, torque equation, errors, merits and demerits of each type. Analysis of three phase balanced load:- Blondell's theorem, Measurement of active and reactive power in single phase and three phase circuits.

Unit III :

Instrument transformers- C.T.and P.T., Importance, theory and construction, phasor diagram, causes of errors, testing, and applications.

Special Instruments- Frequency meter, Power factor meter, Phase sequence indicator, Synchroscopeand Stroboscope.

Unit IV:

Measurement of circuit parameters- Different methods of measurement of low, medium, high value of resistance, sensitivity and accuracy of different methods. AC and DC bridges, Wheat -stone, Kelvin, Maxwell , Wein , Hay , De-Sauty ,Schering , Owen , Anderson's bridge

Unit V:

Digital methods of measurements,Introduction to A/D, D/A techniques , F/V and V/F conversion techniques , Digital voltmeter (DVM), ammeter, wattmeter, multimeter and Electronic energy meter, Sources of error, Inherent error in digital meters

Unit VI:

Generalized Instrumentation system- characteristics of measurement and Instrumentation system. Transducers: Definition, classification, Specification, selection, loading effect, Displacement, velocity transducers, Force and torque transducers, Resistive, inductive, Capacitive, strain gauge transducers, Piezoelectric, current and voltage transducers. Elastic-members (Bellows, Bourdon tube, Diaphragm)

Text Book: A.K. Sawhney, 'Electrical & Electronic Measurements and Instrumentation', Dhanpat Rai& Co (P) Ltd.

Reference Books:

1. E.W.Golding&F.C.Widdis, 'Electrical Measurements & Measuring Instruments', A.H.Wheeler& Co.
2. Albert D. Helfrick& William D. Cooper, 'Modern Electronic Instrumentation & Measurement Techniques', Prentice Hall of India, .
3. Joseph. J. Carr, 'Elements of Electronic Instrumentation & Measurements', III edition, Pearson Education.
4. Bouwens, A.J., "Digital Instrumentation", McGraw Hill.

. **4EE03/4EX03 POWER SYSTEM - I**

Course Outcomes:

At the end of the course the student should be able to:

1. Calculate the transmission line parameters like resistance, inductances and capacitances.
2. Explain the various configurations of line conductors and their effects on the line parameters.
3. Estimate the electrical characteristics of transmission lines and hence to evaluate the performance of the lines.
4. Draw the single line diagram of any electrical system.
5. Perform the per unit calculation of any electrical system.
6. Apply knowledge of voltage control and power factor improve methods practically.
7. Perform the load flow or power flow methods to any electrical system.
8. Design HV, EHV lines, insulators used.
9. Evaluate the mechanical parameters of line supports.
10. draw the various underground cable configurations and to calculate their electrical parameters.

Unit I :

Transmission line parameters: Calculation of resistance, inductance and capacitance of single phase and three phase transmission lines, skin effect and proximity effect, transposition, G.M.D. & G.M.R. methods, double circuit lines, bundled conductors, effect of earth on capacitance, interference with communication lines.

Unit II :

Electrical characteristics of transmission line : V-I characteristics of short, medium and long lines, A, B, C, D constants, nominal Π and nominal T representations, Ferranti effect, corona phenomenon, effect of corona. Representation of power systems: per unit system and one-line reactance diagrams

Unit III :

Voltage control and power factor improvement: Receiving and sending end power circle diagrams, methods of voltage control and power factor improvement, use of static VAR generators and synchronous phase modifiers.

Unit IV : Load flow studies: Load flow problem, classification of buses, network modelling, Y-bus matrix, load flow equation, Gauss-Seidel and Newton-Raphson methods, and comparison of these methods.

Unit V :

Mechanical design: Materials used, types of insulators, comparison of pin type and suspension type insulators, voltage distribution and string efficiency, methods of increasing string efficiency, grading rings and arcing horns. Line supports for LV, HV and EHV, sag calculation.

Unit VI :

Underground cables: Material used for conductor & insulation, different types of cables and their manufacture, parameters of underground cable, grading of cable.

Text Book: C.L.WadhwaEngineering Electrical Power Systems, , 6th Edition 2010, New Age International Pub.

Reference Books:

1.Power System Engineering by D.P.Kothari, I.J.Nagrath TMH 2nd edition, 9th reprint 2010
2.Power System Analysis, N.V.Ramana, PEARSON education, 2010.
3.Power System Analysis, Arthur R. Bergen, Vijay Vittal,2nd Edition, 2009, Pearson Education.

4EE04/ 4EP05 /4EX04 ANALOG AND DIGITAL CIRCUITS

Course Outcomes:

After completing the course, students will be able to

1. Explain the principles of operational amplifiers, parameters of op-amp
2. Illustrate the linear and nonlinear applications of op-amp
3. Demonstrate the knowledge of Voltage regulator and Timer ICs
4. Describe the working of Logic families andtheir applications.
5. Demonstrate the knowledge of combinational and sequential circuits and its application

Unit I:

Introduction to IC's: Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amp, Measurement of op-amp parameter.

Unit II:

Linear and Non-linear Application of Op-amp: Inverting and non inverting amplifiers, voltage follower, integrator, differentiator differential amplifier, op amp as adder subtractor, op amp as a log and antilog amplifier

Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps.

Unit III:

Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78XX, 79XX and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, a stable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

Unit IV:

Basic Logic Circuits : Logic gate characteristics, NMOS inverter, propagation delay, NMOS logic gate, CMOS inverter, CMOS logic gates, BJT inverter, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V:

Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder

Unit VI:

Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters

Text Book: Millman, Microelectronics, 2nd Ed., McGraw Hill.

Reference Books:

1. Gayakwad, Op-Amp & LLG, 2nd Ed.
4. Malvino& Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.
5. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EE05/4EX05 SIGNALS & SYSTEMS

Course Outcomes:
After completing the course, students will be able to

1. Understand importance and applications of signals and systems
2. Classify Systems into various categories
3. Perform convolution of Analog and Discrete time signals
4. Convert Analog signal into discrete signal by using Sampling Method
5. Apply CTFT,Z-Transform, DTFT, FFT for the analysis of Various Signals and Systems.

Unit-I :
Introduction to Signals and Systems: Signals and Systems, Classification of Signals, Classification of Systems, Some Ideal Signals, Energy and Power Signals, Discretization of Continuous-Time Signals, Analysis of Continuous-Time Systems, Time Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit-II :
Fourier series and Its Properties Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit-III :
Analysis of LTI Discrete-Time Systems: Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

Unit-IV :
Sampling: Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit-V :
The Z Transform: The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit-VI :
Discrete Fourier Transform and Fast Fourier Transform Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform

Text Book: Signals and systems, Oppenheim and Schafer PHI. 2nd Edition 1997

Reference Books:
1. Signals &Syatems, Smarajit Ghosh, PEARSON education, 2006
2. Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999
3. Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005

4EX06 ELECTRICAL MEASUREMENTS & INSTRUMENTATION- LAB

Minimum eight experiments based on the syllabus content of 4EE02/4EP02/4EX02Electrical Measurements & Instrumentation. The intensive list of experiment is given below.

1. Measurements of Low resistance by using Kelvin double Bridge.
2. Measurements of Medium resistance by Ammeter Voltmeter method/Wheatstone Bridge

3. Measurement of High resistance by Loss of Charge method.
4. Measurement of Insulation resistance by using Megger
5. Measurement of unknown Inductance using Maxwell Bridge/Hay Bridge/Anderson Bridge
6. Measurement of Unknown Capacitance by Desauty Bridge/Schering Bridge
7. Measurement of frequency using Wien Bridge
8. Extension of range of ammeter using shunt/CT.
9. Extension of range of voltmeter using multiplier/PT.
10. Calibration of Wattmeter by Phantom loading
11. Calibration of energy meter to detect the error in it.
12. Measurement of active & reactive power measurement in 1 phase / 3 phase circuit.
13. Measurement of rotational speed using stroboscope
14. Conversion of non electrical quantity into its equivalent electrical quantity using proper transducer.
15. Compare the accuracy, preciseness, sensitivity of Analog & Digital Measuring Instruments.

4EX07 POWER SYSTEMS I LAB

Minimum eight experiments based on the syllabus content of 4EE03/4EX03 Power System - I

The intensive list of experiment is given below.

1. To study the performance of a transmission line (using a nominal T and π methods).
2. To calculate A,B,C,D parameters for a transmission line by using nominal T method (either using model or simulation).
3. To calculate A,B,C,D parameters for a transmission line by using nominal π method (either using model or simulation).
4. To study skin effect, proximity effect and Ferranti effect in transmission line.
5. To study Corona phenomenon and corona loss and its control in transmission line.
6. To study conversion of single line diagram to impedance diagram and reactance diagram for a typical power system.
7. To draw the circle diagram for a typical power system.
8. Study of a tap changing transformer (ON and OFF load tap changing).
9. Study of static VAR generator and synchronous condenser.
10. Load flow study for a typical power system (A simulation).
11. To study different types of insulators used in power system.
12. To conduct a dry and wet test on a pin type insulator.
13. To conduct a flashover test on a suspension type insulator.
14. To study a horn gap.
15. To study different types of power cables.
16. To study testing of cables.

Note: One may use models, simulation, numerical, drawing sheets or Experimentation for conducting the above experiments.

4EX08 ANALOG AND DIGITAL CIRCUIT LAB

Minimum eight experiments based on the syllabus content of 4EE04/ 4EP05 /4EX04Analog & Digital Circuit. The intensive list of experiment is given below.

1. To Plot Frequency Response Of Non-Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
2. To Plot Frequency Response Of Inverting Mode Of Op-Amp Using IC741 and Determine the Bandwidth & Maximum Gain
3. To Perform Op-Amp as Differentiator Using IC741 .
4. Design The Circuit for Supplying 5V,25mA As A Low Voltage Regulator Using IC 723
5. Verification Of Truth Table Of Various Logic Gates Using ICs
6. To Study and Verify The Operation Of SR and MS ,JK Flip Flop
7. To Verify The Operation Of Multiplexer Using IC74153.
8. To Design And Verify Function Of Decade Counterusing IC 7490
9. To Verify The Truth Table Of 4 Bit Comparator
10. To Perform Op-Amp As Integrator Using IC741
11. A stable Multi-vibrator Using IC 555timer
12. To Study And Verify The Operation Of Half-Adder And Full-Adder

4EX09 ELECTRONIC TECHNOLOGY LAB

Perform Minimum Eight experiments / demonstration based on the following contentand prepare the report as a term work for this laboratory.

- **Study of electronic Components:** Identification of components, name, types, symbol, size, rating and application.
- **Handling Electronic Components:** Finding values and testing (using DMM), test working condition, fault detection.
- **Working with breadboards:** understanding the breadboards for component mounting, working with small circuits on breadboard
- **Soldering:**Soldering skill tips- use of proper soldering Iron, Metal, Flux**,** Cleaning, Tinning etc., mounting components on zero PCB, testing of small circuits mounted on zero PCB. De-soldering of components
- **PCB Layout and design:** Understanding different PCBs, Working on PCB Layout (Software), PCB etching, drilling on PCB, Mounting components on PCB, Working with small circuits on PCB and their testing
- **Electronic circuit Simulation:** Familiarizing with the simulation software, simulation and result validation of simple circuit with software.

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NOTIFICATION

No. 90 /2020 Date : 26/10//2020

Subject : Implementation of new Syllabi of Semester III & IV B.E. (Chemical) / B. Text. E./ B.Tech. (Chem.) (Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum …

It is notified for general information of all concerned that the authorities of the University have accepted to implement new Syllabi of Semester III & IV of of B.E.(Chemical)/B.Text.E./B.Tech. (Chem.) (Tech.) (Food, Pulp & Paper, Oil & Paint and Petrochemical Tech.) (C.B.C.S.) as per A.I.C.T.E. Model Curriculum to be implemented from the academic session 2020-21 & onwards as per **"Appendix-A"** as given :

Sd/-
(Dr.T.R.Deshmukh)
Registrar

"**Appendix – A**"

SYLLABUS OF B.TEXT. ENGG. SEM. III & IV C.B.C.S.]

3 TX 01 Textile Fibre -I

Course objectives :

1) To gain basic knowledge about essential and desirable properties of textile fibres and their classification.
2) To gain the knowledge about various textile natural fibres.
3) To understand various methods for analyzing fibre structure.

Course outcomes :

After the completion of Textile Fibre –I course, students will able to demonstrate,
1) the essential and desirable properties of Textile fibre and their classification
2) the physical, chemical and biological properties of cotton fibre
3) the physical, chemical and biological properties of jute and flax
4) the physical, chemical and biological properties of wool
5) the physical, chemical and biological properties of Silk
6) the various methods for analyzing fibre structure

SECTION-A

Unit-I: Definition of fibre, Classification of Textile fibres, Essential and desirable properties of Textile fibres, Polymers: Definition, Types of polymers, Requirements of fibre forming polymers. Basic structure of fibre: Concept of molecular weight, Degree of polymerization, Orientation and crystallinity, effect of orientation and crystallinity on the properties of fibres.

Unit-II: Cotton: Introduction, structure of Cotton fibre, fibre morphology, cotton polymer system, Physical, chemical and biological properties, Applications. Introduction to Banana, Pineapple fibres and their distinctive features and applications.

Unit-III: Jute: Cultivation and Extraction of Jute fibre, Structure of jute fibre, physical, chemical and biological properties, Applications. Flax: Retting and extraction process, structure of flax fibre, physical, chemical and biological properties, Applications. Introduction to hemp, ramie fibres and their distinctive features and applications.

SECTION-B

Unit-IV: Wool: Types of wool, grading of wool, Structure of wool, chemical composition, polymer system of wool, Physical, chemical and biological properties, Applications. Introduction to fibres like, mohair, camel, alpaca and their distinctive features and applications.

Unit-V: Silk: Types of silk, Production of silk (life cycle, reeling), Structure of silk, chemical composition, polymer system of silk, Physical, chemical and biological properties, Applications, blending opportunities in silk.

Unit-VI: Analysis of fibre structure: Introduction, crystal structure, and polymer crystals. i) X-ray diffraction: Bragg's law, X-ray diffractometer. ii) Electron microscopy: Principle and working of Transmission and scanning electron microscope. iii) Spectroscopy: Principle and working of IR-Spectroscopy and NMR-Spectroscopy. Introduction to thermal analysis of polymers.

Text Books :

1. Textile Fibres – Vol.-I by V.A.Shenai
2. Fibre Science and Technology by S.P. Mishra.

Reference Books :

1. Textile Fibres by H.V.S. Murthy
2. Textile Science- Gohl and Vilensky
3. Hand book of Textile Fibres Vol. I & II by Gordon & Cook.
4. Polymer science- V. Gowarikar
5. Investigation of Physical Properties of textile fibres- Hearle & Meredith.

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3TX02 YARN MANUFACTURING - I

Course Objectives:

1. To gain basic knowledge about various preparatory spinning processes, viz blowroom, carding, drawing and combing.

2. To gain the knowledge about modern aspects of various preparatory spinning processes viz blow room, carding, drawing and combing.

3. To understand various parameters influencing performance ofpreparatory spinning processes.

Course Outcomes:

After the completion of yarn manufacturing course, students will able to -

1. Explain about the concept of ginning and blowroom process and description regarding ginning machines and basics of opening and cleaning.
2. Explain about the concept of blowroom process and description regarding blowroom machines.
3. Explain about the concept of carding process and description about carding machines.
4. Explain about the concept of drawing process and description about drawframe machines.
5. Explain about the concept of combing preparatory and combing process and description regarding combing preparatory machines and basics of combing process.
6. Explain about the concept of combing process and description regarding combing machines.

SECTION-A

Unit-I Ginning: Objectives, classification, different ginning machines, machine parameters, ginning performance. Baling and pressing–objectives, baling and pressing machines, bale specifications and recent developments in ginning machine.

Blowroom: Basics of opening and cleaning, historical review of conventional blowroom machines, degree of opening and cleaning, opening intensity and cleaning efficiency, process flow chart of spinning process.

Unit-II Modern blowroom: Introduction, objectives, its features, modern opening and cleaning machines-automatic bale openers, pre-cleaners, fine openers, fine cleaners, multi roll technology, multi-function separators. Chute feed system, automatic waste collection system. Production and cleaning efficiency calculations.

Mixing-objectives, need of mixing, modern mixing machines. Blending-objectives, selection of blend constituents, blending techniques, modern blending machines, compatibility requirements, blend irregularity.

Unit-III Carding: Objectives, modern carding machines, features of new generation cards, operating regions, selection of card clothing, transfer efficiency-definition, importance, factors affecting transfer efficiency, autolevellers-basic principle, types, working, different settings of card, production and cleaning efficiency calculations, recent developments in carding machine-on line nep control, auto can changer, automatic suction system, sliver information system etc.

SECTION -B

Unit-IV Drawing: Objectives, principle of drafting, modern drawframe machine, types of drafting system, types of draft, roller setting, rollers slip and drafting waves. Autolevellers- principle, types, working, process parameters affecting drawing performance. Production and draft calculations. Recent developments in drawframe machine.

Unit-V Combing preparatory: Objectives, importance, parameters of comber lap, methods of comber lap preparation, different sequences of combing preparatory machines. Process parameters, production calculations and recent developments in combing preparatory machines.

Combing: Objectives, basics of combing process and combing operation

Unit-VI Combing: Modern comber, combing cycle, timing diagram, settings and its importance, fractionating efficiency. Forward and backward feed. Comber noil, influence of combing operation on sliver quality. Automation in comber-automatic noil collection, automatic material handling. Production calculations and technical specifications of modern comber machine.

Text Books :

1. 'Manual of Textile Technology', by Klein W, Vol. I – III.
2. 'Spun Yarn Technology', by Oxtoby E.
3. 'Fundamental of Spun Yarn Technology,' by Lawrence C A.
4. 'Handbook of Yarn Production', by Lord P R.

Reference Books :

1. Manual of Cotton Spinning Vol. II, Part-I by P. Lord.
2. Manual of Cotton Spinning Vol. II, Part-II by Shirley.
3. Opening Cleaning and Picking by Dr. Zoltan S. Szaloki,
4. Cotton Ginning, Textile Progress, The Textile Institute Publication.
5. Blow room and Carding- Training Program conducted by NCUTE, IIT, Delhi.
6. Essential calculations of practical cotton spinning by T.K. Pattabhiraman.
7. Elements of Blowroom and Carding by Dr. A. R. Khare.

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3TX03 FABRIC MANUFACTURING – I

Course objectives :

1) To gain basic knowledge about various weaving preparatory processes viz. winding, warping sizing.
2) To gain the knowledge about modern aspects various weaving preparatory process viz. winding, warping sizing.
3) To understand various key parameters of influencing performance of weaving preparatory process viz. winding, warping sizing.

Course Outcomes :

After the completion of Fabric Manufacturing –I course, students will able to demonstrate

1) Knowledge about the concept of winding process and description regarding high speed winding machines.
2) Knowledge about the automatic winding machines
3) Knowledge about the concept of warping process and description about high speed warping machines
4) Knowledge about the automatic warping machines
5) Knowledge about the concept of sizing process & description about sizing machines
6) Knowledge about control systems, ingredients, and cooling elements related to sizing process.

Section A

Unit I: Brief outline of the process involve in weaving, Yarn quality attributes, Uster yarn quality, objectionable faults & its classification as per Uster calssimate. Winding: Objectives:- High speed winding process, geometrical aspects of winding machines, description about tensioners, slub catchers, winding unit, anti-patterning and safety devices. Concept of cone angle, angle of wind, wind per traverse, production efficiency speed, time, calculation related to winding process.

UNIT II: Automatic cone and cheese winding machines, methods of yarn joining, splicing and knotting. Concept of P& Q winding and their applications, construction details of automatic winding machines:- Creel, unwinding tension regulation unit, splicer, EYC, automatic package doffing clearing and dust removal Splicing: - Types viz. mechanical, pneumatic, aqua and thermal. Splice quality assessment. EYC: - optical and capacitance

UNIT III: Internal and between machine material flow with respect to winding, brief description about pirn winding process. Warping: - Objectives and classification of warping process, construction details about beam warping: viz. Creel, tensioner, stop motions and head stock drive. Modern developments in warping: - Designing creels, various modern types of creel, pre tensioner, automatic tension regulation system

Section B

UNIT IV: Modern developments with respect to head stock of beam warping. Auto leasing, drive, breaks and doffing and donning systems. Sectional warping: - objective, constructional details of sectional warping process, auto-leasing, drum traverse, cone angle adjustment and beam traverse. Calculation related to production, speed, time, efficiency of warping machines

UNIT V: Concept of yarn weaveability. Sizing :- Necessity and objectives, constructional details and calculations regarding slasher sizing and multi-cylinder sizing. Study of modern sizing elements viz. creels, unwinding tension control, saw box, yarn drying methods, head stock weavers beam pressing and doffing.

Unit VI: Sizing control systems viz. size paste level, temperature, stretch, moisture control, driving arrangement of sizing machines, crawl speed, production calculation speed, time, and efficiency. Concept of optimum size pick up and add-on different sizing ingredients with respect to properties, cooking methods and there testing. Description about size paste cooking plants, types of sizing: Heavy, medium, light and pure. Sizing of polyester, PV, PC, blends.

Text Books:

1. Yarn Preparation (Vol-1 and 2) By R.Sengupta.
2. Sizing Method, Material and Mechanism By D.B.Ajgaokar Andtalukdar.

Reference Books:

1. 'Weaving Calcutions', By R. Sengupta
2. 'Textile Mathematics (Vol-3)', By J.E.Booth
3. 'Weaving Technology And Operation', By Allan Armored Andwalter S Sondhelm.
4. 'Weaving Technology', By N.M.Kulkarni
5. 'Weaving Machine : Mechanism And Material', By M.K.Talukdar.

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3TX04 Textile Testing- I

Course objectives:

1) To gain basic knowledge about various statistical techniques used in textile testing field
2) To learn various testing methodologies used in the evaluation of fibre characteristics.
3) To understand the evaluation of basic yarn properties

Course outcomes:

After the completion of Textile Testing –I course, students will able to

1) Demonstrate knowledge of statistic applications in Textile testing field
2) Demonstrate the statistical analysis of various testing results
3) Explain the various sampling methods and moisture properties of textile
4) Demonstrate knowledge of measurement of various types of fibre parameters
5) Explain about various count of yarn and there measurement
6) Explain the evaluation of tensile properties and evenness of yarn

SECTION A

Unit- I: Introduction to textile testing, Tested quality schemes,

Element of Statistics: Graphical presentation of Data, Measures of Location like Mean, Mode, Median, Quartiles, Percentiles. Measures of Dispersion: Range, Quartile Deviation, Percentage Mean Deviation, Standard Deviation, Coefficient of Variation %, Variance. Comparison of frequency distribution

Unit -II : Population values and sample values, estimation of population characteristics from samples and the use of confidence intervals; determination of number of tests to be carried out to give chosen degree of accuracy; test of significance of means and variance, quality control charts, selection of samples for testing; random and biased samples,

Unit -III: Different types of sampling methods of textile materials, sampling for raw cotton testing. selection of sample for testing, fibre sampling from combed slivers, roving and yarns, yarn sampling, fabric sampling. Moisture regain, moisture content and RH %, effect of regain on fibre properties

Testing of Fibre properties - Historical review of fibre length and strength testing: fibre sorter, analysis of sorter diagram, Stelometer.

SECTION B

Unit IV: Fibre fineness: Airflow principle, Micronaire testers. Maturity: Maturity ratio, Maturity Coefficient – testing methods of maturity, Shirley trash analyzer. Advance Fibre Testing: High Volume Instruments (HVI): length, strength, maturity, trash and color modules. Advanced Fibre Information System (AFIS): length, nep and trash modules, Introduction to Instron testing.

Unit V: Yarn Dimension: Count, Direct and Indirect yarn numbering , Count conversion , Measurement of count: Spun and plied yarns. Measurement of Yarn diameter

Twist: Helical geometry, Twist angle, Effect of twist on yarn and fabric properties, measurement of twist by different methods.

Unit VI: Tensile Testing : Terminology and definitions load elongation curves, stress strain curve, initial young modulus, yield point, work of rupture, work factor, elastic recovery, instantaneous and time dependent effects, creep, Types of tensile testing machines: CRL, CRE and CRT principle, various types of measuring instruments and their working principles, factors affecting tensile properties. Evenness: Principle of measurement, Periodic Variation and Spectrogram. Electronic capacitance tester, Causes and effect of Irregularity.

Reference Books:

1) Principles of Textile Testing -J.E. Booth
2) Physical Testing of Textiles - B.P.Saville
3) Textile Testing - Grover and Hamby.
4) Handbook of Technical Textiles:- Anand and Harrocks.
5) Testing and Quality Management- V. K. Kothari

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3 TX 05 Thermal Science and Air Conditioning

Course Objectives :

- To understand the properties of steam and use of boilers in textile industries.
- To understand the basic knowledge about fluid dynamics and its application in textile industry.
- To understand the basic knowledge about refrigeration and air conditioning and their applications in textile industries.

Course Outcomes :

At the end of the course, students will be able to-

CO1- To understand the properties of steam, its types and applications in textile field.
CO2- To describe construction and working of different types of steam boilers their accessories and mountings.
CO3- To describe the concept of fluid dynamics and fluid flow applications in textile industries.
CO4- To describe the function of different types of compressors and their applications in textile industry.
CO5- To describe the function of different types of pumps and refrigeration systems.
CO6- To understand the function of the air conditioning system and its applications in textile industries.

SECTION-A

UNIT I: Properties of Steam: Brief overview about the use of steam in textile industries, Formation of Steam,Triple Point and Critical Point, Sensible Heat, Latent Heat, Superheat and Total Heat of Steam. Wet Steam, Dryness Fraction, Internal energy of steam, External work of Evaporation, Specific Volume, Enthalpy, Internal Energy and Entropy of Steam. T-S Diagram and Steam Table and their use. Difference between Vapor and Gas, Dryness Fraction and Measurement of by Separating, Throttling, and Combine Calorimeter, Specific application of steam in textile industries and processes. (6)

UNIT II: Steam Boiler: Flow Diagram for Steam Power Plant with basic units such as Steam Generator, Turbine, Condenser and Pump, Classification of Boilers, Principal Parts of Steam Boiler and their functions, Characteristics of a Good Steam Boiler, Factor Affecting the Selection of Boilers, Historical Review of Fire Tube Boiler and Water Tube Boiler. Introduction of High Pressure Boilers such as LaMont Boiler, Loeffler Boiler, Benson Boiler, and Velox Boiler.Uses of Boiler in Textile Industry such as Spinning, Weaving, Chemical Processing and others.

Boiler Mounting and Accessories :- Boiler Mountings- Devices for proper functioning and safety such as Safety Valve, Water Level Indicator, Pressure Gauge, Fusible Plug, Blow-off Cock, Feed Check Valve, Steam Stop Valves, Man Hole and Mud Box. Boiler Accessories-Devices for improving Boiler Efficiency such as Superheater, Economizer, Air Preheater. Boiler Draught (Draft), Function of Draught, Classification of Boiler Draught. **(6)**

UNIT III: Fluid Dynamics: Introduction to the study of fluid motion its uses in textile industry, Mechanical Properties of Fluids and their influence on flow characteristics, Types of Flows, Stream Lines, Potential Lines, Flow Net, Continuity Equation, Bernoulli's Equation, Venturimeter.

Fluid flow applications in Textile Processing- Air Jet Spinning, Nozzle design and performance in Air Jet Spinning, Spun bonding process of Non-Woven, Fabric like Structures, Textile Wet Processing, Air-Jet and Water Jet weft insertion mechanisms. **(6)**

SECTION- B

UNIT IV: Air Compressor : Introduction, Classification of Air Compressor, Cycle of operation, Use of Compressed air in Textile Industry such as spinning machine and weaving machine, Introduction to Pneumatic System, Study of various Pneumatic Circuit, and its Component, like Valves Filter, Regulator, Accumulator, Lubricator. Application of Pneumatic circuits in Textile Machines. **(6)**

UNIT V: Pump and Refrigeration: Introduction of Pump used in Textile Industry, Classification of Pump, Centrifugal Pumps, main parts & working, work done, efficiency, Brief Introduction of Reciprocating Pump.

Refrigeration- Introduction to Refrigeration, Application of Refrigeration, Elements of Refrigeration System, Unit of Refrigeration, Coefficient of Performance (COP), Various Refrigeration System such as Ice Refrigeration, Air Refrigeration System, Vapour Compression Refrigeration System, Vapour Absorption Refrigeration System. **(6)**

UNIT VI: Air Conditioning: Concept of Psychometry and Psychometrics terms, Definitions, Psychometric Relations, Psychometric Chart, Psychometric Processes- Mixing of Air Streams, Sensible Heating, Sensible Cooling, Humidification, Dehumidification. Methods and Features of Modern Humidification plant in Textile Mills, Effect of Moisture on Textile Fibers, sling Psychrometer, Use of psychometric chart. (Numerical related to psychometric).Importance of Humidity Control in Textile Processing. Air Conditioning System- Introduction, Air Conditioning Cycle, Classification of Air Conditioning System, Central System, Zoned System, Unitary System, Unitary Central System. **(6)**

Books Recommended:-

Text Books :

1) Thermal Engineering-P.L.Balaney.(Khanna Publication)
2) Fluid Mechanics and Hydraulic Machine by Dr.R.K.Bansal
3) A course in Refrigeration and Air Conditioning – S. C. Arora, S. Domkundwar.(Khanna Publication.)

References Books :

1) Refrigeration & Air Conditioning – P. N. Ananthnarayanan. (TMH Publication)
2) Elements of Heat Engine–R.C.Patel, C.J.Karamchandani.(Charter Publication)
3) Thermal Enginneering B.K.Sarkar.(TMH Publication)
4) Thermal Engineering-S.Domkundalwar.(Khanna Publication)
5) A Textbook of Engineering Thermodynamics by R.K.Rajput.
6) Thermal Engineering by R.S.Khurmi & Gupta.
7) Refrigeration & Air conditioning by R. K.Rajput.
8) Pneumatic Systems by Majumdar.
9) Hydraulics & Pneumatics by Andrew &Parr.
10) Humidification & Air conditioning by S. P.Patel.
11) Textile Humidification by K. G.Vaze.

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Semester-IV
4 TX 01 Textile Fibre - II

Course objectives :

1) To gain basic knowledge about polymers and their extrusion methods.
2) To gain the knowledge about major synthetic fibres and their properties.
3) To understand texturing and its various methods.

Course outcomes :

After the completion of Textile Fibre –II course, students will able to demonstrate,

1) the various extrusion methods of synthetic fibres
2) the manufacturing and properties of regenerated fibres
3) the manufacturing and properties of Polyamide and Polyester fibres
4) the manufacturing and properties of Polyacrylonytrile, Polyvinyl and Polyethylene fibres
5) the concepts of mechanical, thermal and optical properties
6) the various methods of texturing

SECTION-A

Unit-I: Manmade fibres: Definitions of regenerated & synthetic fibres, heterochain and carbon chain fibres, Addition and condensation polymerization, Study of intra-polymer and inter-polymer forces in fibre polymer. Concept of thermoplastic and thermoset material. Introduction to melt spinning, dry spinning and wet spinning.

Unit-II: Regenerated fibres: i)Viscose rayon: Manufacturing process, Physical and chemical properties, Applications, ii)Cuprammnium rayon: Manufacturing process, Physical and chemical properties, Applications. iii) High wet modulus and Polynosic rayon: Manufacturing process, Physical and chemical properties, Applications. iv)Introduction to Acetate & Triacetate fibres

Unit-III: Synthetic fibres: i) Polyamide Fibres: Nylon-6, Nylon-66, Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications. ii) Polyester fibre: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications.

SECTION-B

Unit-IV: Synthetic fibres: i) Polyacrylonitrile fibres: Acrylic and Modacrylic fibres: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications. ii) Polyvinyl alcohol and Polyvinyl chloride fibres: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications. iii) Polyethylene & Polypropylene fibres: Raw materials, manufacturing process, Microscopic structure, Physical and chemical properties, Applications.

Unit-V: Tensile properties: Terms and definitions, Study of stress-strain curve and related properties, importance of tensile properties, factors influencing tensile properties of fibres, Bending and Shear properties, Torsion and Compression properties, Introduction to optical, thermal, frictional and dielectric properties.

Unit-VI: Texturizing: Introduction to various methods of texturizing: Draw Texturising, - sequential (False twist process) and simultaneous draw texturising,. Air Jet Texturizing: - Principle and working of machine. Other Texturising Methods:- Stuffer box crimping, Edge Crimping, Knit-de-knit, Gear crimping. Properties of air and draw textured yarn.

Text Books:

1. Textile Science- Gohl and Vilensky
2. Man Made Fibres – R.W. Moncrieff.

References Books:

1. Hand book of Textile Fibres Vol. I & II by Gordon & Cook.
2. Textile Fibres – Vol.-I by V.A.Shenai
3. Physical Properties of Textile Fibres by W.E. Morton and J.W.S. Hearle,
4. Textile Fibres by H.V.S. Murthy Man Made Fibres – R.W. Moncrieff.

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4TX02 Yarn Manufacturing - II

Course Objectives:

1. To gain basic knowledge about various spinning processes, viz speed frame, ring spinning and doubling.

2. To gain the knowledge about modern aspects of various spinning processes viz speed frame, ring spinning and doubling.

3. To understand various parameters influencing performance of spinning processes.

Course Outcomes:

After the completion of yarn manufacturing course, students will able to -

1. Explain the concept of speed frame process and description regarding speed frame machines.
2. Explain the concept of ring spinning process and description regarding ring spinning machines.
3. Explain the concept of ring spinning process and description about ring spinning machines–principle of drafting, different drafting systems.
4. Explain the concept of ring spinning process and description about ring spinning machines –spinning geometry, spinning triangle.
5. Explain the concept of doubling process and description regarding doubling machines.
6. Explain the concept of fancy yarns and description regarding fancy yarn manufacturing machines.

SECTION- A

Unit-I Speed frame: Objectives, modern speed frame machine, top arm drafting system, flyer, spindle and presser, bobbin and flyer leading winding principle. Differential and building mechanisms. Various parameters affecting roving quality and production. Draft, twist and production calculations. Recent developments in speed frame machine-Auto bobbin transport system etc.

Unit-II Ring frame: Objectives, principle of ring spinning, modern ring frame machine. Details of creel, rings, travelers, importance of ring and traveler profile, balloon control ring, lappet, traveler clearers, suction system. Types of spindles, spindle drives and spindle centering. Building mechanism, building of cops. Compact spinning-principle, different compact spinning systems, structure and properties of compact yarns.

Unit-III Drafting process: Importance, principle of drafting, types of drafting system, top arm drafting system and its advantages, offset drafting, types of draft, top and bottom rollers, cots, aprons, spacers, drafting parameters, different weighing systems- advantages and limitations, factors affecting roller settings and drafting performance, drafting force, roller slip, drafting waves and floating fibres. Production and draft calculations.

SECTION - B

Unit-IV Spinning geometry: Importance, ideal yarn geometry, formation of twist, spinning triangle, spinning angle, spinning tension, balloon formation. Yarn structure and properties. Yarn faults-causes and remedies, end breakages-causes and remedies. Recent developments in ring spinning- ring/travelers systems, automatic doffing, on line quality control, individual spindle monitoring, automatic data acquisition and automatic cop transfer.

Unit-V Doubling: Objectives, types of doubled yarn, effects of twist direction, concept of balance of twist, properties of folded yarn, methods of ply twisting–ring doubling machines, two stage twisting and up twister. Two for one twister- principle, design and constructional details of TFO machine, advantages over ring doubling machine, recent developments in TFO machines, production calculations.

Unit-VI Fancy yarns**:** Basic principle of fancy yarn, classification of fancy yarns, different methods of fancy yarn production - spinning techniques used for the production of fancy yarns, structure of multi-count, slub yarn, spiral, gimp, loop, snarl, knop, covered yarns, diamond, boucle yarns, caterpillar and metallic yarns. Properties and applications of fancy yarns.

Text Books :

1. Manual of Textile Technology by Klein W,
2. A Practical Guide to Ring Spinning by Klein W,
3. Fundamental of Spun Yarn Technology by Lawrence C A,
4. Handbook of Yarn Production by Lord P R,

Reference Books:

1. Drawing, Combing and speed frame by Zoltan, S. Szaloki,
2. Draw frame, combing and speed frame by J. H. Black;
3. Spun Yarn Technology by Eric Oxtoby.
5. Elements of ring frame and doublings by Dr. A. R. Kahre.
6. Advances in Spinning by S. M. Ishtiaque
7. Two for one twister technology by H. S. Kulkarni and HVS Murthy.

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4TX03 Fabric Manufacturing –II

Course objectives :

1) To gain basic knowledge about fabric formation by weaving processes.
2) To gain the knowledge about automatic weaving and dobby shedding.
3) To gain the knowledge about jacquard shedding and various fabric and machines defects.

Course outcomes :

After the completion of Fabric Manufacturing –II course, students will able to demonstrate

1) Knowledge about the concept of fabric forming by weaving
2) Knowledge about the various weaving mechanisms.
3) Kinematics, energy and productivity analysis of shuttle weaving machines
4) Knowledge about the dobby shedding principle and it related machinery
5) Knowledge about jacquard shedding principle & its related machinery.
6) Knowledge about the various warp way, weft way and loom faults.

SECTION-A

Unit I: Classification of different fabric forming process viz. weaving, knitting, breading. Non woven: - Brief description of all methods & there application. Looming: - Working principle of drawing in with respect to plan, twill and satin weave. Study of warp tying, leasing, reaching in, warp knotting and drop pinning processes

Unit II: Weaving:- classification of motions, Shedding:- Classification of shedding principle, types of shed, head movement, shed geometry , reversing motion Brief description about shuttle picking and crank beat up

Unit III: Brief description about warp protection system, weft stop motion and temple**.** Complexity of shuttle picking, kinematics of sley, weaving resistance, bumping condition. Analysis of energy utilization in shuttle picking, limitation of conventional let-up, take-up system. Calculation regarding reed count, average pick, efficiency and production of weaving machine. Automatic loom: - limitation of plain loom and brief description about automatic loom, cop changing mechanism, shuttle protector.

SECTION-B

Unit IV: Historical review of shuttle changing looms. Automatic let-off and positive take up system Historical review of about weft mixing by drop box motion. Dobby shedding: - objectives, classification, climax cam dobby, positive and rotary dobby, method of pegging, dobby setting during weave change

Unit V: Jacquard shedding:- objectives, classification, principal parts , figuring capacity, harness, working principle of Double lift double cylinder jacquard, open shed jacquard, electronic jacquard comparison between various electronic jacquards weave setting of jacquard during weave change

Unit VI: Fabric defect & value less:- Various fabric grading system and its procedure. Fabric defects:- warp and weft defects with causes and remedies, various loom faults with respect to their causes and remedies, various dobby & jacquard related machines and fabric faults with their causes and remedies.

Text Book:

Weaving Machine, Mechanism Management By D.B.Ajagaonkar And M.K.Talukdar .

References Books:

1) Weaving Operation by Allen Armorod
2) Fancy Weaving by K.T. Aswani.
3) Weaving Mechanism vol.II by N.N.Bannarji.
4) Principle of weaving by R. Marks and A.T.C. Robinson.

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4TX04 TEXTILE TESTING — II

Course objectives:

1) To gain knowledge about evaluation of basic fabric properties.
2) To gain knowledge about evaluation of **comfort** properties of textile fabric
3) To gain knowledge about evaluation of basic garment properties by various testing methods.

Course outcomes:

Alter the completion of textile testing—I course, students will able to

I) demonstrate the knowledge about evaluation of service ability of fabric
2) demonstrate the knowledge about the evaluation of dimensional stability of fabric
3) Explain the evaluation of low stress mechanical properties of fabric
4) Demonstrate the knowledge about the evaluation of thermal properties of fabric
5) Demonstrate the knowledge about testing of various parameters of garment
6) Demonstrate the knowledge about quality evaluation of garments

SECTION-A

Unit -I: Fabric Dimension: Length, Width, Thickness, their measurement, Fabric weight per unit area and per length, threads per inch in woven fabric, ends and picks per inch, crimp of yarn in fabric, shrinkage. measurement of crimp, cloth cover and fabric geometry. Serviceability: Introduction, Snagging, Pilling, Factors affecting pilling of fabric Pilling test, Abrasion resistance, factors affecting abrasion resistance. Abrasion tests, wear. Wearer Trials.

Unit -II : Dimensional stability: Introduction, hygral expansion, relaxation shrinkage, swelling shrinkage, felting shrinkage, methods of measuring dimensional stability. Hydraulic bursting strength tester. Tear strength tester .

Flammability terms used relating to flammability, factors affecting flame resistance, flammability testing and flame proofing.

Unit- III : Fabric handle evaluation (Total hand value), Low stress mechanical properties viz.: tensile, shearing, bending, compression and surface friction, Drape, crease recovery, Kawabata system. Colour fastness testing: Introduction, outline of colour fastness tests. Colour fastness to washing, rubbing, light, heat (sublimation), perspiration, sea water, chlorinated water, dry cleaning agents.

SECTION- B

Unit- IV: Comfort: Introduction. Thermal Comfort, heat balance, heat loss, air permeability and its measurement, Effect of air permeability on fabric properties, Measurement of thermal resistance and transmittance of fabrics.

Moisture trasport, sensorial comfort, water absorption, water repellency. Measurement of water vapour permeability and water permeability.

Unit- V: Testing of Garments : Test related to garment appearance and performance such as measurement of seam pucker, seams slippage, seam strength and buffer strength, stitching defects. Different types of defects in fabrics-major and minor faults, fabric inspection system-4 point system

Unit- VI: Quality control in pattern making, grading-maker making, spreading – Quality control of trims and accessories-zippers and buttons. Garments Inspection and measuring guide processing. cutting, stitching in garment industry, tolerance and quality standard for finished garments.

REFFERENCE BOOKS :

1) Principles of Textile Testing – J.E. Booth
2) Physical Testing of Textiles – B.P. Saville
3) Science of Clothing Comfort – V.K.Kothari
4) Testing and Quality Management – V.K. Kothari
5) An Introduction of Quality Control for the Apparel Industry- Pradip V. Mehta.
6) Managing Quality in Apparel Industry – S.K. Bhardwaj and Pradip V. Mehata

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4TX05 GARMENT MANUFACTURING TECHNOLOGY

Course Objectives :

1. To provide the understanding about the scenario of industrial apparel sector.
2. To provide the knowledge about various production processes involved in garment manufacturing.
3. To provide the knowledge about the various industrial production systems and use of CAD and CAM in garment industry.

Course Outcomes :

After completion of the course students will be able to :

1. Explain the apparel industry scenario in form of its structure, types, size, labor, products etc.
2. Explain the various technological aspects and production process involved in pattern making and sizing.
3. Explain the various technological aspects and production process involved in cutting and sewing operations.
4. Explain the various technological aspects and production process involved fusing process.
5. Explain the various technological aspects and production process involved in garment finishing and its inspections.
6. Analyze the various production systems and demonstrate the knowledge about the use of CAD-CAM in garment manufacturingh.

UNIT-I :
World and Indian Scenario of garment industry: Size, various sectors, structure, type of products and business developments in recent years. Overview of export related activities in apparel industry. Brief outline of various steps involved in industrial garment manufacturing process.
Pattern making: Measurement process, size chart and measuring of sizes, definition of various garments parts and positions.

UNIT-II :
Pattern making methods: Bespoke, industrial block method, basic block construction, block preparation and corrections. Figure analysis- body ideals, body proportion, height and weight distribution, body parts, individual figure analysis and body measurement of all age groups. Muslin pattern, commercial pattern, sizes and fabric preparation for garment manufacturing.

UNIT-III :
Types of fabric packages, spreading, marker preparation and its planning, types and functions of cutting machine, preparation for sewing processes,
Sewing: feed systems, types of sewing machinery and equipment, parts of needles and their function,

UNIT-IV :
Sewing thread- Properties, ticket number, classification of seams and stitches.
Fusing- Importance, fusing process, fusing machineries, control of fusing quality. Pressing- Importance, types, pressing equipments.

UNIT-V :
Finishing and inspection: Various components used in garments viz: buttons, zips, underlining, hooks, ornamental materials, sewing labels, motif etc. Garment cleaning and inspection- fitting quality, live models, final inspection of garments, quality standards.

UNIT-VI :
Industrial line production methods: Manual systems, making through, section system, progressive bundle system, straight line system, mechanical transport systems, selective conveyor belt system, unit production system, quick response sewing system.
Ware housing- equipments used in garment handling, storage and packing. Application of CAD and CAM in garment production.

Reference Books :
1. Introduction to clothing Manufacture by Gerry Cooklin
2. Technology of clothing manufacture by Harrold carr & Barbara Lathem
3. Garment Technology by Dr. V.Subramaniam, Winter School booklets 1990
4. Apparel Manufacturing Handbook by Jacob Solinger.
5. Clothing construction and wardrobe planning by Dora S. Lewin, Mabel Goode Bowers, Manetta Knttunen , The Macmillan co New York .

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SEMESTER - III (Practicals)

3TX07 TEXTILE FIBRE - I - LAB.

8 to 10 practicals based on the syllabus 3TX01 **TEXTILE FIBRE – I**

3TX08 YARN MANUFACTURING - I - LAB.

8 to 10 practicals based on the syllabus 3TX02 **YARN MANUFACTURING – I**

3TX09 FABRIC MANUFACTURING - I - LAB.

8 to 10 practicals based on the syllabus **3TX03 FABRIC MANUFACTURING – 1**

3TX10 TEXTILE TESTING - I - LAB.

8 to 10 practicals based on the syllabus 3TX04 **TEXTILE TESTING – I**

SEMESTER - IV (Practicals)

4TX07 TEXTILE FIBRE - II - LAB.

8 to 10 practicals based on the syllabus 4TX01 **TEXTILE FIBRE – II**

4TX08 YARN MANUFACTURING - II - LAB..

8 to 10 practicals based on the syllabus 4TX02 **YARN MANUFACTURING – II**

4TX09 FABRIC MANUFACTURING - II - LAB.

8 to 10practicals based on the syllabus 4TX03 **FABRIC MANUFACTURING – II**

4TX 10 TEXTILE "TES'T'ING - II - LAB.

8 to 10 practicals based on the syllabus **4TX04 TEXTILE TESTING —IT**

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SYLLABI PRESCRIBED FOR FOUR YEAR DEGREE COURSE
BACHELOR OF ENGINEERING (CHEMICAL)
SEMESTER PATTERN (CHOICE BASED CREDIT GRADE SYSTEM)

SEMESTER : THIRD

3 CH 01/3 PE 01 APPLIED MATHEMATICS-III / MATHEMATICS-III

1. **Pre-requisite of Subject** : Engineering Mathematics I and Engineering Mathematics II

2 **Course Objectives of Applied mathematics III** :

On Completion of the students are expected
- To understand Fourier transform & Z-transform, Laplace transform & their application to engineering problems.
- To know probability and probability distribution.
- To understand Numerical analysis.
- To know vector Clarks &their application.

SECTION A

UNIT –I: Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (7 Hrs.)

UNIT-II: Laplace transforms: Definition, standard forms, properties of Laplace transform, Inverse Laplace transform, Laplace convolution theorem, Laplace transforms and Unit step function, Solution of Linear differential equations. (7 Hrs.)

UNIT-III: Probability & Probability Distribution Probability: definition, axioms of mathematical probability, complementation rule, Theorem of total probability, Theorem of compound probability, Independent Events, subjective probability, Baye's Theorem, Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (7 Hrs.)

SECTION B

UNIT-IV: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy- Reimann conditions, Harmonic conjugate functions, Milne's method, singular points, expansion of function in Taylor's and Laurent's series, Cauchy's integral theorem and formula, Residue theorem. (7Hrs.)

UNIT-V: Numerical Analysis: Solution of algebric and transcendental equations by method& method of false position, Newton-Raphson method Solution of system of linear equations by Gauss Seidal method, Relaxation method. Solution of first order ordinary differential equations by modified Euler's, method Runge - Kutta method. (7Hrs.)

UNIT-VI: Vector Calculus :- Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem(without proof). (7Hrs.)

Course Outcomes :

Students are expected to expertise in

- Solving numerical methods, Laplace transform, Fourier Transform & Z-transform Probability & Probability Distribution and statistics are very useful to them in future curriculum/student.
- Complex functions and vector calculus are backbone of future academic curriculum and hence should be in touch with contents in syllabus. Design of syllabus is more than sufficient for academic curriculum of student.

Text Books:

1. Higher Engineering. Mathematics by B.S. Grewal, Khanna Publication.
2. A Text Book of Applied Mathematics, Volume-II by P. N. Wartikar and
J.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Vidyarthi Griha Prakashan, Pune.

Reference Books:

1. Numerical Analysis- S.S. Sastry.
2. Advancing Engg. Mathematics by E.K.Kreyzig.

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3 CH 02 PROCESS INSTRUMENTAION

Monitoring and control of processes is an important activity of Chemical Engineer. This subject deals with measurement principles of process parameters like temperature, pressure, level flow.

Course Objectives:

The students will be able:

To learn the operating principles, construction and working of temperature, pressure, level and flow measuring devices.

To select the most suitable measuring device based on its performance characteristics for specific measuring task.

To test, Calibrate, Maintain measuring devices elements.

SECTION A

UNIT-I : Basic method of measurements –Errors in measurements – Types of Errors. Transducers – definition – classification – Static characteristics of instruments Dynamic characteristic. Transmitter –definition different types. (8)

UNIT-II : Temperature measurements: Introduction – Temperature scale Conventional methods of temperature sensing. Resistance Thermometer Detector (RTD) – Unbalanced Wheatstone Bridge Direct conversion. Thermistors – Temperature sensing using thermistor – Semiconductor temperature sensor. Thermocouple – Basics of thermocouple – Thermocouple types – Cold junction compensation. Infrared thermometry – Basics of radiation – Emissivity – Methods of sensing –Direct detection – Indirect detection. (8)

UNIT-III: Pressure measurements: Introduction – Units of pressure – Types of pressure measurement- –Bourdon tube and bellows – SG based pressure sensors – Capacitance type pressure transducers. Low pressure measurements – pirani gauge – Thermocouple gauge – Ionization gauge. (8)

SECTION B

UNIT-IV: Basics of fluid flow – Flow meters – Quantum flow measurements, Differential pressure measurement – Principle of the differential pressure flow meter, Orifice plate, Venturimeter, Flow nozzle, Dall tube, Pitot tube. Variable area flow meter,Magnet Flowmeters – DC Magnetic Flow meter, Pulsed Magnetic Flow meter, Permanent Magnet Type Magnetic Flow meter, AC Magnetic Flow meter. Positive displacement Flowmeters – Different type of ultrasonic Flow meter. (7)

UNIT-V : Level Measurements – Level transducer with differential pressure sensing –Capacitance based level sensors – Capacitance sensors for conducting liquids – Capacitance sensors for Non – conducting liquids, other liquid sensors – Displacement type level sensor – Ultrasonic type level sensor, Gamma ray level sensor. (7)

UNIT-VI : pH measurements – Basic ideas of pH value – Measurement of electrode potentials – Glass electrode – Reference electrode – Calomel electrode – Silver- Silver chloride electrode, Humidity Sensing – Basic ideas of humidity sensing – Humidity measurement by dew point sensing – Humidity measurement using Lithium Chloride.

Measurement for Concentration: Obtaining concentration of solution by conductivity and conductivity titration, determination of concentration by density meter, hydrometer, refractometer, measurement of concentration of ion and coloured solution.. (7)

Text Books:

1. Tattamangalam R. Padmanaban “Industrial Instrumentation Principles and Design” Springer, 2000.
2. Donald P. Eckman, “ Industrial Instrumentation”, CBS Publishers, New Delhi,2002.

Reference Books:

1. R.K.Jain, “Mechanical and Industrial Measurements” Khanna Publishers, New Delhi, 1999
2. D.Patranabis, “Principles of Industrial Instrumentation”, Tata McGraw Hill Publishing Ltd, New Delhi, 1999
3. C.D. Johnsons, “Process Control Instrumentation Technology”, Prentice Hall Inc,
4. A.K.Sawhney, “A Course In Electrical and Electronics Measurement and Instrumentation”, Dhanpat Rai and Sons, New Delhi, 1999

3 CH 03 /3CT03 STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. TodeterminetheMechanicalbehaviorofthebodyandconstructionmaterialsbydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel, Generalized Hook's law, factor of safety. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit II: Axial force, shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Unit III: Stresses in beams (Bending, Shear), i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section. ii) Shear: Distribution of shear stresses on beam cross sections, impact loads and instantaneous stresses.

SECTION – B

Unit IV: Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's formula.

Books Recommended:

1. E. P. Popov, "Mechanics of Materials", Prentice Hall of India, New Delhi.
2. S.Timoshenko and O. H. Young, 'Elements of Strength of Materials', East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, 'Strength of Materials', Harper and Row, New York.
4. Shames, I. H., 'Introduction to Solid Mechanics', Prentice Hall of India, New Delhi.
5. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3 CH 04 : CHEMICAL ENGINEERING THERMODYNAMICS-I

Chemical Engineering Thermodynamics is primarily concerned with the application of thermodynamics to phase equilibria and reaction equilibria. It is concerned with the application of Thermodynamics to heat-to-work and work- to-heat conversion devices. Chemical engineers are seriously concerned with the calculation of work in separation and in mixing processes. Its applications are obvious in the design of Chemical engineering equipments in processes.

Course Objectives:

After studying this subject the student will have:

* The mathematical abilities required for applying thermodynamics to practical problems.
* Its applications in the design of Chemical engineering equipments in processes.

SECTION A

UNIT-I:BASIC CONCEPTS: The terminologies of thermodynamics, the variables and quantities of thermodynamics, categorization of systems and processes. Energy classifications, point and path properties, energy in transition, heat and work, reversible and irreversible processes, phase rule. (8)

UNIT-II: FIRST LAW OF THERMODYNAMICS: First law of thermodynamics – heat and energy changes, enthalpy and heat capacity limitations of the first law, application of first law to different processes. (8)

UNIT-III: SECOND LAW THERMODYNAMICS: Second law of thermodynamics and its applications - Entropy, reversible and irreversible processes, Carnot cycle, T-S diagrams, enthalpy of mixing and disorder, refrigeration and liquefaction. (8)

SECTION B

UNIT-IV: REFRIGERATION AND LIQUEFACTION: The carnot refrigerator, the vapour- compression cycle, comparison of refrigeration cycles, liquefaction processes, heat pump. Rankine power cycle. (7)

UNIT-V: THERMODYNAMIC PROPERTIES OF FLUIDS: Property relations for homogeneous phases, thermodynamic diagram, generalized property correlation for gases. (7)

UNIT-VI: THERMODYNAMICS OF FLOW PROCESSES: flow of compressible fluids through ducts, compression processes, steam turbines and nozzles, condensers. (7)

Text Books:

1. J.M. Smith and H.C. Van Ness, “Introduction to Chemical Engineering Thermodynamics”, McGraw Hill, 1998.

2. K.V.Narayanan, .”A textbook of Chemical Engineering Thermodynamics”, Prentice Hall of India Ltd., 2001.

Reference Books:

1. Sadler S. I., J, “Chemical and Engineering Thermodynamics” John Wiley and Sons, Inc. New York, 3rd Ed., 1999.

2. Elliot J. R. and Lira C.T., “Introductory Chemical Engineering Thermodynamics”, Prentice Hall, 1999.

3. Eastop T. D. and McConkey A.,” Applied Thermodynamics for Engineering Technologists’, Addison Wesley Longman Ltd., England, 5th Ed., 1999.

3 CH 05 PROCESS CALCULATION

Course objectiveS :

1. Students will learn the basic and fundamentals of chemical engineering operations and processes.
2. Students will understand the material balance and energy balance of various unit operations and unit processes.
3. Students will learn how to formulate and solve the problems related to material and energy balance with or without chemical reaction.

Course Outcomes:

After successful completion of this course student will be able to :

1. Understand the concept of basic chemical calculations
2. Understand the concept and application of theory of proportions
3. Determine the humidity with/without using a psychrometric chart.
4. Make the material balance over unit operations and processes.
5. Make the energy balance over unit operations and processes.
6. Solve the problem of fuels and combustion.

Course Contents :

Unit I. Introduction to unit operations and unit processes, Units and dimensions, Atoms, moles and molecular weight, mole and mass fraction, Composition of solids, liquids and gases, Concept of Normality, Molarity and Molality, PPM (Parts Per Million), Ideal Gas Law, Dalton’s Law, Partial Pressure, Amagat’s Law, Average Molecular Weight,Density of Gas Mixture, Raoult’s Law, Henry’s Law, Vapour Pressure, Clausius Clapeyron equation, Cox Chart,.Humidity and saturation, Humidity Chart, and their application.

Unit II. Material balance without chemical reaction stoichiometry and unit operations Distillation, Absorption, Extraction, Crystallization, Drying, Mixing, Evaporation. Recycle, purge and Bypass calculations.

Unit III.: Material balance involves chemical reaction, Principle of stoichiometry, simple oxidation reaction, multiple chemical reaction, percentage Conversion, percentage Yield, and selectivity, calculation involving combustion of gases, liquid and solid fuel. Recycle, purge and bypass calculations.
Introduction to unsteady state material balance

Unit IV.: Energy balance: open and closed system, heat capacity, calculations of enthalpy changes, enthalpy changes for phases transitions, evaporation, Solution and mixing, clausius clapeyron equation.

Unit V.: Energy balance with chemical reaction, calculation of standard heat of reaction, heat of formation, heat of combustion, Hess law, Effect of temperature on heat of reaction; adiabatic flame temperature calculations.

Unit VI.: Heating value of fuels, calculations involving theoretical and excess air, heat and material balance of combustion processes.

References :

1. Bhatt, B. I., Vora, S. M., “Stoichiometry”, Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004.
2. Narayanan K V and Lakshmikutty B, Stoichiometry and Process Calculations, Prentice Hall of India Pvt Ltd, New Delhi 2006.
3. Sikdar, D. C., “Chemical Process Calculations”, Prentice Hall of India.
4. Himmelblau, D. M., Riggs, J. B. “Basic Principles and Calculations in Chemical Engineering”, Eighth Ed., Pearson India Education Services, 2015.
5. Hougen. O. A, Watson K.M. and Ragatz R.A. “Chemical Process Principles, Part -I, Material and Energy Balance”.

3CH07 PROCESS INSTRUMENTATION - LAB

List of experiments:

1. Measurement of temperature using thermocouple or RTD or Thermistor and to find their characteristics.
2. Measurement of high temperature using radiation or Optical pyrometer.
3. Measurement of pressure using LVDT or Strain gauge transducer.
4. Calibration of pressure gauge using Dead Weight Tester.
5. Measurement of level using air purge or capacitance type level detector.
6. Measurement of flow using magnetic flow meter or Ultrasonic flow meter.
7. Calibration of thermocouple/Bimetallic thermocouple/Resistance thermocouple.
8. Calibration of Pressure gauge/ Pnuematic pressure recorder/ Differential pressure recorder.
9. Calibration of Orificemeter/ Venturimeter / Rotameter/ Gas flow meter.
10. Estimation of viscosity by Redwood/ Saybolt/ Ostwald viscometer.
11. Calibration of pH meter.
12. Calibration of Conductivity meter.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

3CH08 / 3CE06 – STRENGTH OF MATERIALS – LAB

List of Practical’s in Strength of Material Lab (Minimum any eight practical from the list should be performed)

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

3CH09 CHEMICAL ENGINEERING THERMODYNAMICS-I–LAB

List of Study Experiments:

- Study 1st law of Thermodynamics

- Study of low temperature refrigeration system.

- Study of ranking power cycle.

- Study of steam nozzles

- Study of steam turbine
- Study of boiler

- Study of mounting accessories of boiler.

- Study of condensers.

- Study of economizer and super-heater.

- Visit to thermal power station.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be studied by the student to complete the term work.

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SEMESTER: FOURTH

4 CH01 APPLIED PHYSICAL CHEMISTRY

Teaching Scheme:
Lecture: 03 Hours / week
Tutorial: 01 Hour /week
(Total credit: 04)

Examination Scheme:
Theory
T (E) : 80 Marks T (I) : 20 Marks
Duration of University Exam : 03 Hours

Learning Objectives:

- To understand the transport phenomenon, internal forces and molecular speed in gases.
- To understand the electrical properties of fluid.
- To know the rate, order, energy of activation of chemical reactions and their determination.
- To know the use of kinetics and thermodynamics to elucidate mechanisms of reactions.
- To understand the basic concepts, the Ist and IInd Laws of Thermodynamics, Thermodynamic functions and their applications.
- To predict the high and low quantum yield photochemical reactions and to know about advanced spectroscopic analysis techniques.
- To know the basic concepts and industrial examples of catalysis and adsorption on surface.

Contents:

Unit-I : Advanced Gas Concepts : Equation of state for real and ideal gases, Van-der-waal‘s equation, critical phenomenon, calculation of critical constants, Principle of corresponding states, compressibility factor, Principle of equipartition of energy, Maxwell-Boltzmann‘s law of distribution of molecular speed, Root mean square speed, Average speed and Most probable speed. Numerical. (6 Hrs)

Unit- II : Kinetics & Reaction mechanism: Introduction, Rate of reaction, concept of molecularity and order in elementary and complex reactions, differential and integral methods to formulate rate equations of zero, first and second order reactions. experimental methods in kinetic studies, effect of temperature on reaction rate, energy of activation and its determination, steady state approximation and rate determining step, Mechanism of complex reactions, photochemical chain reactions, polymerization reactions. Fast reactions – experimental techniques. Numerical (10 Hrs.)

Unit-III : Surface, interfacial chemistry and catalysis: Adsorption , types of adsorption, Adsorption isotherms , Langmuir theory of adsorption, BET adsorption isotherm and it's application for determination of surface area of fine powder. Homogeneous and Heterogeneous catalysis, Criteria of catalyst, Theory of heterogeneous catalysis, Homogeneous, Lewis acid-base catalysts, organometallic catalysts and industrially examples, Auto and enzyme catalysis. kinetics of reactions on surfaces. (8 Hrs.)

Unit – IV : Ion transport and electrical phenomenon at interface: Specific, Equivalent and Molar conductivity, Kohlraush's law and its applications ,Transport number and their determination ,Relation between electrical work done and free energy, Nernst equation for electrode potential ,Electrolytic concentration cell with and without transference, Debye- Huckel's theory of strong electrolyte, Determination of pH, solubility and solubility product of sparingly soluble salts, dissociation constant by emf measurement, Numerical. (8 Hrs.)

Unit – V : **Thermodynamics and Equilibrium :** Statements of the second law; Heat engines, Carnot's theorem, and Carnot cycle, Mathematical statement of the second law, Introduction of Entropy under the IInd Law to define spontaneity of a process, Temperature- entropy diagram, Introduction of the state functions A & G to determine conditions of Material Equilibrium. Condition of reversibility, Transformation at constant temperature and pressure, Gibbs- Helmholtz equation, pressure – volume and volume – Temperature relationship under isothermal condition for ideal gas. Partialmolar properties, chemical potential, Numerical (8 Hrs.)

Unit VI: **Spectroscopic techniques and applications :** Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Principle and Applications of Nuclear magnetic resonance and magnetic resonance imaging.

Photochemistry and Modern Analytical techniques: Lows of photochemistry, quantum efficiency and its determination, low & high quantum yield reactions, Mass spectrometry. Chromatography. (8 Hrs.)

Course Outcomes :

The course will enable the student to:

- Evaluate the properties of non-ideal gases, Intermolecular forces in gas, critical phenomenon & probability consideration of molecular speed.
- Solve problems involving root mean square, average and most probable speeds & critical constants.
- Evaluate the specific rate, order and energy of activation of chemical reactions.
- Know the fundamental concepts related to homogeneous and heterogeneous catalysis, mechanisms of industrially important reactions, surface phenomenon and adsorption isotherms.
- Apply mass and energy balances to closed and open systems ,Rationalize bulk properties and processes using thermodynamic considerations
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques and spectroscopic methods for identification of compounds.
- Know the ion transport & electrical properties of solutions, solve problems involving transport no, electrode potential and emf of different types of cell.

Books Recommended :

1. Physical Chemistry , P.W. Atkins and J.D. Paula, Oxford University Press.
2. Physical Chemistry , K.J. Laidler and J.M. Meiser, CBS Publisher
3. Chemical kinetics and catalysis , R. J. Masel, John Wiley publications
4. Handbook of conducting polymers, Skotheim, Elsenbaumer and Reynolds, Marce Dekker.
5. Fundamentals of spectroscopy ,Banwell, Tata McGraw-Hill
6. Physical chemistry of surfaces, Arthur W. Adamsons, Alice P. Gast, John Wiley publications
7. Principle of Heterogeneous catalysis, J.M.Thomas, W.J. Thomas, John Wiley publications
8. Thermodynamics for students of chemistry, Dr. J. Rajaram & Dr. J. C. Kuriacose, Chand & comp.

4 CH02 MACHINE DESIGN & DRAWING

SECTION - A

Unit I- (a) Sectional Views Conversion of pictorial view in to sectional orthographic projections, Sectional views with different types of projections, Missing views (12 Hrs)

Unit II- a) Development of surfaces 31 32 Development of surfaces of cubes, prisms, cylinders, pyramids, cones & their cut sections

b) Intersection of solids-prism and prism, cylinder and cylinder, cylinder and prism, cone and cylin-der, cone and prism. (12 Hrs)

SECTION B

Unit III- (a) Meaning of Design, Phases of Design, Design considerations.

(b) Simple stresses, Thermal stresses, Torsional Stress, stresses in straight & curved beams and its application- hooks, cclamps

(c) Design & drawing of riveted joints- Caulking & fullering, failures, strength & efficiency of riveted joints.

(d) Welded joints- Symbolic representation, Strength of transverse & parallel fillet welded section e) Design & drawing of Knuckle Joints (12 hrs)

Unit IV :(a) Design of Helical springs- Types of springs, stresses in helical springs, Wahl's stress factor, Buckling & surge, tension spring (b) spiral & leaf springs c) Design of power screw-Torque required to raise loads, efficiency & helix angle, overhauling & self locking of screw, acme threads, stresses in power screw. (12 hrs)

Books Recommended :

Text Books :

1) Machine Drawing by N. D. Bhatt, Charator Publication
2) Machine Design by R. S. Khurmi & J. K. Gupta , S. Chand Publication .

Reference Books :

1) Machine Design by Dr. P. C. Sharma & Dr. D. K. Agrawal, Katsons Books publication
2) Design of Machine elements by C. S. Sharma, Kamlesh Purohit, PHI publication
3) Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publication
4) Machine Design, Jindal, Pearson publications
5) Design Data Book by- P.S.G. Koimbatore
6) Design Data Book by Mahadevan.

(Use of any data book from the above will be permitted during the examination).

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4CH03 FLUID FLOW OPERATIONS

Course Objectives:

This basic course introduces concepts of momentum transfer to students. Various concepts such as pressure, momentum, energy are introduced. Laws related to conservation of momentum, energy are taught. Applications of these laws to various engineering situations and process equipment is explained with the help of several problems

SECTION A

Unit I: Properties of fluids and their classification. Fluid statics: Forces on fluids, pressure depth relationship for compressible and incompressible fluids. Forces on submerged bodies. Rigid body motion, pressure measurements, Euler's equation. (8)

Unit II: Kinematics of flow, Description of velocity field, Stream functions, Angular velocity, Fluids in circulation, Fluid flow: Laminar and turbulent flows, Equations of Continuity and Motion in laminar flows and its applications for the calculation of velocity profiles, shear stresses, power, etc. in various engineering applications. Dimensional analysis; Buckingham's Pi Theorem ; Dimensionless numbers and their physical significance; Vortex flow (8)

Unit III Dynamics of flow , Bernoulli's Equation and engineering applications, Conservation of mass, momentum and energy; Mechanical energy balance ,Basics of Turbulent flows, equations of continuity and motion for turbulent flows: Prandtl mixing length theory,. Turbulent pipe flow, basis of Universal velocity profile and its use. Von-Karman integral equations . Pressure drop in pipes and Fittings, Piping systems. (10)

SECTION B

Unit IV: Flow measuring devices for chemical plants: Orifice meter, Venturi meters, Rotameter, Pitot tube and Notches.

(7)

Unit V : Fluid moving machinery such as pumps like reciprocating pumps, rotary pumps, Centrifugal pumps, blowers, compressors, vacuum systems, etc. . (8)

Unit VI: Flow past immersed bodies, Particle Dynamics, flow through packed bed and fluidized Bed. Introductory concepts of two-phase flow. (6)

Books Recommended:

1. Unit Operations in Chemical Engineering, McCabe Smith: McGraw Hill.

2. Chemical Engineering, Vol. 1, Coulson J. M. and Richardson J. F. Butterworth Heinemann.

3. Fluid Mechanics, F. W. White.

4. A Text book of Fluid Mechanics and Hydraulic Machines ; Dr. R.K.Bansal

5. Fluid Mechanics , R. P. Vyas.

Subject Outcomes :

1 Students should be able to calculate velocity profiles by simplification of equations of motion in simple 1-D flows
2 Students should be able to calculate friction factor, losses in pipe fittings
3 Students will be able to calculate pressure drop, power requirements for single phase flow in pipes
4 Students should be able to calculate two phase gas/liquid pressure drop
5 Students should be able to calculate power requirements, NPSH requirements of pumps
6 Students should be able to calculate drag force and terminal settling velocity for single particles
7 Students will be able to calculate pressure drop in fixed and fluidized beds.

4CH04 CHEMICAL ENGINEERING THERMODYNAMICS-II

Chemical Engineering Thermodynamics is primarily concerned with the application of thermodynamics to phase equilibria and reaction equilibria. It is concerned with the application of Thermodynamics to heat-to-work and work- to-heat conversion devices. Chemical engineers are seriously concerned with the calculation of work in separation and in mixing processes. Its applications are obvious in the design of Chemical engineering equipments in processes.

Course Objectives:
After studying this subject the student will have:

- The mathematical abilities required for applying thermodynamics to practical problems.
- Its applications in the design of Chemical engineering equipments in processes.

SECTION A

UNIT-I: First law of thermodynamics, equation of state, critical properties, Vander Wall's constants, Virial expansions, Redlich-Kwong equation, Beattle-Bridgeman equation.
First law applied to thermodynamic processes and calculations of work, free energy and heat changes. Maxwell relation equation, second law and third law of thermodynamics. Thermodynamics relations based on second law. Relation between Cp and Cv, compressibility factor and coefficient of thermal expansion, concept of residual entropy and entropy of equilibrium. (8)

UNIT-II: Partial molar and apparent molar properties, Gibbs Duhem equation, chemical potential, effect of temperature and pressure fugacity, excess thermodynamic properties of mixing. Gibbs-Duhem-Morgules equation, Konovalov laws.

UNIT-III: Colligative properties, Ebulliometric constant. Determination of molecular weight of unknown chemical substances. Solubility law. Vapour liquid equilibrium, T-X-Y diagrams and X-Y diagram for ideal and non ideal system . Raoult's law and Henry's law, Deviations from Raoult's law. Comparison of ideal and non- ideal systems. (8)

SECTION B

UNIT-IV: Phase equilibria in non reacting multi-components, binary and ternary systems. Graphical representation of L/L, L/S and G/S systems. Right angled triangular diagrams. Equilateral triangular diagrams, Janecke diagram, Phenol-water systems, Aniline-water-chlorobenzene systems. (7)

UNIT-V: Statistical thermodynamics, thermodynamics probability, its relation with entropy, partition function and its relation with thermodynamic functions, the Boltzman distribution law, Distribution law for chemically reactive system Thermodynamics charts and their uses. Searching of thermodynamics data. (7)

UNIT-VI: Chemical equilibrium, feasibility of chemical reaction, free energy change, Reaction co-ordinate, equilibrium constant, effect of temperature and pressure, Relation between Kp, Kc and Kv, Le-Chatelier's principle. Endo-exothermic reactions. Heterogeneous equilibria, various methods of calculating free enegy charge, equilibrium conversions, case study of feasibility report for manufacture of industrial chemicals. (7)

Text Books:

1. An Introduction of Chemical Thermodynamics: R.P.Rastogi and R.R. Mishra
2. Chemical Engineering Process: Houghen and Watson

Reference Books:

1. Introduction to Chemical Engineering Thermodynamics: J. M. Smith and H. C. Vauhess.
2. Thermodynamics for Chemical Engineering: H. C. Weber and J. P. Meissner.
3. Engineering Thermodynamics: P.K. Nag.

4CH05 CHEMICAL ENGINEERING OPERATIONS–I (MECH. OPERATIONS)

This subject intends to equip the students with concepts and principles as well as construction of equipments used for handling Mechanical Operations in a chemical plant. This subject gives idea about principles of handling mixtures of solids, liquid and gases. This subject will help students for understanding principles for separation and purification techniques of solid, liquids and gases mixtures.

Course Objective: After studying this subject's student will be able to:

- Explain methods of size reduction and equipments working on those principles.

- Describe various equipments used for size separation.

- Identify various other physical properties used for purification solid-solid mixtures and equipments working on this principle.
- Describe various method of purification of heterogeneous mixture of solid liquid, & equipments like filters, settlers, used for separation of solid liquid mixtures.
- Identify various types of agitators used for mixing solids-liquids mixtures, power calculation of a mixer.

SECTION - A

UNIT-I: Size reduction, stages of reduction, equipment operating variables, laws of energies, energy requirements. Screening: Screen analysis, particle size distribution. (7)

UNIT-II: Classification: Equal falling particles, equipment, jigging, tabling. Gravity settling, drag force, terminal settling velocity Sedimentation: Continuous thickners. (8)

UNIT-III: 1. Storage and handling of solids, transportation.

2. Mixing, mixers, agitation, type of equipments. (7)

SECTION - B

UNIT-IV: Filtration: Theory, operation, types, flotation agents, flotation cells Filter calculations, filtration equation for compressible and non- compressible cakes , specific cake resistance. Filtration- constant pressure and constant rate and their equipments. (8)

UNIT-V: Centrifuges: Theory, equipments, types and calculations.

Cyclones: Hydro cyclones, liquid scrubbers and electronic precipitators (7)

UNIT-VI: Adsorption, theory, type and application, Langmuir's Freund Lich;s equation nature of adsorbents, industrial adsorbents. Adsorption on fixed bed, fluidized beds Recent developments in mechanical operations. **(8)**

Text Books:

1. Bedger and Bencharo, "Introduction to Chemical Engineering". Tata McGraw Hill.
2. Narayanan C.M. & Bhattacharya B.C. "Mechanical operations for chemical engineers", Khanna Publishers, 3 rd Ed.1999.

Reference Books:

1. Coulson and Richardson: Chemical Engineering, Vol. 2

2. Brown,G.G. and Associates "Unit operations" Wiley , New York

4CH07 APPLIED PHYSICAL CHEMISTRY- LAB

Total credits: 2 Examination Scheme: (I): 25 (Ext): 25 Marks

Objectives: To provide the practical knowledge of analysis techniques by classical and instrumental methods for developing experimental skill to built technical competence.

List of Experiments:

1. Determination of critical temperature of phenol-water system
2. Determination of order of reaction and specific rate constant of hydrolysis of methyl acetate.
3. Study of kinetics of second order reaction.
4. Determination of relative strength of two acids by kinetic study of reaction
5. Determination of energy of activation of reaction
6. Determination of equivalent conductivity of strong electrolytes at infinite dilution.
7. Determination of transport number
8. Determination of equivalence point of titration by conductance measurement.
9. Potentiometric titration between strong acid and strong base.
10. Verification of Beer- Lambert's law and determination of concentration of unknown solution.
11. Verification of Freundlich and Langmuir isotherm.
12. Determination of refractive index.
13. Determination of solubility of sparingly soluble salts by EMF measurement.
14. Determination of heat of neutralization & ionization of acetic acid
15. Determination of ΔH and ΔS of monobasic acid by measuring its solubility at different temperatures.
16. Determination of specific rotation of cane sugar by polarimetry.

Course outcomes: After completion of this course the students shall be able to ;

1. Understand the objectives of their experiments.
2. Follow the proper and safe procedure to get the accurate results.
3. Record and analyze the results.
4. Interpret the results through proper writing in laboratory journal

Books Recommended :

1. Experiments in Physical Chemistry, David P. Shoemaker, Carl W. Garland, Jeffrey I. Steinfeld
2. Experiments in Chemistry, Dr. D. V. Jahagirdar, Himalaya Publishing House, New Delhi
3. A Text Book of on experiments and calculations- Engg. Chemistry, S.S. Dara, S. Chand & Comp. ltd.

All above experiments are to be arranged in the laboratory. Minimum 08 experiments are required to be performed by the student to complete the term work.

4CH08 FLUID FLOW OPERATION-LAB

Experiments:

- To obtain the coefficient of discharge for the given Venturimeter and obtain its relationship with Reynolds' no.
- To calibrate the given Rotameter.

- To obtain the coefficient of discharge for the given orifice meter and obtain its relationship with Reynolds' no.
- To study the flow and determine critical Reynolds no.

- To determine the discharge co-efficient of the given v-notch.

- To verify the Bernoulli's theorem.

- To determine the viscosity of the given liquids using Stoke's law.

- To determine the viscosity of a given liquid by measuring efflux time of a given tank. Also determine the diameter of a given capillary and compare.

- To determine relation between friction factor and Reynolds number for the given flowing fluid through circular pipe.
- To obtain relation between friction factor and Reynolds number for flow of water through annulus.
- To determine the resistance offered by various pipe fittings and express them in terms of equipment straight pipe length.
- To study characteristics curves for a centrifugal pump.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

4CH09 CHEMICAL ENGINEERING THERMODYNAMICS –II -LAB

List of experiments:

- Critical solution temperature of phenol water system.

- Critical solution temperature of phenol water system in presence of impurity like NaCl.

- Critical solution temperature of phenol water system in presence of impurity like succnic acid.

- Determination of boiling point elevation in presence of impurity.

- Determination of freezing point depression in presence of impurity.

- Study of T-X-Y Diagram.

- Lowering of vapour pressure.

- Study of boiling point diagram.

- Study of ternary diagram.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

4CH10 CHEMICAL ENGINEERING OPERATIONS-I LAB (MECH. OPERATIONS) -LAB

- To study the performance of Ball Mill and find out it's crushing efficiency.
- To study the performance of Jaw Crusher and find out it's crushing efficiency.
- To study the performance of Crushing Rolls and find out it's crushing efficiency.
- To study the settling characteristics (Free & Hindered settling) of a given suspension of particles.
- To study the filtration characteristics of rotary vacuum filter.
- To study the filtration characteristics of Plate and frame filter press.
- To study the filtration characteristics of Leaf and sparkle filter.
- To carry out differential and cumulative screen analysis of given sample of solid particles.
- To determine energy consumption and crushing law constants for jaw crusher.
- To determine Critical speed of Ball mill & Average particle size of the product obtained in ball mill, **OR** Average particle size of product obtained in Bhrustone mill.
- To determine area of batch thickener by conducting batch sedimentation test.
- To determine efficiency of Cyclone separator.
- To Determine Variation of size reduction in ball Mill by changing the residence time, size of grinding medium and material of grinding medium.

All above experiments are to be arranged in the laboratory. Minimum 8 experiments are required to be performed by the student to complete the term work.

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SYLLABI PRESCRIBED FOR FOUR YEAR DEGREE COURSE

BACHELOR OF TECHNOLOGY CHEMICAL TECHNOLOGY

SEMESTER PATTERN (CHOICE BASED CREDIT GRADE SYSTEM)

SEMESTER : THIRD

3CT01 APPLIED ORGANIC CHEMISTRY

Course Objectives:

1. Students will get introduced to aromatic compounds, heterocyclic chemistry and natural products, properties and applications of phenols, ethers, epoxides, amines and their derivatives.
2. Student will get the knowledge about the chemistry of unit process, kinetics and mechanism of Nitration, sulphonation and sulphation.
3. Students will get introduces to polymer chemistry and technical preparation of some polymers.

Course Outcomes:

Students will be able to -

1. Analyzed aromaticity and list properties of aromatic compounds.
2. Write simple mechanisms of aromatic reactions.
3. List some of the heterocyclic chemistry and chemistry of natural products.
4. List some properties of amines and their derivatives.
5. Know the unit process like halogenation, sulfonation and nitration.
6. Synthesized some simple organic compounds, polymers and understand the kinetics and mechanism of unit processes.

SECTION-A

Unit I : 1. Aromatic hydrocarbons : Preparation, properties and applications of Benzene, and Naphthalene

2. Heterocyclic compounds: Classification of heterocyclic compounds, preparation, Properties and applications of pyrrole, thiophene, & furan (8 Hrs.)

Unit II : 1.Phenols : Basic concepts, classification, preparation, properties and applications of Phenol, resorcinols, cresols, catechol.

2. Ethers, epoxides and sulphur acids: Methods of preparation, General reaction, ethylene and propyleneoxides – their reactions and applications (8 Hrs.)

Unit III : Amines and their derivatives : Basic concepts, classification of amines, preparation, properties and applications of aniline and Benzene diazonium chloride.

Natural products: Terpenes, alkaloids, plant pigments, their applications (8 Hrs.)

SECTION-B

Unit IV : 1) Study of Chemistry of Unit Process : Nitration, nitrating agents, kinetics and mechanism of aromatic nitration. Technical preparation of nitrobenzene and nitronaphthalene.

2) Study of Chemistry of Unit Process : Sulphonation and Sulphation : Sulphonating & Sulphating agents, kinetics of mechanism of sulphonation. Technical preparation of Sulphonation of Benzene (8 Hrs.)

Unit V : 1) Study of Chemistry of Unit Process : Halogenation : Halogenating agents, thermodynamics, kinetics Technical preparation of DDT and Vinyl chlorides.

2) Principles of polymer chemistry and practices: Classification of polymerization. Types of polymers. Technical preparation of Polyvinylchloride, Bakelite. (10 Hrs.)

Unit VI: 1) Carbohydrates: Basic concepts, classification, industrial applications of glucose, sucrose and starch.

2) Chemicals in food products: Study of preservatives, sweetening agents and antioxidants. (6 Hrs.)

Books Recommended :

1) Organic Chemistry (Vol. I & II): I.L.Finar, Longman Group Ltd. And the English Language Book Society, London, 6th edition.
2) Advance Organic Chemistry: Fieser and Fieser, Asia Pub. House, Mumbai, 1961.
3) Unit Process in Organic Synthesis: P.H.Groggins, McGraw Hill, 5th edition.

3CT02 APPLIED PHYSICAL CHEMISTRY

Teaching Scheme:
(Th)Lecture: 03 Hours / week
Tutorial: 01 Hour /week
Total credit: 04

Examination Scheme:

T (U) : 80 Marks T (I) : 20 Marks
Duration of Univ. Exam : 03 Hours

Learning Objectives:

- To understand the effect of structure on properties of polymer, concept of weight average and number average molecular weight of macromolecules.
- To understand the electrical properties of fluid.
- To know the rate, order, energy of activation of chemical reactions and their determination.
- To know the use of kinetics and thermodynamics to elucidate mechanisms of reactions.
- To understand the basic concepts, the Ist and IInd Laws of Thermodynamics, Thermodynamic functions and their applications.
- To predict the high and low quantum yield photochemical reactions and to know about advanced spectroscopic analysis techniques.
- To know the basic concepts and industrial examples of catalysis and adsorption on surface.

Course outcomes :

The course will enable the student to:

- Evaluate the structural properties of macromolecules, average molecular weight determination of polymers by various methods.
- Evaluate the specific rate, order and energy of activation of chemical reactions.
- Know the fundamental concepts related to homogeneous and heterogeneous catalysis, mechanisms of industrially important reactions, surface phenomenon and adsorption isotherms.
- Apply mass and energy balances to closed and open systems ,Rationalize bulk properties and processes using thermodynamic considerations
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques and spectroscopic methods for identification of compounds.
- Know the ion transport & electrical properties of solutions, solve problems involving transport no, electrode potential and emf of different types of cell.

Contents:

Unit- I : Ion transport and electrical phenomenon at interface: Specific, Equivalent and Molar conductivity, Kohlraush's law and its applications ,Transport number and their determination ,Reversible and reference electrode , Thermodynamics of reversible electrode, Relation between electrical work done and free energy, Nernst equation for electrode potential , Standard electrode potential , Electrolytic concentration cell with and without transference, Determination of pH, solubility and solubility product of sparingly soluble salts, dissociation constant by EMF measurement, Numerical. (8 Hrs.)

Unit-II : Polymer science: Number average and weight average molecular weight of macromolecule, Methods of molecular weight determination of macromolecules, Membrane osmometry, Light scattering, sedimentation and ultracentrifuge methods, Effect of polymer structure on properties of polymers. Numerical on molecular weight determination. (6 Hrs)

Unit- III : Kinetics & Reaction mechanism: Introduction, Rate of reaction, concept of molecularity and order in elementary and complex reactions, differential and integral methods to formulate rate equations of zero, first and second order reactions. experimental methods in kinetic studies, effect of temperature on reaction rate, energy of activation and its determination, steady state approximation and rate determining step, Mechanism of complex reactions, photochemical chain reactions, polymerization reactions. Fast reactions – experimental techniques. Numerical (10 Hrs.)

Unit-IV : Surface, interfacial chemistry and catalysis: Adsorption , types of adsorption, Adsorption isotherms , Langmuir theory of adsorption, BET adsorption isotherm and it's application for determination of surface area of fine powder. Homogeneous and Heterogeneous catalysis, Criteria of catalyst, Theory of heterogeneous catalysis, Homogeneous, Lewis acid-base catalysts, organometallic catalysts and industrially examples, Auto and enzyme catalysis. kinetics of reactions on surfaces. (8 Hrs.)

Unit – V : **Thermodynamics and Equilibrium :** Statements of the second law; Heat engines, Carnot's theorem, and Carnot cycle, Mathematical statement of the second law, Introduction of Entropy under the IInd Law to define spontaneity of a process, Temperature- entropy diagram, Introduction of the state functions A & G to determine conditions of Material Equilibrium. Condition of reversibility, Transformation at constant temperature and pressure, Gibbs- Helmholtz equation, pressure – volume and volume – Temperature relationship under isothermal condition for ideal gas. Partialmolar properties, chemical potential, Numerical. (8 Hrs.)

Unit VI: Spectroscopic techniques and applications : Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy of diatomic molecules. Principle, Instrumentation and Applications of IR, UV & NMR spectroscopy

Photochemistry and Modern Analytical techniques: Lows of photochemistry, quantum efficiency and its determination, low & high quantum yield reactions, Atomic absorption spectroscopy, chromatography. (8 Hrs.)

Books Recommended :

1. Physical Chemistry , P.W. Atkins and J.D. Paula, Oxford University Press.
2. Physical Chemistry , K.J. Laidler and J.M. Meiser, CBS Publisher
3. Chemical kinetics and catalysis , R. J. Masel, John Wiley publications
4. Handbook of conducting polymers, Skotheim, Elsenbaumer and Reynolds, Marce Dekker.
5. Fundamentals of spectroscopy ,Banwell, Tata McGraw-Hill
6. Physical chemistry of surfaces, Arthur W. Adamsons, Alice P. Gast, John Wiley publications
7. Principle of Heterogeneous catalysis, J.M.Thomas, W.J. Thomas, John Wiley publications
8. Thermodynamics for students of chemistry, Dr. J. Rajaram & Dr. J. C. Kuriacose, Chand & comp.

3 CH 03 /3CT03 STRENGTH OF MATERIALS

Learning Objectives of Subject:

1. TodeterminetheMechanicalbehaviorofthebodyandconstructionmaterialsbydetermining the stresses, strains produced by the application of loads.
2. To apply the fundamentals of simple stresses and strains.
3. To make one understand the concept of bending and its theoretical analysis.
4. To apply fundamental concepts related to deformation, moment of inertia, load carrying capacity, shear forces, bending moments, torsional moments, principal stresses and strains, slopes and deflection.

Course outcomes:

At the end of the subject the students will be able -

1. To understand the basics of material properties, stress and strain.
2. To apply knowledge of mathematics, science, for engineering applications
3. To identify, formulate, and solve engineering & real life problems
4. To design and conduct experiments, as well as to analyze and interpret action and reaction data.
5. To understand specific requirement from the component to meet desired needs within realistic constraints of safety.

SECTION – A

Unit I: Mechanical properties: Concept of direct and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel, Generalized Hook's law, factor of safety. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit II: Axial force, shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Unit III: Stresses in beams (Bending, Shear), i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section. ii) Shear: Distribution of shear stresses on beam cross sections, impact loads and instantaneous stresses.

SECTION – B

Unit IV: Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load. Thin cylinders subjected to internal pressures.

Unit V: Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.

Unit VI: Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method. Theory of long columns, Euler, Rankin's formula.

Books Recommended:

1. E. P. Popov, "Mechanics of Materials", Prentice Hall of India, New Delhi.
2. S.Timoshenko and O. H. Young, 'Elements of Strength of Materials', East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, 'Strength of Materials', Harper and Row, New York.
4. Shames, I. H., 'Introduction to Solid Mechanics', Prentice Hall of India, New Delhi.
5. R. K. Bansal, Strength of materials, Laxmi Publications Pvt Ltd.
6. Junnarkar, S. B., Mechanics of materials.
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pvt. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.
9. S. Ramamrutham, Strength of Materials, Dhanpat Rai Publishing Co Pvt Ltd.

3CT04 APPLIED THERMODYANICS

Course Learning Objectives :

1. To study the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. To study the laws of thermodynamics and their applications
3. To study the properties of steam, work done and concept of heat transfer
4. To study the air standard cycles

Course Outcomes :

Students will be able to

1. Understand the basic concepts of thermodynamics, thermodynamic systems, work and heat
2. Apply first law of thermodynamics and application of first law to flow and non-flow processes
3. Apply second law of thermodynamics and understand concept of entropy
4. Understand the properties of steam, work done and heat transfer during various thermodynamics processes with steam as working fluid
5. Understand the concept of air standard cycles

SECTION – A

Unit-I: Introduction to basic concepts of thermodynamics, Macroscopic and microscopic approaches, properties of system, state, processes and cycle, thermodynamic equilibrium, types of thermodynamic systems, Temperatures and Zeroth law of thermodynamics, Quasi-static process, Gas Laws and Ideal gas equation of states, gas constant and universal gas constant.
Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams (10 hrs)

Unit-II: First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Application of first law to non-flow processes, Change in internal energy, work done and Heat transfer during various non-flow processes. (7 hrs)

Unit-III: First Law applied to flow processes: Steady state, steady flow process, equation for work done in steady flow process and its representation on P-V diagram, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes. (9 hrs)

SECTION – B

Unit-IV: Second Law of thermodynamics: Limitations of First law, Thermal energy reservoir, heat engines refrigerator and heat pumps, COP and tonne of refrigeration, COP for heat pump and refrigerator, Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, Carnot theorem and its corollary, The thermodynamic temperature scale, Reverse Carnot cycle, Inequality of Clausius.
Introduction to Entropy, availability and irreversibility. Principle of increase of entropy. (8Hrs)

Unit-V: Properties of Steam: Triple point and critical point, Sensible heat, latent heat, superheat and total heat of steam. Wet steam, dryness fraction, Internal energy of steam, External work of evaporation, internal latent hear, Specific volume, enthalpy, internal energy and entropy of steam. T-S diagram Mollier chart, Steam tables and their use. Work done and heat transfer during various thermodynamics processes with steam as working fluid. Throttling of steam, determination of dryness fraction using various calorimeters. (8 Hrs)

Unit VI : Air Standard Cycles: Ottto, diesel, semidiesel, Brayton, Sterling and joule cycles etc., their efficiencies and mean effective pressure, comparison of auto, diesel and duel cycles.
Vapour Cycles:- Rankine and Modified Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram. (No numerical on this unit) (numerical on air standard cycle) (8 Hrs)

BOOKS RECOMMENDED:

Text Books :

1. Engineering Thermodynamic - by P. K. Nag.
2. Fundamentals of Engineering Thermodynamics; R. Yadav;
3. Thermodynamics Basics and Applied: by V. Ganeshan
4. Thermal Engineerirng: by Mahesh M. Rathore.

Reference Books :

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G. J.Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson.

3CT05 PROCESS CALCULATION

Course objectives :

1. Students will learn the basic and fundamentals of chemical engineering operations and processes.
2. Students will understand the material balance and energy balance of various unit operations and unit processes.
3. Students will learn how to formulate and solve the problems related to material and energy balance with or without chemical reaction.

Course Outcomes:

After successful completion of this course student will be able to

1. Understand the concept of basic chemical calculations
2. Understand the concept and application of theory of proportions
3. Determine the humidity with/without using a psychrometric chart.
4. Make the material balance over unit operations and processes.
5. Make the energy balance over unit operations and processes.
6. Solve the problem of fuels and combustion.

SECTION A

Unit I: Introduction to unit operations and unit processes, Units and dimensions, Atoms, moles and molecular weight, mole and mass fraction, Composition of solids, liquids and gases, Concept of Normality, Molarity and Molality, PPM (Parts Per Million), Ideal Gas Law, Dalton's Law, Partial Pressure, Amagat's Law, Average Molecular Weight,Density of Gas Mixture, Raoult's Law, Henry's Law, Vapour Pressure, Clausius Clapeyron equation, Cox Chart,.Humidity and saturation, Humidity Chart, and their application.

Unit II : Material balance without chemical reaction stoichiometry and unit operations Distillation, Absorption, Extraction, Crystallization, Drying, Mixing, Evaporation. Recycle, purge and Bypass calculations.

Unit III : Material balance involves chemical reaction, Principle of stoichiometry, simple oxidation reaction, multiple chemical reaction, percentage Conversion, percentage Yield, and selectivity, calculation involving combustion of gases, liquid and solid fuel. Recycle, purge and bypass calculations.
Introduction to unsteady state material balance

SECTION B

Unit IV : Energy balance: open and closed system, heat capacity, calculations of enthalpy changes, enthalpy changes for phases transitions, evaporation, Solution and mixing, clausius clapeyron equation.

Unit V: Energy balance with chemical reaction, calculation of standard heat of reaction, heat of formation, heat of combustion, Hess law, Effect of temperature on heat of reaction; adiabatic flame temperature calculations.

Unit VI : Heating value of fuels, calculations involving theoretical and excess air, heat and material balance of combustion processes.

References :

1. Bhatt, B. I., Vora, S. M., "Stoichiometry", Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004.
2. Narayanan K V and Lakshmikutty B, Stoichiometry and Process Calculations, Prentice Hall of India Pvt Ltd, New Delhi 2006.
3. Sikdar, D. C., "Chemical Process Calculations", Prentice Hall of India.
4. Himmelblau, D. M., Riggs, J. B. "Basic Principles and Calculations in Chemical Engineering", Eighth Ed., Pearson India Education Services, 2015.
5. Hougen. O. A, Watson K.M. and Ragatz R.A. "Chemical Process Principles, Part -I, Material and Energy Balance".

3CT06 APPLIED ORGANIC CHEMISTRY- LAB

Course objectives:

1. Students should be familiar with common organic compounds, should identify them and should know simple organic preparation and separationmethods.
2. Students will get introduced to aromatic compounds, heterocyclic chemistry and natural Products.

Course outcomes:

1. Students will be able to list steps for identifying simple organic compounds
2. Students will be able to list some methods of separation of organic compounds
3. Student will be able to synthesize simple organic compounds.

Content:

1. Identification of an organic compound through elemental analysis, group detection, physical constants (m.p and b.p) and derivatisation.
2. Separation and purification of binary mixtures of the type: water soluble-water insoluble, both watersoluble, liquid-liquid by distillation, dissociation - extraction , crystallization, etc.
3. Simple organic preparations:
   i) Acetanilide
   ii) Nitro Acetanilide
   iii) Aspirin

Books Recommended:

1. Practical Organic Chemistry, by I.L. Finar
2. Laboratory hand book of organic qualitative analysis and separation, by Kulkarni V. S. D. Ramchandra & co. Pune.

3CT07 APPLIED PHYSICAL CHEMISTRY- II - LAB

Total hours / week : 2 Examination Scheme: (I): 25, (Ext): 25 Marks
Total credit: 1

Course Objectives: To provide the practical knowledge of analysis techniques by classical and instrumental methods for developing experimental skill to built technical competence.

List of Experiments:

1. Determination of viscosity average molecular weight of polymer.
2. Determination of order of reaction and specific rate constant of hydrolysis of methyl acetate.
3. Study of kinetics of second order reaction.(Saponification of ethyl acetate & reaction between potassium per sulphate & potassium iodide)
4. Determination of relative strength of two acids by kinetic study of reaction
5. Determination of energy of activation of reaction
6. Determination of equivalent conductivity of strong electrolytes at infinite dilution.
7. Determination of transport number by EMF measurement.
8. Determination of equivalence point of titration by conductance measurement.
9. Potentiometric titration between strong acid and strong base.
10. Verification of Beer- Lambert's law and determination of concentration of unknown solution.
11. Verification of Freundlich and Langmuir isotherm.
12. Determination of refractive index.
13. Determination of solubility of sparingly soluble salts by EMF measurement.
14. Determination of heat of neutralization & ionization of acetic acid
15. Determination of ΔH and ΔS of monobasic acid by measuring its solubility at different temperatures.
16. Determination of specific rotation of cane sugar by polarimetry.

All above experiments are to be arranged in the laboratory. Minimum 08 experiments are required to be performed by the student to complete the term work.

Course outcomes: After completion of this course the students shall be able to :

1. Understand the objectives of their experiments.
2. Follow the proper and safe procedure to get the accurate results.
3. Record and analyze the results.
4. Interpret the results through proper writing in laboratory journal

Books Recommended :

1. Experiments in Physical Chemistry, David P. Shoemaker, Carl W. Garland, Jeffrey I. Steinfeld
2. Experiments in Chemistry, Dr. D. V. Gahagirdar, Himalaya Publishing House
3. A Text Book of on experiments and calculations- Engg. Chemistry, S.S. Dara, S. Chand & Comp. ltd.

3CT08 / 3CH08 – STRENGTH OF MATERIALS – LAB

List of Practical's in Strength of Material Lab (Minimum any eight practical from the list should be performed)

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

3CT09 APPLIED THERMODYNAMICS – lab.

Minimum 8 10 10 Practicals based on the Syllabus 3CT09 APPLIED THERMODYNAMICS**.**

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SEMESTER - IV

4CT01 MATHEMATICS - II

Course Outcomes:

After successfully completing the course, the students will be able to

1. Demonstrate the knowledge of partial differential equations, applied to Computer technology.
2. Find roots of complex numbers, separate the complex quantity in real & imaginary parts, and find logarithms of negative numbers and complex quantities.
3. Compute different Numerical Methods
4. Analyze the Knowledge of Optimization.
5. Analyze the concept of Linear Programming Problems and Simplex Method
6. Demonstrate the basic concepts of probability and statistics

Students are expected to be aware of the statements of the relevant theorem without mastering their proofs.

Unit I :Partial Differential Equations : Basic concepts (@J 1.1), Vibrating string (@11.2), separation of variables (@11.3), one dimensional heat flow(@11.5), 11.6) (07 periods)

Unit II: Complex Numbers and Analytic functions : Complex numbers(@12.1), polar fonn(@12.2),Complex function limit, derivative analytic function (@12.4), Cauchy Riemann Equations, Laplace's Equation(@12.5), rational functions(@12.6), Exponential function (@12.7), Trigonometricand hyperbolic functions (@12.8), logarithm (@12.9) (07 periods)

Unit III : Numerical Analysis : Errors in computation (@19.1), Solution of Equations by iteration, Newton - Raphson method (@19.2) Finite differences{@19.3}, Interpolation (@19.4), Numerical integration using rectangular, trapezoidal and Simpson's rule (07 periods)

Unit IV : Optimization : Basic concepts (@22.1), Linear programming{@22.2), Simplex method{@22.3),(@~2.4) (07 periods)

Unit V : Probability and Statistics : Sample mean and variance (@23.3), probability (@23.S),Permutations and combinations (@23.6), discrete and continuous distributions (@23.7), mean and variance of adistribution (@23.8), Binomial, Poisson distributions (@23.9),Normal distribution (@23.10) (07 periods)

Unit VI : Probability and Statistics (continued) : Random sampling (@23.12), Estimation of parameters (@23.13),confidence intervals (@23.14), Testing of hypothesis (@23.15) (07 periods)

Note : Numbers in bracket refer to section number; T1 "AdvancedEngineering Maths" by Erwin Kreyszig (Finn jdn), WileyEastern.

Books Recommended :

1) Elements of Applied Mathematics: P.N. Wartikar& J.N. Wartikar,
2) A text book of Applied Mathematics: P. N. Wartikar& J. N. Wartikar,
3) Advanced Engg. Mathematics - Erwin Kreyszig, Wiley Eastern (5thEdition),
4) Higher Engg. Mathemetics . B.S.Grewal.
5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI
6) 4. Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford.

4FT02 FOOD TECHNOLOGY-I:

CHEMISTRY OF FOODS :

Development of Food Chemistry : History of Food Chemistry. Nature and Origin of life. Basic activities of animals and plants and their relations. Water and Ice: Importance of water in foods. Structure of water and ice. Concept of bound and free water and their implications.

Carbohydtrates :- Nomenclature, Classification and structure of Carbohydrates. Chemical reactions of carbohydrates. Physical and Chemical properties of sugars, starch, pectic substances, gums and other polysacchrides, Functional properties of carbohydrates in foods.

Lipids: Definition and classification of lipids, Chemistry of fatty acids and glycerides, Physical and chemical characteristics. Chemistry of processing of fats and oils, hydrogenated fats, shortening agents and confectionery fat etc. Rancidity of fats and oils, its prevention and antioxidants. Functional properties of lipids in foods.

Protein: Importance of proteins. Nomenclature, classification, structure and chemistry of amino acids, peptides and proteins Sources and distribution of proteins. Isolation identification and purity of proteins, Denatruation Functional properties of proteins in food.

Fruits and Vegetables: Plant Cells and tissues, their structure, functions and physiology, Chemical Composition of edible plant tissue. Texture of fruits and vegetables. Effects of cooking on texture and composition of fruits and vegetables.

Meat. Fish and Poultry : Animal Proteins, Structure and chemical composition of muscles, **Myoglobin and hemoglobin** - Post - Mortem charges regor mortis. Methods of cooking and processing and their influence on texture. Physical and chemical changes during cooking Palatability characters; texture and tenderness. Structure and composition of eggs. Chemistry and functional properties of eggs.

Milk and Milk Products : Composition of milk, Physical and chemical properties of milk protein and effects of processing on these. Chemistry of milk product like cheese, cream, butter, ghee etc

Miscellaneous: Sensory perception of tests and flavors. .Browing reactions, Nutritive and non-nutritive sweeteners. Food dispersions and their implications on foods.

Books Recommended :

1. Food Chemistry by L.H. Meyer, Publishers, Van Nostrand Reinhold Co.New York, Latest Edition.
2. Principles of Food Science- Edited by Owen R. Fennema, Part I Food Chemistry, Publishers Marce Dekker, Inc. New York.
3. The Chemical Analysis of Foods and Food Products : Morries, B.Jacobs 3rd Edition, Publishers Van. Nostrand Company, INC. Princeton, New.
4. Introduction to the Biochemistry of Foods by J..B.S. Braverman, Publishers Elsevier Publishing Co. Amsterdam, Latest Edition.
5. The Spice Hand Book by J. W.Patty, Publishers Chemical Publishing Co. Inc.New York, Latest Edition.
6. Food Theory andApplication by Paul, Pauline and Palmer, Helen H., Publishers, John Wiley and Sons. NewYork,. Latest Edition.

4PT02 PULP AND PAPER TECHNOLOGY-I

CHEMISTRY OF WOOD AND PULP OF PAPER MATERIALS:

Species, anatomy and physical properties of Wood:-

Classification of woods, plants used in pulp and paper, gross structure of trunk, structure elements of wood, fiber dimensions water conducting system, food conducting system, reactions of wood, bark and its structural elements, dec of wood, physical properties of wood. Fiber morphology: Cell formation and growth, fiber structure, chemical composition of wood, non-wood fibers used in pulping bast, fruits, grass, leaf, animal, mineral and synthe: icfibers

Cellulose: Chemistry and location in the cell, isolation molecular constitution, microfibrils, crystalline and amorphoupus Pulp of Paper biogenesis of the cell wall, Polysacchrides, sorption, swelling and solution of cellulose, degradation reactions of pulp of paper.

Hemicelluloses : Structure and properties of hemicelluloses.

Lignin: Lignification in wood, biological and biochemical aspects of lignin information, structure and properties of lignin, separation of lignin from woodytissues and Fiber laboratory separation, commercial separation, analysis of'lignin and utilization of Lignin.

Books Recommended :

1. "The Chemistry of Cellulose" by Emil Hauser, John Wiley & Sons, New York.
2. "The Methods of Cellulose Chern. " by Charles Dorce, Chapman & Hall, L.
3. High Polymers Vol V (Part-I to V) edited by Emil Ott& Others, Interscience Publishers.
4. Publishing Processes by S.A.Rydholm, John Wiley & Sons, Inc.,New York.
5. Pulp &Paper : Chemistry & Chemical Technology by James P. Cascy.

4OT02 OIL & PAINT TECHNOLOGY-I

(CHEMISTRY OF OIL AND FATS & INTRODUCTION OF PAINTS)

Natural Fats : Their Sources, classification and composition Constituents of natural fats : Glycerides, Phospholipids, Fatty acids, non-glycerides constituents, toxic constituents and detoxication, Nutritional functions of Fats. **Glycerides and fatty acids :** Nomenclature, Structure, occurrence in fats. Physical properties of fats and fatty acids. Elementary ideas on their liquid properties, solution properties and spectral properties.

Chemical reaction of fats and their fatty acids. Chemistry of hydrogenation, hydrogenolysis, autoxidation, polymerisation dehydration, pyrolysis, halogenation, sulpation and sulphonation , esterification , interesterification and hydrolysis. Chemical Oxidation of fatty acids, Significance and importance of these reactions. Rancidity Of Oils & Fats, . Oils Antioxidant and Synergists.

Physical and Chemical characteristics : Indian standards for oils and fats - ISI Specifications of Oilseeds, Oils, DOC, Vegetable Ghee . Identification of fats. Detection of adulteration in fats and Indian standards for oils and fats. **Introduction of Paints**, Types Of Paints, Basic Ingredients of Paint System, Industrial Applications of Paints , Recent development in the field of Oils & Paints.

Books Recommended :

1. Industrial Oil and Fat Products Ed. : A.E.Bailey. Interscience & Sons New York, London, Sydney 5th Edn.
2. An Introduction of the Chemistry and Biochemistry of Fatty Acids : Gumstone.
3. Progress in the Chemistry of Fats and other liquids (Vols. 1 to 11) T.R.Holmann, Pergamon Press.
4. Fatty Acids : K.S.Markley, Inter Sc.Publishers, 2nd edition, New York.
5. Industrial Chemistry of Fats and Waxes : T.Hilditch Balliere Tindall and Cox, London 2nd Edition.
6. Rancidity of Edible Fats : C.H.Lea, His Majesty's Stationary Office, London, Latest Edition.
7. Analysis of Fats and Oils : V.V.Mellen Bacher, Garrard Press Publishers, Illinois, Latest Edition.
8. Outline of Paint Tech. - H.Hea
9. Introduction of paints by Morgan.

4PC02 PETROCHEMICAL TECHNOLOGY - I

Course Objectives: Basic Concepts of Chemistry of Hydrocarbons, Introduction to Basic Refinery Processes. Formation Theories of Petroleum. Exploration and prospecting for petroleum and gas field, Drilling. Transportation, Storage of Petroleum & Products and future Energy Sources.

Course Outcomes:

1) Students will be able to understand the chemistry and composition of petroleum.
2) Students will be able to understand the importance petroleum as a source of energy and petrochemicals
3) Students will be able to understand the technology involved in exploration and prospecting for petroleum and gas field, as well as drilling for petroleum.

Unit-I: Origin, Occurrence, and Formation of crude petroleum. History of Indian Petroleum and Refining Industry and future trends. Hydrocarbon resources in India, history. World Petroleum Scenario, world Petroleum Reserves and Deposits. Crude Oil and Natural Gas Production and Consumption in India. Petroleum refineries in India, their location, year of commissioning, and organizations, Refining Capacity& throughput, Production& Consumption of Petroleum Products. Advantages and disadvantages of petroleum.

Unit-II: Composition, Chemistry, Classification of Petroleum Hydrocarbon composition of petroleum and petroleum products (liquid and gas).Non-hydrocarbon compounds in petroleum. Properties of hydrocarbons and non-hydrocarbons. Classification and description of crude oils and petroleum gases.

Unit-III: Refining Processes and Operations Various refining processes, operations and chemistry involved. Principle involved in dehydration, desalting and conditioning of crude oil. Thermodynamics, kinetics and reaction mechanism, principle involved in thermal and catalytic processes such as thermal and catalytic cracking, hydro cracking, reforming, isomerisation, polymerization, alkylation.

Unit-IV: Exploration and prospecting for petroleum and gas field Structure of earth and of the earth crust, formation of Sedimentary rocks, Exploration and prospecting for petroleum and gas field, Geological, Geophysical, Geochemical prospecting methods, geophysical borehole logging methods. Migration of petroleum and gas deposits and commercial petroleum accumulations. Petroleum traps and their classifications. Development of an oil or gas field.

Unit-V: Drilling for Petroleum Drilling operation, Cable tool method, Rotary drilling, Turbo drilling, types of drill bits, mud fluids, casing off formations, Deviation of holes, Directional drilling, Offshore drilling rigs, Well control systems.

Unit-VI : Other Sources of Hydrocarbons, Transportation& Storage of Petroleum Sources of hydrocarbons other than crude oil, future automotive fuel resources, new and future energy sources. Transportation and storage of crude oil, petroleum gases, and petroleum products. Shipping tankers, Pipelines: Materials and Corrosion, Onshore and offshore pipeline construction. Pipeline network in India.

Books Recommended :

1) Modern Petroleum Refining Processes by B. K. BhaskaraRao, Latest Edition.
2) Chemistry of Petrochemical Processes by Sami Matar, Lewis F. Hatch
3) The Chemistry and Technology of Petroleum by James G. Speight
4) Fundamentals of Petroleum and Petrochemical Engineering by Uttam Ray Chaudhuri
5) Modern Petroleum Technology Volume-I Upstream Edited by Richard A. Dawe

4 CT03 / 4CH02 MACHINE DESIGN & DRAWING

SECTION - A

Unit I- (a) Sectional Views Conversion of pictorial view in to sectional orthographic projections, Sectional views with different types of projections, Missing views (12 Hrs)

Unit II- a) Development of surfaces 31 32 Development of surfaces of cubes, prisms, cylinders, pyramids, cones & their cut sections

b) Intersection of solids-prism and prism, cylinder and cylinder, cylinder and prism, cone and cylin-der, cone and prism. (12 Hrs)

SECTION B

Unit III- (a) Meaning of Design, Phases of Design, Design considerations.

(b) Simple stresses, Thermal stresses, Torsional Stress, stresses in straight & curved beams and its application- hooks, cclamps

(c) Design & drawing of riveted joints- Caulking & fullering, failures, strength & efficiency of riveted joints.

(d) Welded joints- Symbolic representation, Strength of transverse & parallel fillet welded section e) Design & drawing of Knuckle Joints (12 hrs)

Unit IV :(a) Design of Helical springs- Types of springs, stresses in helical springs, Wahl's stress factor, Buckling & surge, tension spring (b) spiral & leaf springs c) Design of power screw-Torque required to raise loads, efficiency & helix angle, overhauling & self locking of screw, acme threads, stresses in power screw. (12 hrs)

Books Recommended :

Text Books :

1) Machine Drawing by N. D. Bhatt, Charator Publication
2) Machine Design by R. S. Khurmi & J. K. Gupta , S. Chand Publication .

Reference Books :

1) Machine Design by Dr. P. C. Sharma & Dr. D. K. Agrawal, Katsons Books publication
2) Design of Machine elements by C. S. Sharma, Kamlesh Purohit, PHI publication
3) Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publication
4) Machine Design, Jindal, Pearson publications
5) Design Data Book by- P.S.G. Koimbatore
6) Design Data Book by Mahadevan.

(Use of any data book from the above will be permitted during the examination).

4CT04 MATERIAL SCIENCE & ENGINEERING

SECTION-A

Unit I : Crystalline and non crystalline structure sensitive and insensitive properties and defects in crystals. Co-relation of mechanical properties with reference to structure.

Unit II: Effect of temperature on mechanical properties various rnethods of improving the strength failure under service conditions

Unit III : Solid solutions phase diagrams and their relation to meta properties with reference to steels and cast irons.

SECTION-B

Unit IV : Heat treatment of steels and common on ferrous alloyes.

Unit V: Elastomers and plasiomers, molecular structure and properties of polymers, ceramic materials and refractoriness, High ternperature oxide ceramics glasses and their properties, composite materials.

Unit VI : Corrosion: Electrode potentials e.m.f and galavanic series, polarization forms of corrosion, rate factors, inhibition, prevention, control and testing, Corrosion behaviour of metals and alloys chemical resistance of polymers, Forming processes and corrosion. Non destructive methods of testing, Metallic, Plastic and other protective coatings.

Books Recommended :

1. Nature and properties of Engineering Materials by D.Jastrebski.

2. Introduction to Materials science by Guy.

3. Materia! Science and Processes by SK.Hajra Chaudhry

4. Material Science for Engineers by Van Valack.

4CT05 FLUID FLOW OPERATION

Course Objectives:

1. Students will understand the basic concept of fluid flow, types of flow, and application of fluid mechanics.
2. Students will get the knowledge of flow and pressure measurement using different flow meters, and pressure measuring devices.
3. Students will get the knowledge of various pumps used in chemical industries.
4. Students will get the knowledge of various agitators and mixing equipments and power consumption for mixing.

Course Outcomes:

After successful completion of this course student will be able to

1. Understand the knowledge of fluid flow, fluid properties and type of fluid
2. Understand the concept of dimensional analysis
3. Select the agitators for mixing operations and able to calculate the power required for mixing.
4. Understand the concept and applications of Bernoulli's theorem,
5. Understand the principle, working and application of different flow meter
6. Understand the principle, working and application of various pumps and able to calculate the power requirement and NPSH of centrifugal pump.
7. Calculate the pressure drop across packed bed and minimum fluidization velocity in fluidized bed; understand the concept of two phase flow.

Course Contents:

Unit I :Properties of fluid and their classification : Fluid statics: Forces on fluids, pressure depth relationship for compressible and incompressible fluids, forces on submerged bodies. rigid body motion, pressure measurement, Euler's equation.

Unit II :Kinetics of flow, Description of velocity field, Stream functions, angular velocity, Fluids in circulation, Irrational flow. Dimensional analysis: Buckingham Pi theorem, dimensionless number and their physical significance, simulated criteria. Mixing and agitation of fluid, types of mixers and their selection, power requirement.

Unit III :Fluid flow: Laminar and turbulent flows, pressure drop in pipes and tubes, pipe fitting and pipe network and friction factor, conversion of mass Momentum and energy, Navier-Stokes equation, mechanical energy balance and Bernoulli's theorem.

Unit IV :Flow measuring devices for chemical plants: Orifice metre, Nozzle Venturimeter, Rotameter and pitot tube.

Unit V :Pumping and compressing of chemicals and gases, reciprocating pump, rotary pump, centrifugal pump and blowers. NPSH and calibrations. Mixing and agitation fluids. Compressible fluid flow and Aerodynamics.

Unit VI :Flow past immersed bodies, flow through packed bed and fluidized bed, Introductory concept of two phase flow.

Text Books/ Reference Books :

1. R. P. Vyas, Fluid Mechanics, Central Techno Publications, Nagpur.
2. W. L. McCabe, J. C. Smith and P. Harriot, Unit Operations of Chemical Engineering, 7th Edition, McGraw-Hill International Edition 2005.
3. Chemical Engineering volume 1 coulson J. M. and Richardson J. F. Butterworth Heinemann, Oxford
4. M. White, Fluid Mechanics, 8th Edition, Tata-McGraw Hill, 2016.
5. O. Wilkes, Fluid Mechanics for Chemical Engineers, Prentice Hall of India, 2005.
6. R. W. Fox, P. J. Pritchard & A. T. McDonald, Introduction to Fluid Mechanics, 7th Edn, Wiley-India 2010.

4 FT 06 FOOD TECHNOLOGY - I –LAB

General methods of proximate analysis of food materials. Analysis of Oils and Fats, Chemical Analysis of carbohydrates and proteins, taniles vitamanies etc. colorimetric methods for starch. and qualitative detection of carbohydrates and proteins, taniles, vitamins etc. Colorimetric methods for starch, polyphenols, carotenes Xanthophylls etc. Paper chromatography and qualitative detection of carbohydrates, proteins and, tats oils, Colour. test for oil. Qualitative and quantitative analysis of acided and antioxidates. Chemical Preservations like benzoic acid and sulfur dioxide, Non-Nutritive Sweetness and emulsifying agents.

Books Recommended :

1. The Chemical Analysis of Foods, Sixth Edition by David Perason, J.O.A. Churbcill, 104 Gloucester place London. 70

2. Manual of Analysis of Fruits and Vegetable Products: S.Ranganna, Ph.D. Central Food Technological. Research Institute, Mysore, Publisher, Tata McGraw Hill Publishing Company Ltd., New Delhi.

3. Food Analysis by A.G. Woodman, 4th Edition, Publishers, Mc.Graw Hill Book Company, INC, New York and London, Latest Edition.

4. Modem Food Analysis by F.Leslie Hart A.N. and Hary John Stone Fishes. Ph.D. Publishers, Springer - Verlag. Berlin Heidelberg, New York, Latest Edition.

5. Food Analysis by RLees, Published by Leonard Hill Books, London.

6. Official Methods of Analysis of Association of Official Analytical Chemists, Pub.Associ. Office, Anal, Chemist, Washington D.C. Latest Edition.

7. Approved Methods of the American Association of Cereal Chemist, Vols. I & II, Latest Edition. Published by American Association of Cereal Chemist inc. Paul, Minnesota U.S.A.

4 PT 06 PULP & PAPER TECHNOLOGY-I - LAB

Determination of various components of wood such as moisture content.ash content, Water Solubility, alkali, solubility extractives, lignin Cellulose; hemicellulose, holo cellulosepentosans etc. Microscopic observations of fibrous materials.

4 OT 06 OIL AND PAINT TECHNOLOGY-I – LAB

Preparations & Standardization Of Solutions, Determination of various Physical and Chemical characteristics of oils, fats and waxes, colour, solubility and thermal test for purity. Analysis of oilseeds and cakes, estimation of rancidity. Analysis of nickel catalysts and acid oils determination, Physical and Chemical, characteristics of vanaspati, margarine and ghee. Detection of adulteration in oils & fats Testing of readymade Paints & Raw materials of paints systems like pigments, Solvents, additives, Resins .

4 PC06 PETROCHEMICAL TECHNOLOGY- I –LAB

Course Objectives:

Petrochemical Technology lab provides students first handexperience of conducting preliminary tests for various petroleum products and verifying various standard tests and test methods setfor petroleum products and comparing and studying the standard specifications set for petroleum products.

Contents:

Experiments for Petrochemical Technology-I (Chemistry of Petroleum Hydrocarbons) such as Flash Point by Abel’s Method, Flash Point by Pensky Martien’s Method, Flash and Fire Point by Clevland Open Cup Method, Smoke Point, Aniline Point, Cloud and Pour Point, API Gravity, Viscosity (by Redwood Viscometer/Saybolt Viscometer/Engler Viscometer), Copper Strip Corrosion, Drop Melting Point of Wax, Melting Point of Wax by Cooling Curve Method, Congealing Point of Wax etc.

Lab. Outcomes :

Students will be able to:

- Learn how to experimentally verify various theoretical concepts.
- Visualize practical testing of petroleum products under standard test conditions.
- Develop experimental skills.

4 CT07 MACHINE DESIGN & DRAWING –LAB

Minimum 8 to 10 practicals based on the Syllabus 4 CT04 MACHINE DESIGN & DRAWING

4 CT08 MATERIAL SCIENCE & ENGINEERING – LAB

Ten experiments based on the above syllabus evenly distribute shall be performed and a report/journal there of submitted by each student. The practical Examination shall consist of practicals and viva voce based on the syllabus and practicals.

4 CT09 FLUID FLOW OPERATIONS – LAB

List of Practicals :

1. Calibration of Venturi metre
2. To obtain the coefficient of discharge for the given orifice meter
3. To study the types of flow and determine critical Reynolds number.
4. To verify Bernoulli's theorem.
5. To study the centrifugal pump
6. To study the reciprocating pump
7. To study the loss of head due to Pipe Friction
8. To study the Loss of head due to Pipe Fittings

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SYLLABUS

PRESCRIBED FOR

BACHELOR OF ENGINEERING

CIVIL ENGINEERING EXAMS.

SEMESTER PATTERN (CREDIT GRADE SYSTEM)

THIRD SEMESTER

Inpalnt Training & Industrial Visit in the faculty of Engineering & Technology

1)
a) the inplant training shall not be compulsory,
b) the inplant training shall be taken by students strickly during Summer vacation. after IVth or VIth Semester examination and /or during Winter vacation after Vth or VIIth Semester examinations,
c) the inplant training shall not be part of examination system, however, student shall prepare and submit report after completion of training to the concerned Head of Department alongwith certificate issued by the industry,
d) the inplant training shall be of minimum two weeks duration,
e) there shall not be any liability whatsoever on the Institution with respect to implant training of the students,
f) students shall undertake inplant training on their own risk and cost. An undertaking in this regards signed by student and parents shall be submitted before proceding for training to the concerned Head of Department/ Head of Institution.
g) the students shall complete inplant training under the supervision of concerned person in the industry,
h) Institutes shall help students to organise inplant training by way of correspondance,

2) Industrial Visit : Industrial visit may be organised for the students. Students should prepare & submit the report on Industrial visit to the concerned Head of Department/Head of Institution.

3CE01 MATHEMATICS-III

SECTION - A

Unit I : Ordinary Differential Equations.

Complete solution, Operator D, rules for finding the complementry function, the inverse operator , Rules for finding particular integral. Method of variation of parameters, Cauchy's and Legendre's Linear Differential equations. Simultaneous linear differential equations with constant coefficients Applications to civil engineering.

Unit II: Laplace transforms :

Definition and elementry properties, Inverse L.T. by various methods, Convolution theorem, Solution of ordinary and simultaneous differential equation using Laplace transform of periodic functions. Application to problems of beams.

Unit III Partial Differential Equations.

P.D.E. of first order and first degree of types i) f(p,q) = O ii) f(p,q,z)=0, iii) f(p,q,x,y)=O iv) f(p,q,x,y,z)=O i.e. (a) Lagrange's form Pp + Qq = R (b) Claivant's form z=px+qy+f(p,q) v) Equations reducible to above standard types linear Homogeneous P.D.E. of nth order with constant co-efficients.

SECTION-B

Unit IV Numerical Methods :-

(a) i) Solution of Algebraic and transcendal Equations by

Newton Raphson method and by method of False Position.

ii) Solution of system of linear equations by Grout's method, Gauss Seidal method and Relaxation Method.

(b) Numerical solution of differential equations by Picard's method, Taylor's series method, Euler's method, modified Euler's method and Rungekutta forth order method.

Unit V : Complex variable :

Analytic functions, C.R.conditions, Harmonic functions. harmonic conjugate functions, Milne's method, conformal mapping, Elementary conformal mapping w=z+c, w=cz, w+ Bilinear transformation.

Unit VI Statistics :

Probability : Axioms, conditional probability, Baye's theorem, Mathematical Expectation and probability distributions (Binomial, Poisson and Normal) Curve fitting by method of least square only for line and parabola, Corelation regression.

Books Recommended :

1) Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
2) Advance Mathematics for Engineers by Chandrika Prasad.
3) Method of Applied mathematics by F.B.Hildebran.
4) Introductory methods of Numerical Analysis by S.S.Sasby.
5) Computer Oriented Numerical Method by Raja Raman.

3CE02 STRENGTH OF MATERIALS

SECTION-A

Unit-I
1. Mechanical properties : Concept of direct, bearing and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel and concrete, Generlized Hook's law, factor of safety.
2. Uniaxial stresses and strains : Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit-II
1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear force, bending moment and loading intensity.

Unit-III
1. Stresses in beams (Bending, Shear),
   i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.
   ii) Shear : Distribution of shear stresses on beam cross sections,
   iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

SECTION - B

Unit-IV
1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.
2. Thin cylinders subjected to internal pressures.

Unit -V :
1. Principal stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.
2. Combined direct & bending stresses : Combined direct and bending stresses, applications to short columns with eccentric loads, retaining walls with horizontal lateral force.

Unit-VI
1. Slope & deflection of beams : Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by a) Macauley's method b) Moment Area method c) Conjugate Beam method.
2. Theory of long columns, Euler, Rankine formula.

BOOKS RECOMMENDED:

1. E.P.Popov, Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young, Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Ferdinard L. Singer, Strength of Materials, Harper and Row, New York
4. Shames, I. H., Introduction to solid mechanics, Prentice Hall of India, New Delhi
5. Natarajan, Mahadeoappa, Strength of materials
6. Junnarkar, S. B., Mechanics of materials
7. Mubeen, A., Mechanics of solids, Pearson education (Singapore) Pte. Ltd.
8. Beer and Johston, Mechanics of materials, Mc-Graw Hill.

3CE03 TRANSPORTATION ENGINEERING -I

SECTION-A

Unit-I
Highway : Development And Planning, Road Transport characteristics, classification of Roads, Road development plans & Salient features, Road pattern, Alignment principles, Egg. Survey for highway. Material And Testing.
Various properties of aggregates and bituminous materials and Test, IRC, IS Specifications, bituminous mix design.

Unit-II
Geometric Design : cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEVTheory, stopping sight distance, Overtaking sight distance, Horizontal alignment - curves, superelevation, Extra widening, transition curves, vertical alignment, Design of summit and valley curves, IRC Standards for Geometric design.

Unit-III
Pavement Design : Components of Flexible and Rigid pavement, Design factors, ESWL, Flexible pavement design by C.B.R. Method. Westergards analysis for wheel load & Temperature stresses in rigid pavement, Rigid pavement by IRC method (As per IRC-37), Combination of stresses, Joints in Rigid Pavement,
Construction And Maintenance – WBM Surface dressing, Bituminous roads, cement concrete Pavement, construction procedure, construction of roads in expansive soil.

SECTION-B

Unit-IV Traffic Engineering : Traffic Characteristics, Traffic studies, road parking system, accident study, traffic control devices, marking, signs, signals, island its type, At grade intersections – clover leaf, diamond, rotary intersections & design elements, 3 E's of traffic, regulation for driving motor vehicle, motor vehicle Act & Rule.

Unit-V Bridge Engineering – Component, classification and identification, data collection, site selection, economic span, different structural form – culverts, causeways, major and minor bridges, types of foundation, abutments, piers and wing wall, bearing their types and choices, Erection of bridge superstructure.

Unit-VI Bridge Hydrology - Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board. Load, Forces, Stresses – Loads, forces, stresses acting on bridges.IRC Specification and code practices, critical combination. Rating And Maintenance – Methods and techniques of rating of existing bridges, repairs, maintenance, corrosion – causes and prevention, Strengthning of bridge superstructure.

BOOKS RECOMMENDED :-

1) Khanna S.K. & Justo C.E. : Highway Engineering
2) Rao G.V. : Principles of Transporatation & Highway Engg.
3) Dr.Kadiyali L.R. : Traffic Engg. & Transport Planning.
4) Shrarma S.K. : Principles, Practice & Design of Highway Engg.
5) Bindra S.P. : Principles & Practice of Bridge Engg.
6) Bindra S.P. : A Course in Highway Engg.
7) Duggal A.K. & Puri V.P. : Laboratory Mannual in Highway Engg.

3CE04 BUILDING CONSTRUCTION & MATERIALS

SECTION - A

Unit- I Introduction : Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages, load bearing walls and partition walls, HDPE Wall panel.

Foundation :- Definition and necessity, loads of foundation, Bearing Capacity soil, SBC values based on IS code, field methods of improving bearing capacity.

Types of foundation – shallow foundation & deep foundations for buildings, spread footings for walls &

columns, Raft foundations, Foundations in black cotton soils, under-reamed pile foundation, precautions to be taken. Causes of failure of foundations. Setting out for foundation, excavation for foundation.

Unit-II Stone Masonry – Technical terms, General principles to be observed during construction, random rubble masonry, coursed and un- coursed rubble masonry, Selection of stone for masonry.

Brick Masonry – Classification of bricks, manufacturing of clay bricks, tests on bricks, properties of burnt bricks, new trends in brick manufacturing such as use of fly ash, stabilized mud blocks.

Brick masonry construction – Technical terms, general principles, commonly used types of bonds such as stretcher, header, English bond and Flemish bond, their suitability. Earthquake force, various features for making load bearing structure earthquake resistant.

Unit-III Floors – Types of Floors – Basement floor, ground floor and upper floors, Types of upper floors – R.C.C. slab floor, R.C.C. slab & beam floor, R.C.C. ribbed floor, R.C.C. Grid floor, R.C.C. flat slab floor, Floor finishes – Types of flooring material, Sahabad, Kotta, Granite, Ceramic tiles, plain tiles, mosaic tiles, glazed tiles, different types of floor finishes, their suitability, method of construction, criteria for selection.

Roofs – Flat & pitched roof, steel roof trusses – types and suitability, fixing details at supports, types of roof covering, AC & GI sheets, acrylic sheets, fixing details of roof covering.

Formwork – Different types, their relative merits & demerits, period for removal of formwork for different members.

SECTION - B

Unit-IV Doors & Windows – Different forms of commercial woods-plywood, particle-board, batten-board, block-board, novapan, sunmica, veneer sheets.

Doors : Purpose, criteria for location, size of door, door frames & its types, methods of fixing, T Types of door shutters and their suitability, HDPE door shutter.

Windows – Purpose, criteria for location, no. sizes & shapes of Windows, types of windows & their suitability.

Ventilators – Types and their suitability. Fixtures & fastening for doors & windows.

Glass – Types of glass & their suitability.

Arches & lintels – Types & their suitability, details of R.C.C.

lintels & chajja, precast lintels & arches.

Unit-V Stairs – Function, technical terms, criteria for location, types of staircases, their suitability, principle of stair layout design.
Lifts, ramps & escalators – suitability.
Plastering & pointing- Necessity, types, processes of different types of plastering, defects in plastered work.
Painting & Colouring – Necessity, types, processes of painting & colouring to wall surfaces, wooden surface, iron & steel surfaces, types of paints and their uses.
Scaffolding – Purpose, types, suitability.

Unit-VI Special Aspects of Construction –
Damp proofing – causes of dampness, its effects, various methods of damp proofing, material used for damp proofing, details of cavity wall construction.
Fire proof construction – Points to be observed during planning & construction. Fire protection requirements for a multistoried building.
Sound proof Construction – Sound absorbants and their characteristic, factors affecting the acoustical design of an auditorium.
Joints – Expansion & construction joints necessity, details of expansion joint at foundation level & roof level of load bearing structure and framed structure. Provision of construction joints in slabs, beams & columns.

BOOKS RECOMMENDED :

1) Mackay W.B. : Building Construction, Vol. I, II, III, Longmans.
2) Sushilkumar : Building Construction, Standard Publishers Distributors.
3) Deshpande R.S. and Vartak C.V. : A Treatise on Building Construction.
4) Sharma S.K. Kaul B.K. : A. T.B. of Building Construction, S. Chand & Co.
5) Gurucharan Sing : Building Construction Engg., Standard Book House, Delhi-6
6) Sane L.S. : Construction Engg., Manak Talas, Mumbai.
7) Chudley R. : Construction Technology, Vol. I, II, III & IV, Longmans Group Ltd.
8) ISE National Building Code of India, 1970.
9) Punmia B.C. : Building Construction.
10) A Manual of Earthquake Resistant, Non-Engineered Construction Indian Society of Earthquake Tech.

3CE05 ENGINEERING GEOLOGY

Unit-I : Introdution - Different branches of Geology and importance of Geology in Civil Engineering.
Mineralogy - Study of common rock forming and ore minerals with reference to its physical properties.
Petrology - rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Unit II : Structural Geology - outcrop, dip strike, elementary ideas about folds, faults, joints and unconformity, effect of these structures in foundation.
Earthquake Engineering - earthquake waves, causes and effects, magnitude and intensity, earthquake zones of India, seismic coefficient.
Geological investigation - surface and sub-surface investigation, direct and indirect.

Unit-III : Rock as a material of construction. Study of engineering properties of rocks and soils. Geological studies related to site selection for dams and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields etc. Case histories of some major projects of tunnels, dams and reservoirs.

BOOKS RECOMMENDED :-

1) Singh Parbin : General & Engineering Geology.
2) Mukharjee : A Text Book of Geology.
3) Tuyrell G.W. : The Principle of Petrology.
4) Wadia D.N. : Geology of India.
5) Krishan M.S. : Geology of India.
6) Date S.Y. & Mukharjee D.M. : Geological Maps.
7) Deshmukh D.N. & Mukharjee D.M. : Engineering Geological Maps.
8) Gupte R.B. : Geology of Engineering.
9) Reddy Venkata : Engnieering Geology.

3CE06 STRENGTH OF MATERIALS -LAB

PRACTICALS:

Minimum seven out of following:

1. Tension test on metals.
2. Compression test on metals.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.

7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.
10. Deflection of springs.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3CE07 TRANSPORTATION ENGINEERING-I-LAB

PRACTICALS

Based on above syllabus, following practical are required to be performed and a laboratory report be submitted by every student. Practical examination will be viva based on above system.

List of Experiments (Any Eight)

1. Determination of Los Angeles value
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of perforation value of Bitumen
7. Determination of Viscosity of Bituminous material
8. Determination of softening point of bituminous material.
9. Determination of ductility of bitumen.
10. Determination of flash point and fire point of Bituminous material
11. Determination of marshal stability value

3CE08 BUILDING CONSTRUCTION & MATERIALS - LAB

PRACTICALS –

1. Drawing of following building elements on A-2 size sheet.
   a) Panelled door, flush door, glazed window.
   b) Steel truss with details of joints, details & support, details of fixing of roof covering.
2. Planning & drawing of a staircase for the given data. [On A-2 size sheet, Design calculations, plan & section.]
3. Preparation of foundation plan from the given line plan of a two room building [On a A-2 size sheet.]
4. Layout of the above, in field.
5. Fields visits to building under construction and its report writing including material of construction, construction processes, Human

recourses required, construction details.

6. Sketch book containing Free hand sketches of following
   i) Different types of foundations.
   ii) Bonds in brick masonry
   iii) Types of floors. [sections]
   iv) Types of stairs. [plans and side view]
   v) Line sketches of different types of steel roof trusses.
   vi) Details of expansion joints.
   vii) Details of damp proofing for basement.
   viii) Fixtures & fastenings of doors & windows.

3CE09 ENGINEERING GEOLOGY - LAB

LABORATORY WORK :-

1) Megascopic study of common rock forming and ore minerals.
2) Megascopic study of the common igneous, sedementary and metamorpic rocks.
3) Geological map reading and construction of sections from simple geological maps with engineering problems (about 8 maps)

A report/journal on above practical conducted shall be submitted by each student. Practical examination shall be based on practical and viva-voce conducted on the above syllabus.

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SEMESTER : FOURTH

4CE01 GEOTECHNICAL ENGINEERING – I

SECTION – A

Unit- I History of development of soil mechanics , formation of soil, its significance to the field problems.

Soil properties and its classification, system: Definition of soil, soil as a three phase system, weight – volume relationship Density of Soil, relative density, in-situ density, specific gravity of soil solids, soil solids index and simple soil properties, void ratio, porosity, degree of saturation and functional relationship. Grain size analysis, Mechanical and Sedimentation analysis, consistency limits and their determination, liquidity idea, activity, sensitivity etc. Criteria of classification of fine grained and coarse grained soil IS soil classification

Unit-II Concept of clay mineral, major soil minerals, Kaolonite, IIIite, Montmorillonite, its structural formation and properties. Mechanics of compaction, factors affecting compaction, standard and modificfed Proctor test, OMC, their field determination, zero air-void line, concept of wet of optimum and dry of optimum, different structures of soil, field method

of compactions and quality control. Mechanical stabilization and CBR test & its application.

Unit-III Absorbed water, surface tension, capillarity and its effect on soil properties permeability of soil, Darcy's law and validity, Discharge and seepage velocity, factors affection permeability, determination of oefficient of permeability laboratory and field methods. IS procedure for determination of coefficient of permeability for stratified deposits.

Drainage and dewatering of soil, various methods, deciding different drainage system.

SECTION – B

Unit-IV Laplace equation, its derivation in Cartesian co-ordainate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concepts flow net, method to draw flow nets, characteristics and use of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, method of arresting seepage, design of graded filter, Terzagghi's criteria, protection filter, requirement of ideal filter material, concept of piping and criteria of stability against piping.

Unit-V State of stress at a point, Mohrs stress circle, stress distribution in soil mass, Boussinesqs theory and its applications, point load, uniformly loaded rectangular and circular area New-marks chart, its preparation and use, equivalent point load to deleted.

Compression of laterally confined soil, e-p virgin compression curve, compression index, swelling index, coefficient compressibility, concept of consolidation spring analogy Terzaghi's theory of one imensional consolidation. Mathematical treatment). Consoledo meter-test, coefficient consolidation, time factor curve fitting methods, consolidation. Cassagrandes method for determination of pre-consolidation pressure.

Unit-VI A physical concept of shear strength, Introduction of Mohr's stress diagram, Mohr's failure criterial, Mohr-Coulambs theory and development of failure envelopes, Laboratory measurement of shear strength for different drainage, coditions by direct shear test, Unconfined compression test,Triaxial and vane sheartest, concept of pore pressure coefficients and their significance on strength of soil, overconsolidation ratio, shear characteristics of sand, NC

and OC clays and partially saturated soil: Influence of soil structure and strain rate on shear strength, Merits and demerits of various shear strength tests.

BOOKS RECOMMENDED :

1) Craig R.F. : Soil Mechanics, ELBS, 1983.
2) Lambe T.W. & Whiteman R.V. : Soil Mechanics, John Wiley and Sons, 1969.
3) Terzaghi K. & Peck R.B. : Soil Mechanics in Engg. Practice, John Wiley & Sons, 1967.
4) Gulhati S.K. : Engg. Properties of Soils, Tata McGraw Hill, New Delhi, 1978.
5) Singh A. : Soil Engg. in Theory and Practice, Asia Publishing House, Mumbai.
6) Venkategramiah C. : Soil Mechanics and Foundation Engg.

4CE02 FLUID MECHANICS – I

SECTION - A

Unit I : Introduction: Definition of Fluid, physical properties of fluid mass density, unit weight, specific Gravity, dynamic viscosity, Kinematic Viscosity, Newton's law of viscosity, Rheological classification of fluids. Adhesion, Cohesion, surface tension, capillarity, pressure inside droplet & jet of liquid.

Fluid Statics I : Pressure at a point, Pascal's law, Equation of fluid static's & its integration, Measurement of pressure, absolute & gauge, types of manometers.

Unit II: Fluid Statics II : Forces on immersed areas – plane and curved, Buoyancy, equilibrium of floating bodies, metacenter, metacentric height, its determination by analytical method only. Kinematics : types of Flow – Eulerian approach of describing fluid motion, streamline, stream tube, streak line, Path line, substantive, local, convective acceleration, velocity potential, stream function, continuity equation of ID & 3D flow in Cartesian coordinates.

Unit III : Fluid Dynamics : Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, HGL, EGL, velocity distribution, Average velocity, Kinetic – Energy correction factor, momentum correction factor (Definition only) Momentum equation (Statement Only) Forces on pipe bends.

SECTION - B

Unit IV: Fluid Measurement –I : Venturimeter, Orificemeter, Pitot tube, Prandtl Pitot tube, circular orifices & mouthpieces, time of

emptying rectangular tanks by orifices at bottom & sides.

Fluid Measurement – II: Notches & weirs, Definition, Types rectangular, triangular, trapezoidal, cipolletti weir, end contractions, velocity of approach, Francis equation.

Unit V: Laminar flow through circular pipes, velocity distribution, Hayegen Puiseuille equation with Proof. Reynold's number, Boundary layer, definition, development along a flat plate, Nominal thickness, energy thickness, Momentum thickness, displacement thickness.

Unit VI : Flow around immersed bodies, drag, lift, different forms of drag, calculations of drag & lift on cylindrical bodies only. Pipe flow Darcy – Weisbach equation $h_f = flv^2/2gd$ (no proof) major & minor losses, pipes in series, pipes in parallel, equivalent pipe, pipe Network (Hardy – Cross method only)

Books Recommended :

1) Modi P.N. & Seth S.M. : Hydraulics & Fluid Mechanics, SI Edition.
2) Dr. Jain A.K. : Fluid Mechanics.
3) Subramanya K. : Fluid Mechanics.
4) Streeter : Fluid Mechanics.
5) Garde & Mirajgaonkar : Fluid Mechanics.

4CE03 THEORY OF STRUCTURES – I

SECTION – A

Unit-I
1. Classification of Structures, Concept of statically indeterminate beam and frame, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.
2. Analysis of Continuous beam by theorem of three moments, sinking of support.

Unit-II
1. Castigliano's theorem I, Unit load method, slope and deflection in determinate beams and portals.
2. Deflection in determinate trusses.

Unit-III
1. Influence line diagrams for reactions, bending moment and shear force for determinate beams.
2.. Rolling loads on simply supported beams, concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.

SECTION B

Unit-IV
1. Rolling loads on trusses, Influence line diagrams for forces in members of simple trusses.
2. Three hinged arches subjected to static loads, Bending moment, radial shear and axial thrust.

Unit-V Slope deflection method:
1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

Unit-VI Moment Distribution method:
1. Analysis of continuous beams with and without sinking of support.
2. Analysis of portal frames without side sway.

BOOKS RECOMMENDED:

1. Junnarkar, S. B., Mechanics of Structure, Volume I and II
2. Jain and Arya, Theory and Analysis of Structures
3. Reddy. C. S., Basic Structural Analysis, Tata – McGraw hill
4. Wang, C. K., Elementary Analysis of Structures
5. Norris and Wilbur, Elementary Structural Snalysis.

4CE04 SURVEYING – I

SECTION-A

Unit-I
1. Introduction Surveying – Necessity & purpose, Geodetic & plane surveying, classification of survey, principles of surveying.
2. Instruments for measurement of distance, linear measurements, corrections to field measurements, ranging out, direct and indirect ranging. Use of distomat.
3. Chain surveying: basic definition, principle, selection of survey stations, offsets for locating details, limiting length of offsets, degree of accuracy of offsets, use of cross staff, optical square, prism square, obstacles in chaining, plotting of chain survey work, cross staff survey.

UnitII
1. Instruments for measurement of angles: Prismatic compass, surveyor's compass, their use and adjustments. Vernier and microscopic theodolite, their temporary adjustment. Permanent adjustment of vernier theodolite. Introduction and uses of Total Station.
2. Traversing with chain and compass, Reference meridians, bearing and azimuths. Local attraction, magnetic declination and its variation. Open & closed traverses. Adjustment of closed traverse - Bowditch's Graphical method.

Unit-III
1. Instruments for measurement of elevation : Dumpy levels tilting and automatic levels. Details of their construction.
2. Temporary and permanent adjustments of Dumpy and tilting levels.

SECTION - B

Unit-IV: 1. Measurement. of Horizontal and Vertical angles with theodolite by different methods. Other uses of theodolite.
2. Theodolite traverse, latitude and departure, Gale's traverse table.

Unit-V 1. Leveling: Definition of terms, Principle, leveling methods, leveling staves, Booking and reduction of field notes, curvature and refraction.
2. Contouring: Definition, Characteristics and uses of contour maps, methods of contouring. Refraction, reciprocal leveling plotting of profiles. Errors in leveling.

Unit-VI: 1. Plane tabling : equipments, methods, two point and three point problems, Advantages & disadvantages of plane tabling, Lehman's rules.
2. Construction and use of minor instruments such as Abney level, Box sextant, Plan i meter, Tangent clinometer, Ghat Tracer.

BOOKS RECOMMENDED :

1. D.Clark : Plane and Geodetic Surveying, Vol. I & II Aisa Publication House.
2. P.B.Sahani : T.B. of Surveying, Vol. I & II, Oxford B.H.B.H.
3. T.P.Kanetkar & Kulkarni : Surveying and Leveling, Part I & II, Pune Vidharthi Griha Prakashan, Pune.
4. B.C.Punmia : Surveying I & II, Standard Book House Delhi.
5. R.C.Brinker and P.R.Wolf, Harper and Row : Elementary Surveying

4CE05 REINFORCED CEMENT CONCRETE – I

SECTION – A

Unit-I Cement: Physical properties of Portland cement, laboratory tests, special types of cements.
Aggregate: Classification of aggregate, physical properties, bulking and moisture content, specific gravity, bulk density, laboratory tests.
Properties of fresh concrete: Workability of concrete, methods of measuring workability, nominal mix, mixing, centering & formwork, placing, compaction and curing of concrete

Unit II Properties of hardened concrete: Grades of concrete, properties of concrete, compressive, tensile, and shear strength, modulus of elasticity, creep, shrinkage and durability, laboratory tests on concrete.

Pozzolana and Admixtures: Plasticizer, retarders, accelerators, water proofing agents, mineral admixtures, IS code provisions.

Unit-III Special concrete: Light weight concrete, fibre reinforced concrete, Roller compacted concrete, self compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete.
Special concreting techniques: Guniting, grouting and shotcreting concrete, introduction & application of Ferrocement.

SECTION-B

Unit-IV Introduction of mix design, factors governing mix design, IS code method of mix design (IS: 10262 – 1982) and Indian Road Congress (IRC) – 44 methods.

Unit-V Basic elastic theory and concept of reinforced concrete, types of reinforcement.
Analysis of rectangular sections by working stress method, modes of failure, design of singly reinforced beams, one-way slabs (simply supported), lintels, and chajjas.

Unit-VI Analysis and design of doubly reinforced rectangular beam by working stress method section for simply supported span.
Shear and Bond: Shear stress in reinforced concrete beam section, shear reinforcement, bent up bars and stirrups, bond stress, local and average bond stress, and development length.

Students must be shown video CD, slides, transparencies, and photograph of actual structures.

BOOKS RECOMMENDED:

1. Lea, F. M. The Chemistry of Cement and Concrete, Edward Arnold (Publishers) ltd.
2. Neville, A. M. : Properties of Concrete, Pitman Publishing Company.
3. Neville, Brooks : Concrete Technology, ELBS
4. Gambhir, M. L. : Concrete Technology, Dhanpat Rai and Sons
5. Orchard D. F. : Concrete Technology, Applied Science Pub Ltd.
6. Shetty, M. S. : Concrete Technology, S. Chand
7. Varshney, R. S. : Concrete Technology, Oxford Pub. house.
8. IS: 456 – 2000,
9. IS: 10262 – 1982,
10. Krishna Raju : Design of Concrete Mixes, Mc – Graw Hill.

11. Shah and Kale : Reinforced Cement Concrete Design,
12. Sushil Kumar : Treasure of Reinforced Cement Concrete

4CE06 GEOTECHNICAL ENGINEERING – I-LAB

PRACTICALS :-

Based on above syllabus, following ten practical are required to be formed and a laboratory report be submitted by vevery student. Practical-examination will be viva based on above syllabus.

EXPERIMENTS :-

1. Determination of specific gravity of soil solids by Pyconometer, density bottle.
2. Determination of moisture content by ovendrying method.
3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination f Atterbergs limits (LL, PL and SL)
6. Determinatin of Compaction properties (Standard Proctor Test)
7. Determination of permeability of falling head test
8. Determination of shear strength parameters by direct shear test
9. Determination of unconfined compressive strength of soil.
10. Determination of shear strength parameters by Triaxial of UU type
11. C.B.R. test.
12. Consolidation test

4CE07 FLUID MECHANICS – I - LAB

PRACTICALS :-

Minimum 8 practical out of the list given should be carried out. The practical examination shall consist of viva-voce based on theory & practical. Graphs are to be drawn wherever necessary.

1. Verification of Bernoullis theorem.
2. Reynolds experiment to determine type of flow.
3. Determination of coefficient of discharge for Venturimeter
4. Determination of coefficient of discharge for Orificemeter
5. Determination of hydraulic coefficients of orifice.
6. Determination of metacentric height.
7. Determination of friction factor for GI pipe
8. Determination of coefficient of discharge for rectangular notch .
9. Determination of coefficient of discharge for triangular notch.
10. Determination of coefficient of discharge for trapezoidal notch.
11. Determination of coefficient of discharge for mouthpiece.
12. Determination of Viscocity of fluid at different temperatures.

4CE08 SURVEYING – I-LAB

PRACTICALS –

Any 7 practicals mentioned below shall be performed by each student, Observations, calculations and relevant work to be submitted in the form of field book and 4 drawing in A-1 size sheet as a sessional work.

1. Measurement of length – use Distomat.
2. Chain and Compass surveying.
3. L Section & C/section of road.
4. Plane table survey.
5. Theodolite traverse.
6. Study and use of minor instruments.
7. Measurement of area of a irregular figure by digital planimeter.
8. To find corrected bearing using prismatic compass (local attraction).
9. To find R.L. of given point (differential levelling)

Practical examination shall consists of field exercise and vivavoce based on the above syllabus and practical work.

4CE09 REINFORCED CEMENT CONCRETE – I -LAB

PRACTICALS:

- Compulsory site visit and submission of site visit report.
- Minimum seven out of following list:

1. Fineness of cement:
2. Soundness of cement
3. Consistency and setting time of the cement
4. Compressive strength of cement
5. Sieve analysis of aggregate.
6. Bulking of sand (fine aggregate).
7. Silting of sand.
8. Workability by slump cone test.
9. Workability by compaction factor test.
10. Workability by flow table method.
11. Compressive strength of concrete.
12. Mix Design (Compulsory) by IS method.

A journal/report on experiments conducted shall be submitted by each student. Practical examination shall be viva-voce based on above practical and the syllabus of the course.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
MECHANICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3ME01 MATHEMATICS-III

Section-A

UNIT-I : **Ordinary differential equations:-** Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. (10 Hrs)

UNIT-II **Laplace transforms :** Definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function. Solution of Linear differential equations. (10 Hrs.)

UNIT-III a) Partial differential equation of first order of following form- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii)f (x,p)=g(y,q); (iv) Pp+Qq=R (Lagranges form); (v) z=px+qy+f (p,q) (Clairaut form)

b) Statistics : Curve fitting by method of least squares (Straight and parabola only), Correlation, Regression.

c) Probability Distribution:– Binomial distribution, Poisson and normal Distribution. (10 Hrs.)

Section-B

UNIT-IV **Complex Analysis :-** Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings (translation, rotation, magnification, inversion, bilinear transformation), singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (12 Hrs.)

UNIT-V **Numerical Analysis :** Solution of algebric and transcendental equations by Newton-Raphson method & method of false position. Solution of system of linear equations by Gauss-Seidal method, Relaxation method. Solution of first order ordinary differential equations by Picard's, modified Euler's, Runge-Kutta and Taylor's method. (10 Hrs.)

UNIT-VI **Vector Calculus :-** Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function,

Directional derivatives, Divergence and curl of a vector point function and their physical meaning, line, surface, volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

Books Recommended:-

Text Books:

1. Text book on Applied Engineering Mathematics, Vol. II, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
2. Higher Engineering Mathematics, B.S Grewal, Himalaya Publishing House.
3. Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

Reference Book :

1. Advanced Engineering Mathematics, Erwin Kreyzig, John Wiley.

3ME02/ 3PE02 MECHANICS OF MATERIALS / STRENGTH OF MATERIALS

SECTION-A

Unit-I 1. Mechanical properties: Concept of direct, bending and shear stresses and strains, stress-strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, and other metals, factor of safety,

2. Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Unit-II 1. Axial force, shear force & bending moment diagrams : Beams, loading and support conditions, bending moment and shear force for all types of loadings for simply supported beams, cantilevers, relation between shear force, bending moment and loading intensity.

2. Simple or pure bending theory: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section, leaf springs.

Unit-III 1. Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft, power transmitted by shaft, closed coiled helical spring with axial load.

2. Shear stress distribution on beam rectangular and circular cross sections.

SECTION – B

Unit-IV Thin and thick cylinders and thin spherical shells subjected to internal pressures.

Unit –V 1. Strain energy under uniaxial tension and compression impact loads and instantaneous stresses.

2. Principal Stresses : Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses.

Unit-VI Deflection of beams

Deflection in statically determinate (simply supported) beams subjected to point loads, uniformly distributed loads, moments by Macauley's method.

Books Recommended:

Text Books :

1. F. L. Singer : Strength of Materials, Harper and Row Publication, New York .
2. Ramamruthm : Strength of Materials, Danpat Rai and Sons, New Delhi .

Reference Books :

1. E.P.Popov : Mechanics of Materials, Prentice Hall of India, New Delhi.
2. S. Timoshenko and O.H.Young : Elements of Strength of Materials, East West Press Private Ltd., New Delhi.
3. Shames, I. H. : Introduction to Solid Mechanics, Prentice Hall of India, New Delhi, 1990.
4. Beer and Johston : Mechanics of Materials, McGraw Hill.
5. D. S. Prakash Rao : Strength of Material : A Practical Approach, I ed, University Press, Hydrabad.

3ME03 FLUID POWER-I

Section - A

UNIT-I : - 1) Introduction to the study of fluid motion. Mechanical properties of fluids and their influence on flow characteristics.

2) Fluid Statics:- Fluid pressure, pressure variation in fluids, manometers, forces on plane and curved surface buoyancy. (12 Hrs)

UNIT-II:- Buoyancy, stability of floating bodies. Kinematics and dynamics of fluid flow:- Types of flows, Stream lines, potential lines, flow net, continuity equation. One and two dimensional motion, one dimensional method of flow analysis. Bernoulli's

equation. Venturimeter, Momentum equation for steady flow. Vortex motion. (8 Hrs)

UNIT-III:- Dimensional analysis: Dimensional homogeneity and dimension less ratios. Dimensionless parameters. Similitude and model studies. (6 Hrs)

Section - B

UNIT-IV:- Motion of viscous fluids:-Introduction to laminar and Turbulent flows. Boundary layer concept. Separation. Drag lift on immersed bodies. Reynolds number and its significance. (7 Hrs)

UNIT V:- Darcy weisbach equation i.e. Equation of pipe flow, friction charts and its use, Minor losses in pipes and fittings, losses due to sudden enlargement and contraction, Hydraulic and energy gradient lines, pipes in series and parallel. Elementary concept of water hammer. (8 Hrs)

UNIT VI:- 1. Principles of fluid machinery: Dynamic action of fluid force exerted by fluid jet on plane, curved, stationary and moving vanes. Velocity diagrams, Work done by impact, pressure due to deviated flow.

2. General Theory of Hydrodynamic Machines:- Eulers equation, Degree of reaction, classification of machines according to degree of reaction. Efficiencies: Volumetric efficiency, Hydraulic efficiency, mechanical efficiency and overall efficiency. (7 Hrs)

Books Recommended :-

Text Books:-

1. CSP Ojha, R. Berndtsson, Fluid Mechanics and Machinery; Oxford university.
2. Bansal R.K., Fluid Mechanics and Fluid Machines; Laxmi publications.

Reference Books:-

1. R.K.Rajput; Engineering Fluid Mechanics; S. Chand publications.
2. Dr. Mody & Seth; Hydraulics and Fluid Mechanics; Standard book house
3. S. Ramamrutham, Hydraulic, Fluid Mechanics & Fluid Machines, Dhanpatrai publishing company.
4. Strecter, Fluid Mechanics, Tata McGraw Hill.

3ME04 ENGINEERING THERMODYNAMICS

Section-A

Unit-I Introduction to basic concepts of thermodynamics,

Macroscopic and microscopic approaches, properties of system, state and equilibrium, processes and cycle. Temperatures and Zeroth law of thermodynamics, Quasi-static process, Forms of energy and its conversion.

Gas Laws and Ideal gas equation of states, difference between gases and vapours, equation of state, gas constant and universal gas constant. (08 hrs)

Unit-II Work and Heat: Definition of work, thermodynamic work, displacement work and other forms of work, Definition of Heat, Work and heat transfer as path function, comparison of work and heat, work done during various processes, P-V diagrams.

First law of thermodynamics: Energy of a system, classification of energy, law of conservation of energy law applied to closed system under going a cycle, Joules experiment. Energy a property of system, internal energy-a function of temperature, Enthalpy, specific heat at constant volume and constant pressure. Change in internal energy and Heat transfer during various non-flow processes. (10 hrs)

Unit-III First Law applied to flow processes: Steady state, steady flow process, mass balance and energy balance in steady flow process, steady flow energy equation and its application to nozzles and diffusers, turbine and compressor pumps, heat exchangers, Throttle valve etc. work done and Heat transfer during steady flow processes. (9Hrs)

SECTION - B

Unit-IV Second Law of thermodynamics: Limitations of Ist law, Thermal energy reservoir, heat engines refrigerator and heat pumps. Kelvin-Plank and Clausious statements, their equivalence, reversible and irreversible processes, Carnot cycle, two propositions regarding the efficiency of Carnot cycles. The thermodynamic temperature scale. Reverse carnot cycle. COP of heat pump and refrigeration. Inequality of Clausius. (7 Hrs)

Unit-V Entropy: Entropy-a property of system, entropy change for ideal gases, entropy change of a system during irreversible process, lost work. Principle of increase of entropy.

Availability and irreversibility:- Available energy referred to cycle, decrease in available energy with heat transfer through a finite temperature differences. The Helmhltz and Gibbs functions, Availability, Irreversibility and effectiveness. (8 Hrs)

UnitVI a) Air Standard Cycles: Ottto, diesel, semidiesel, sterling and joule cycles etc., their efficiencies and mean effective pressure.

b) Vapour Cycles:- Rankine and Modified Rankine Cycle. Comparison of Rankine and Carnot cycle, representation on P-V, T-S and H-S diagram. (No numerical on this unit) (8 Hrs)

Books Recommended

Text Books

1. Engineering Thermodynamic - by P.K.Nag.
2. Thermodynamics Volume: I & II; R. Yadav;

Reference Books

1. Basic Engineering Thermodynamics - by Reyner Joel
2. Thermodynamics - by C.P. Arora.
3. Fundamentals of Classical Thermodynamics - by G.J.Vanwylen.
4. Engineering Thermodynamics; P. Chattopadhyay; Oxford
5. Engineering Thermodynamics; Gordon Rogers, Yon Mayhew; Pearson

3ME05 MANUFACTURING PROCESSES-I

Section - A

Unit-I :- Introduction to manufacturing processes & classification; Introduction to pattern making- Pattern materials, pattern making tools, allowances, Types of patterns, functions of patterns, General properties of moulding sands, Mold hardness. Preparation of sand moulds of different types, Moulding processes, core making, core prints, core boxes. Sand casting Processes - Basic principle and Terminology of sand casting, gating system, types of gate, risers, etc. (9Hrs)

Unit-II:- Technology of melting and casting - Melting furnaces, crucibles, pit, open hearth, gas fired cupola, cupola operation and electric hearth furnaces, Electric furnaces - Direct Arc, Indirect arc and electric induction furnace.

Defects in castings and its types, Causes and remedies of casting defects. Origin and classification of defects, shaping faults, Inclusion and sand defects, Gas defects, shrinkage defects, contraction defects, dimensional errors. Inspection and testing of castings:- Radiography, ultrasonic, Eddy current testing, fluorescent penetrant test. (7 Hrs)

Unit III:- Casting processes and their principle of operation and applications permanent mold casting, slush casting, shell

molding, Investment or lost wax casting, vacuum process, centrifugal casting, continuous casting, Die casting equipment and processes for Gravity, pressure and vacuum casting methods, cleaning of castings, Modernisation & Mechanisation of Foundries. (8 Hrs)

Section - B

Unit IV :- Mechanical working of metals: Principle of hot and cold working process and its types, Extrusion, piercing, pipe and tube production, manufacture of seamless pipe and tubing. Shearing operations, tube drawing, wire drawing, spinning, embossing and coining, squeezing and bending operations, rotary swaging, Rolling, types of rolling mills, forging operations, upset forging. (8 Hrs)

Unit V:- Joining processes:- Mechanical joining processes, Mechanical fastening, riveting, soldering, brazing Welding, Types of welding processes-Arc welding: principle and working, Gas welding- principle and working Types and purpose of Electrodes, Electrode coatings(flux). TIG & MIG processes – Working principles and its applications, shielding gases, MIG-Spray transfer and dip transfer processes. (6 Hrs.)

Unit VI:- Submerged arc welding & resistance welding :- Heat generation in resistance welding, operational characteristics of resistance welding processes such as spot welding, projection welding, butt welding.

Principle of operation of friction welding, forge welding, plasma arc, thermit welding. Welding defects, Testing and Inspection of welds, Ultrasonic, Electroslag, Electron Beam, laser welding, weldability.

Surface Treatment-Electroplating, electroforming, and iodising, metal spraying, shot peening, polishing, mechanical cleaning. (9 Hrs)

Books Recommended

Text Books:-

1. Workshop Technology Vol. I by Bawa, Tata McGraw Hill Publication.
2. Workshop Technology Vol I by Hajra Chaudhary, Dhanpat Rai & Sons 2001.

References:-

1. Workshop Technology Vol I by Raghuwanshi.
2. Manufacturing Processes by J.P. Kaushish; PHI
3. Processes and Materials of Manufacture by R.A.Lindberg, PHI Pub 2001.

4. Foundry Technology by Goel Sinha.

3ME06 / 3PE06 MECHANICS OF MATERIAL-LAB. / STRENGTH OF MATERIALS-LAB.

Practicals:

Minimum Six to Eight out of following:

1. Tension test on metals.
2. Compression test on materials.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Deflection of springs.

Practical examination shall be viva-voce based on above practical and the syllabus of the course.

3ME07 FLUID POWER-I-LAB.

Practical Term Work:-

At least six practical's (study/Trials) based on above syllabus, as given below shall be performed and a report there of submitted by the students.

1. Study of Manometers.
2. Measurement of fluid pressure by manometer.
3. Determination of metacentric height.
4. Verification of Bernoulli's equation.
5. Flow measurement by venturimeter.
6. Study of venturimeter.
7. Determination of Reynolds number.
8. Velocity distribution in Boundary layer & thickness of B.L.
9. Determination of co-efficient of friction for pipes.
10. Determination of head loss due to sudden enlargement.
11. Determination of head loss due to sudden contraction.
12. Determination of losses in bends.
13. Determination of losses in elbows.
14. Study of flow through pipes in series & parallel.
15. Verification of momentum equation.

Note :- Practical examination shall consist of oral or Experimentation based on above term work.

3ME08 MANUFACTURING PROCESSES-I –LAB.

Practice:-

1. Study of safety precautions in workshop practices.
2. Foundary:- Any two of the following jobs Sand preparation and practice in moulding of various types of patterns:- Pattern making 1 job, Moulding 1 job Casting 1 job.
3. Joining Processes:- 2 composite jobs involving electric welding, gas welding and resistance welding process.

A journal should be prepared and submitted on above term work.

The practical examination shall consist of a job preparation and college assessment should be based upon the jobs, termwork and viva examination.

SEMESTER : FOURTH

4ME01 /4PE01 BASIC ELECTRICAL DRIVES & CONTROL

Section-A

Unit I : Concept of general electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Introduction to mechatronics, Theory and principle of Power Transistor, SCR

Unit II : Basic characteristics of D.C. motor, Torque equation, Modified speed – Torque characteristics. Starting and braking of Electrical D.C. motors, comparison of mechanical and electrical braking methods. Introduction, Principle, construction and working of Servo motors, stepper motors, Brushless D.C. motors.

Unit III : Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phase Induction motors, applications. Starting and braking of 3 phase induction motors. Classification of single phase induction motors. construction, principle and working and applications. Principle and working of universal motor.

Section-B

Unit IV : Conventional methods of speed control of A.C. and D.C. motors. Thyristorized stator voltage control of 3 phase induction motor, (v/f) control method, slip-power recovery scheme. Thyristorized armature voltage control of D.C. motors using phase control & Thyristorized chopper.

Unit V : Basic principle, construction & applications of sensors and transducers, contact - non- contact type, optical proximity

sensors. Switches, contact type, magnet type, electromagnetic type, sound, light, pressure, vibration transducers, Hall effect-sensors A.C./D.C. Tachogenerators.

Unit VI: Industrial applications - classes of duty selection of an electric drive for particular applications such as steel mill, paper mill, cement mill, textile mill, sugar mill, electric traction, coal mining, etc. Induction heating, surface hardening & Dielectric heating.

Books Recommended

Text Books:-

1. A First Course on Electrical Drives - S.K. Pillai.
2. Basic Electrical Technology (Vol. 11) - B.L. Theraja

Reference Books :

1. Drives and Control - N. Dutta
2. Mechatronics - W.Bolton, Addison Wesley, Longman Ltd., 1997.
3. A Course in Electrical, Electronics Measurement and Instrumentation, By A.K.Sawhney, Dhanpat Rai & Sons, 2006

4ME02 ENGINEERING METALLURGY

Section - A

Unit I : - Introduction to metallurgy: Basic concept of process metallurgy, physical metallurgy, and mechanical metallurgy, Classification of materials & their application, Structure of metals and alloys, formation of Alloys, Solid solutions, types and their formation, lever rule for phase mixtures. Solidification of pure metals, nucleation and growth, ingot structure, dendritic solidification (8)

Unit II : Study of binary equilibrium diagram and invariant reactions, Construction and study of Iron-carbon Equilibrium Diagram, Critical temperatures, Microstructure of slowly cooled steel, Estimation of carbon from microstructure, structure property relation, Introduction to composite materials, advantages and applications. (8)

Section-B

Unit IV : Cast irons **:** Factors governing condition of carbon in cast iron, Maurer's diagram, Solidification of grey and white cast iron, Malleabalizing, Constitution and properties of white, gray, Nodular and Malleable cast irons, their applications, Alloy cast irons.

Non Ferrous Metals and Alloys : Types, Properties and uses of Brasses and Bronzes. Important alloys of

Aluminium, Lead, Tin and Zinc, their applications. Bearing materials, Season cracking, precipitation hardening. (8)

Unit V : Principles of Heat Treatment: - Annealing, Normalizing, Tempering Iso-thermal transformation diagrams(S-curve), super imposition of continuous cooling curves on 's' Curve, pearlite, bainite and martenste transformation, Quenching media, severity of quench, Austempering, Martempering and patenting, Retained austenite and sub-zero treatment. Hardenability. (8)

Unit VI : Methods of surface hardening: Carburizing, Nitriding, Cyaniding, Flame and Induction Hardening.

Mechanical working of Metals: - Hot and cold working, Relative advantages and disadvantages, study of stress strain curve, Luder's bands, Work hardening, strain Ageing; Recovery, Recrystallization and grain growth.

Metallurgical factors affecting various Mechanical working processes, preferred orientation, Deformation mechanisms-Slip& twining, critical resolved shear stress.

Powder Metallurgy: Concept, Methods of Manufacture of metal powders, compaction Process- Single die and double die, sintering, stages of sintering, Manufacture of porous bearings & cemented carbide tip tools by P.M.T. Advantages, limitations and applications of powder metallurgy. (8)

Book Recommended:-

Text Books:-

1. Introduction to physical metallurgy ;Sidney H Avner, TATA Mc-Graw hill
2. Engineering materials & metallurgy R.K.Rajput, S chand publication

Reference Books:

1. Mechanical Metallurgy, G. E. Dieter, Mc- Graw Hill International, London 3rd Edn. 1999
2. Physical metallurgy for engineers, Clarke and Varney, second Edn.,1987.
3. Power metallurgy, A.K Sinha First Edn. 1991.
4. Material Science and Metallurgy; V.D. Kodgire; Everest Publishing House
5. Engineering physical Metallugrgy, Y Lakhtin, Mir Publications. Second Ed. 1999
6. Material Science and Meallurgy- C Daniel Yesudian, Scitech Publication

4ME03 ENERGY CONVERSION-I

Section - A

Unit I Properties of Steam: Triple point and critical point, Sensible heat, latent heat, superheat and total heat of steam. Wet steam, dryness fraction, Internal energy of steam, External work of evaporation, Specific volume, enthalpy, internal energy and entropy of steam. T-S diagram Mollier chart, Steam tables and their use. Work done and heat transfer during various thermodynamics processes with steam as working fluid. Throttling of steam, determination of dryness fraction using various calorimeters. (8 Hrs)

Unit II Flow diagram for steam power plant with basic units such as steam generator, turbine, condenser and pump. Boilers: Introduction to water tube boilers used in thermal power plants, packaged Boilers (fire tube), High pressure boilers; Loeffler, Benson, Lamont Boilers, Boiler mountings and accessories—devices for improving Boiler efficiency. Principle of fluidized bed combustion. Boiler draught; Types of draught, expression for diameter & height of chimney, condition for maximum discharge, efficiency of chimney, reasons for draught loss. (7 Hrs)

Unit III FUEL & ASH HANDLING : Elementary treatment on coal, coal transportation from mine to site and site to boiler house. Fuel bed firing and suspension firing, Equipments of Mechanical grate firing, pulverised coal firing including crushers & pulverisers and burners. Oil handling system,and burner equipment,Elementary treatment on ash handling. Type of dust collectors and disposal of dust. Boiler performance:- Boiler rating, boiler power, equivalent evaporation, efficiency. Effect of accessories on boiler efficiancy and heat balance. (8 Hrs)

Section - B

Unit IV Steam power plant: General features, representation of Ranking cycle on phasediagrams. layout,site selection, concept of co-generation. CONDENSERS : Need,Types of condensers, quantity of cooling water required. Dalton's law of partial pressure, condenser and vacuum efficiency. Sources of air in condensers and its effect on performance. Condensate pump and air extraction pumps, air enjectors Cooling water system: cooling ponds, spray tanks, cooling towers: Natural and mechanical wet type cooling tower. (7 Hrs)

UNIT V Steam nozzles : Flow of steam through nozzles & diffusers, Maximum discharge, critical pressure ratio, Effect of friction. Determination of throat & exit areas, Nozzle efficiency, no

nunmerical on concept of super saturated flow & wilson line Steam Turbines:- Principle of working, Types of steam turbines such as impulse, reaction, axial & radial flow, back pressure & condensing turbines. Compounding. Reheat, regenerative cycles, bleeding. Analysis limited to two stages only. (7 Hrs)

UNIT VI Analysis of steam Turbines : Flow of steam through impulse & impulse reaction turbine blading. Velocity diagrams. Graphical & analytical methods for work & power developed, axial thrust and efficiency. Height of turbine blades. LOSSES IN STEAM TURBINES:- Nozzle losses:- blade friction, partial admission, disc friction, gland leakage losses and velocity losses. Governing of steam turbines. (10 Hrs)

Recommended Books:

Text books

1. Thermal engineering; Mahesh M Rathore; Tata McGraw-Hill
2. Thermal Engineering R.Yadav; Central publication

Reference books:

1. Steam Turbine; Kearton; Oscar *Publications*
2. Thermal Power Engineering; Mathur Mehta; Tata McGraw-Hill
3. Power Plant Engineeirng; R.K.Rajput; Laxmi Publications
4. Thermal Engineering, P.L.Ballaney; Laxmi *Publications*

4ME04 MANUFACTURING PROCESSES -II

Section - A

UNIT I :- Theory of Metal cutting: Mechanics of Metal cutting, Tool material, Tool Geometry, Cutting tool classification, Tool life, Tool wear, Cutting forces and power consumption, Machinability, Cutting fluids, Machine Tool classification. (8 Hrs)

UNIT II:- Construction, Operations and accessories of centre lathe, introduction of capstan & turret lathe, indexing mechanism, bar feeding mechanism, introduction to Automatic screwmachines & Single spindle and multi-spindle automat. (10 Hrs)

UNIT III:- a) Drilling M/cs general purpose, Mass production and special purpose drilling M/cs.

b) Boring M/c :- Horizontal, Vertical and jig Boring M/c.

c) Introduction to Broaching and its types, reaming operation. (8 Hrs)

Section - B

UNIT IV:- a) Milling M/c :- Types, Types of Milling Cutters, Dividing head, Compound and differential indexing.

b) Gear producing M/cs.

c) Study of various parts and operations of power hack saw. (6 Hrs)

UNIT V :- a) Grinding Machines: Bench grinders, surface grinders, centreles grinders, types of bonds & Abrasive modification of grinding wheels.

b) Study of various part & Operation of Shaper, Planer, Sloter. (6 Hrs)

UNIT VI:- Unconventional Machining Processes:-

a) Mechanical Processes:- Ultrasonic Machining - principle and applications. process parameters; Abrasive and water parameters involved.

b) Thermal processes:- Election Beam Machining – Generation of beam, principle and applications : Laser Beam machining applications : Plasma-arc machining- Concept and generation of plasma, principle of PAM, applications.

c) Electro Chemical Machining- Classification, fundamentals: Electro mechanical milling.

d) Electric discharge Machining - Types dis-sie-onking, wire EDM, Mechanism of material removal, process parameters, advantages and applications. (8 Hrs)

Books Recomonded:

Text Books:

1. Manufacturing Technology-Vol 1 & 2; R.L.Timings, S.P. Wilkinson; Pearson Publication.
2. Workshop Technology - By Hajra Choudhaury Vol II.

References:-

1. Pandya & Shah, Modern Machining process, Tata McGraw Hill 1998.
2. Workshop Technology, O.P. Khanna, Dhanpatrai & Sons.
3. Workshop Technology - By Raghuwanshi. Vol II.

4ME05 MACHINE DESIGN & DRAWING-I

Section - A

Unit I- a) Sectional Views

Conversion of pictorial view in to sectional orthographic projections, Sectional views with different types of projections, Missing views (12 Hrs)

Unit II- a) Development of surfaces

Development of surfaces of cubes, prisms, cylinders, pyramids, cones & their cut sections

b) Intersection of solids-prism and prism, cylinder and cylinder, cylinder and prism, cone and cylin-der, cone and prism. (12 Hrs)

Section B

Unit III- a) Meaning of Design, Phases of Design, Design considerations

b) Simple stresses, Thermal stresses, Torsional Stress, stresses in straight & curved beams and its application- hooks, c-clamps

c) Design & drawing of riveted joints- Caulking & fullering, failures, strength & efficiency of riveted joints.

d) Welded joints- Symbolic representation, Strength of transverse & parallel fillet welded section

e) Design & drawing of Knuckle Joints (12 hrs)

Unit IV-a) Design of Helical springs- Types of springs, stresses in helical springs, Wahl's stress factor, Buckling & surge, tension spring

b) spiral & leaf springs

c) Design of power screw-Torque required to raise loads, efficiency & helix angle, overhauling & self locking of screw, acme threads, stresses in power screw. (12 hrs)

Books Recommended

Text Books :

1) Machine Drawing by N. D. Bhatt, Charator Publication
2) Machine Design by R. S. Khurmi & J. K. Gupta , S. Chand Publication

Reference Books :

1) Machine Design by Dr. P. C. Sharma & Dr. D. K. Agrawal, Katsons Books publication
2) Design of Machine elements by C. S. Sharma, Kamlesh Purohit, PHI publication
3) Design of Machine elements by V. B. Bhandari, Tata McGraw Hill Publication
4) Machine Design, Jindal, Pearson publications
5) Design Data Book by- P.S.G. Koimbatore
6) Design Data Book by Mahadevan,

(Use of any data book from the above will be permitted during the examination).

4ME06 / 4PE06 BASIC ELECTRICAL DRIVES & CONTROL-LAB.

List of Experiments

Any eight practicals from the following list:

1. To study the Specification of Various Electrical Machines.
2. To study the D.C. Motor Starters.
3. To study the Running and Reversing of D.C. Motor.
4. Speed Measurements using Magnetic Pick-up.
5. To study the Speed reversal of counter Current Breaking of 3-phase Induction Motor.
6. To control the speed of D.C. Motor by a) Armature Control b) Field Control.
7. To perform Load Test on Induction Motor.
8. To study Dynamic/Rheostatic Breaking of D.C. Motor.
9. To study Characteristics of Thyristor.
10. To study the speed -Torque Characteristic of Servo Motor.

4ME07 ENGINEERING METALLURGY-LAB.

List of Practicals: - (At least eight practicals out of the following list.)

1. Study of metallurgical microscope.
2. Preparation of specimen for micro-examination.
3. Moulding of specimen for micro-examination.
4. Study of micro structures of Annealed and normalized plain carbon steels.
5. Study of micro structures of alloy steels and H.S.S.
6. Study of micro structures of various cast irons.
7. Study of micro structures of non ferrous metals.(brasses, bronzes)
8. Study of micro structures of hardened and tempered steels.
9. Study of Iron carbon Equilibrium diagram & Allotropic forms of iron.
10. Study different Heat Treatment Process for steel.
11. Study of different surface Hardening processes for steels.
12. Study of effect of alloying elements on the properties of steels.
13. Measurement of hardenability by Jominy end quench test apparatus.
14. Study of hardness tester and conversion of Hardness number
15. Industrial visit to study heat treatment plant.
16. Measurement of particle size, grain size, nodularity, coating thickness etc. by using some software like Metzer Microcam 4.0

Practical Examination:

Practical examination shall consist of viva voce/performance based on the above syllabus and practical work.

4ME08 ENERGY CONVERSION–I-LAB.

Practical Term Work:-

At least six practicals (Study/trials) based on above syllabus, as given below shall be included in the report by the students.

1. Study of a water tube boiler (Babcock Wilcox boiler)
2. Study of a locomotive boiler.
3. Study of a high pressure boiler.
4. Study of boiler accessories.
5. Trial on a boiler and heat balance sheet.
6. Study of boiler mountings.
7. Study and trial on a steam turbine.
8. Study of condensers.
9. Study of condensate and air extraction pumps.
10. Study of steam power plant.

Practical Examination:- Shall consist of based on above term work and syllabus.

4ME09 MANUFACTURING PROCESSES–II-LAB.

Practicals:-

1. Demonstration of operations related to lathe, shaper, slotter, drilling & grinding m/cs.
2. One job on lathe covering taper turning and threading.
3. One job on shaping covering plane and inclined surfaces.
4. One job on milling machine.

The above jobs should include drilling, grinding, tapping etc.

Term work should be submitted in the form of journal.

N.B. :- The practical examination shall consists of preparation of practical jobs and assessment by external and internal examiner.

4ME10 MACHINE DESIGN & DRAWING-I-LAB.

List of Practical's

Any Six of the following

1) Sectional views & missing views of objects
2) Development of surfaces
3) Intersection of Solids
4) Conventions for various components like bearing, gears, springs, key & key ways, threads, tap holes and materials, Surface roughness etc
5) Design & Drawing of cotter joint
6) Design & drawing of screw jack
7) Design & drawing of flywheel
8) Design & drawing of helical spring

Any one practical from the above list should be done using software.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL ENGINEERING
(ELECTRONICS & POWER) /
ELECTRICAL & ELECTRONICS ENGINEERING /
ELECTRICAL ENGINEERING
(ELECTRICAL & POWER) /
ELECTRICAL ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER

SEMESTER : THIRD

BRANCH ABBRIVIATIONS **:-**
EP : Electrical Engg. (Electronics & Power)
EX : Electrical & Electronics Engg.
EL : Electrical Engg. (Electrical & Power)
EE : Electrical Engg.

3 EP01/3EX01/3EL01/3EE 01 MATHEMATICS-III

SECTION-A

UNIT-I : Ordinary differential equations:- Completer solution, Operator D,Rules for finding complementary function, the inverse oprator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations. Simultaneous linear differential equations with constant co-efficient, Applications to electrical circuits.

UNIT-II : Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, Convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function.

UNIT-III : a) Application of L.T. to linear differential equations with constant coefficients & Simultaneous linear differential equations.

b) Fourier transforms- Definition, standard forms, inverse Fourier transform, Properties of Fourier transforms, Convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

SECTION-B

UNIT-IV : a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients.

b) Z-transform: Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (Linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

UNIT-V : Vector calculus: Scalar and vector point functions, Differentiation of vectors, Curves in space,Gradient of a scalar point function, and their physical meaning, expansion formulae (without proof).

UNIT-VI : Line,surface,volume integrals, irrotational and solenoidal vector fields, Stoke's and Divergence theorem (without proof).

BOOKS RECOMMENDED:-

1) Advanced Engineering Mathematics, 3 edi – Potter, Oxford University Press, 2008
2) Mathematical Techniques – Jordan and Smith 4/e – Oxford University Press, 2008
3) A Mathematical Companion for Science and Engineering Students – Brettenbach, Oxford University Press, 2008
4) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
5) Advancing Engg. Mathematics by E.K.Kreyzig.

3 EP02/3EX02/3EL02/3EE 02 NETWORK ANALYSIS

SECTION-A

Unit I : a] **Terminal Element Relationships:** V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] **Basic Nodal and mesh Analysis:** Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : **Network Theorems :** Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliman's theorem, Substitution

theorem, Compensation theorem, Tellegen's theorems

Unit III : **Time Domain Analysis of Circuits:** Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] **Review of Laplace Transforms:** Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. ***(Review to be done by students. No class hour will be spent for this review.)***

b] **Transformation of a Circuit into s-domain:** Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] **Sinusoidal Steady State analysis: Intro**duction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] **Fourier Series:** Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : **Two Port Networks:** two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero

plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis 6/e By Hayt & Kemmerly TataMcgraw Hill 2004
2) Network Analysis, By M.E. Van Valkenberg PHI 2005
3) Electrical Linear Circuits – David Bell Oxford University Press 2008
4) Linear Circuit Analysis 2/e – DeCarlo and Lin Oxford University Press 2009
5) Network Analysis, P.Ramesh babu, SCITECH Publications,Chennai 2009
6) Circuit and Network Analysis By Sudhakar Shyammohan Tata Mc Graw Hill 2005
7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010

3 EP03/3EX03/3EL03/3EE 03 ENERGY RESOURCES AND GENERATION

SECTION A

Unit I : **Thermal and Hydro Power plant:** Selection of site, working of various parts: Economizer, air preheater, condenser, cooling tower, coal handling system, ash handling system, Classification of hydro power plant according to available head, nature of load, functions of different components and their working.

Unit II : **Nuclear and Diesel Power plant**: Methods of producing nuclear reactions, functions of different components of nuclear plant, functions of different components of diesel plant

Unit III : **Solar Energy and its measurement**: Solar constants, solar radiation at earth's surface, solar radiation geometry, solar radiation measurement, estimation of average solar radiation, solar radiation on tilted surface, principle of solar energy conversion in to heat, flat plate collectors, energy balance equation and collector efficiency

SECTION B

Unit IV : a] **Fuel cells:** Chemistry applied to fuel cells, principle and operation ,classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cells system

b] **Wind Energy**: Basic principle of wind energy conversion, wind data and energy estimation, selection of site, basic components of wind energy conversion system (WECS), classification of WEC systems, generating system, energy

storage, application of wind energy.

Unit V : **Ocean and tidal energy:** Ocean energy resources, ocean energy routes, ocean thermal energy conversion, progressive wave, wave data collection, Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in simple single basin tidal system

Unit VI : **Other non- conventional energy resources:** Operating principle of energy from biomass, energy from biogas, geothermal energy, MHD power generation, energy from urban and rural waste, mini and micro hydroelectric power generation, principle and operation of fuel cells, classification and types of fuel cells, performance characteristics of fuel cells.

Books Recommended :-

1) Energy Science, Principles Technologies & Impacts, John Andrews & Nick Jelley, Oxford University Press, 2009
2) Renewable Energy – Power for Sustainable Future, Godfrey Boyle, Oxford University Press, 2004
3) Conventional Energy Technology By S.B.Pandya, Tata McGrawHill, 2005
4) Non Conventional Energy Resources By G.D.Rai, Khanna Publishers, 2001
5) Energy and Atmosphere By I.M.Campbell, Wiley, New York, 2006
6) Solar Energy By S.P.Sukhatme, Tata Mc-GrawHill, 2006
7) Conventional Energy Resourses By B.H.Khan, Tata McGrawHill, 2003.

3 EP04/3EX04/3EL04/3EE 04 ELECTRONIC DEVICES AND CIRCUITS

SECTION-A

UNIT-I : P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge rectifier. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II : Theory and Analysis of Bipolar Junction transistor, 'H' Parameter, methods of biasing, their needs, 'Q' and stability factors, compensation techniques.

UNIT-III Study of typical transistor amplifier circuits

i) Emitter follower,
ii) Darlington emitter follower.
iii) Bootstrap emitter follower,
iv) RC coupled amplifier,

v) Transformer coupled amplifier,
vi) Cascaded amplifier,
vii) Direct coupled amplifier,
viii) Cascade stage.

SECTION-B

UNIT-IV : Class 'A' 'B' 'AB' and 'C' amplifiers, configuration of audio amplifiers, Calculations of power gain, efficiency, dissipation and distortion, oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V : Theory, construction and applications of Schottky diode,Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI : FETs (JFET & MOSFET) : Types, Characteristics and parameters (u, gm & Rds),Applications of FET amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

BOOKS RECOMMENDED:

1) Millman's Electronic Devices & Circuits by J.Millman, C.Halkias, Satyabrata Jit TMH 3rd ed, 2nd reprint 2011
2) Electronic Devices and Circuits 5/e – David Bell Oxford University Press
3) Microelectronic Circuits 5/3 – Sedra nad Smith Oxford University Press
4) Boylestad R. and "Electronics Devices & Circuits", Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.

3 EP05/3EX05/3EL05/3EE 05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

SECTION A

Unit I : **Measuring Instruments**: Classification, deflecting, controlling, damping, breaking torques. Basic principles of operation of Ammeter & Voltmeter: PMMC, MI, Electro dynamic, Electrostatic: construction, Principle of operation, torque equation, Scale shape, errors, merits & demerits of each type.

Unit II : **Watt meters & Energy meters**: Electro dynamic & Induction type: construction, theory of operation, torque equation, errors & demerits, Electronic energy meter.

Analysis of three phase balanced load, Blondel's Theorem, Measurement of active & reactive power & energy in single phase & three phase circuits.

Unit III : a] **Instrument Transformer**: Need of extension of range: extension using shunt & multipliers Instrument transformers:

CT & PT, Theory & construction, Phasor diagram, Ratio & Phase angle error, causes of error, applications Hall effect sensors for voltage and current measurement.

b] **Special Measuring Instruments** :- Maximum demand indicator, Trivector meter, Frequency meter, P.F. meter, Phase sequence indicator, Synchroscope, stroboscope, potentiometers.

SECTION B

Unit IV : **Measurement of circuit parameters**: Different methods of measurement of low, medium & high value of resistance, sensitivity & accuracy of different methods.

AC & DC bridges : Wheatstone, Kelvin, Maxwell, Wein, Hay, Desauty, Anderson, Schearing

Unit V : **Generalized instrumentation system** , characteristics of measurement & instrumentation system Transducers : Definition, classification, specification, selection & loading effect, Displacement, Velocity, force, & Torque transducers, Resistive, Inductive, capacitive, Strain gauge, Piezoelectric, current & voltage transducers.

Unit VI : **Transducers for pressure & temperature**: Manometer, Elastic members (Bellows, Bourdon tube, Diaphragm), RTD, Thermocouple, Thermister, Infrared & Crystal Cathode ray oscilloscope: Time, frequency & phase angle measurement using CRO. Spectrum & Wave analyzer.

Books Recommended

1) Electronic Measurement & Instrumentation by Oliver – cage, TMH 4th reprint 2010
2) Electronic Instrumentation by H.S Kalsi, TMH 3rd edition, 2nd reprint 2011
3) Instrumentation for scientists and Engineers – Turner Oxford University Press 2008
4) Electronic Instrumentation & Measurement , David Bell Oxford University Press 2nd Ed
5) A course in Electrical, Electronics measurement and Instrumentation, By A.K.Sawhney Dhanpat Rai & sons 2006
6) Electrical measurement and measuring Instruments By Golding Wheeler Publishing 2003
7) Electronic measurement and measuring Instruments By Coo.

3 EP06/3EX06/3EL06/3EE 06 NETWORK ANALYSIS LAB

Any TEN experiments based on contents of 3 EP02/3EX02/ 3EL02/3EE 02 NETWORK ANALYSIS

3 EP07/3EX07/3EL07/3EE 07 ELECTRONIC DEVICES AND CIRCUITS LAB

Any TEN experiments based on contents of 3 EP04/3EX04/ 3EL04/3EE 04 ELECTRONIC DEVICES AND CIRCUITS

3 EP08/3EX08/3EL08/3EE 08 ELECTRICAL MEASUREMENT AND INSTRUMENTATION LAB

Any TEN experiments based on contents of 3 EP05/3EX05/ 3EL05/3EE 05 ELECTRICAL MEASUREMENT AND INSTRUMENTATION

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SEMESTER : FOURTH

4EP01/4EX01/4EL01/4EE 01 ELECTRICAL MACHINES-I

SECTION A

Unit I : **D.C. Machines**

Construction, principle of operation, Emf equation, torque equation. Armature winding – Lap, wave, single layer, double layer. Armature reaction and commutation, method of improving commutation.

Unit II : **D.C. Generators.**

Types, characteristics and applications of d.c. shunt, series and compound generators.

Parallel operation of d.c. shunt, series and compound generators. Introduction for conducting and reporting the test on d.c. machines as per Indian standard.

Unit III: **D.C. Motors**

Characteristics, applications of d.c. shunt, series and compound motors, starting and speed control, losses, efficiency and testing.

SECTION-B

Unit IV: **Single phase Transformer.**

Heat run test, separation of core losses in to its component, parallel operation, equivalent circuit. Autotransformer - construction, working, merits, demerits and application.

Introduction for conducting and reporting the test on transformer as per Indian standard.

Unit V: **Three phase Transformer:**

Construction, working, types, connections, applications, testing, parallel operation, open delta, power transformer, distribution transformer construction.

Unit VI: Three phase to single phase, two phase, six phase, twelve phase conversion. Three-winding transformer and tap

changing transformer. Wave forms of no-load current and inrush current phenomenon.

Books Recommended

Electrical Machines by D.P.Kothari, I.J.nagrath TMH 4th edition, 2nd reprint 2011

ELECTRIC MACHINERY and Transformer, 3E – Bhag S Guru Oxford University Press

Advance Electrical Technology By H.Cooton. 1999

Substation Equipment By Satnam and Gupta 2003 .

4EP02/4EX02/4EL02/4EE 02 ELECTROMAGNETIC THEORY

SECTION A

Unit I : Review of Vector Analysis :cartesian, cylindrical and spherical co-ordinate systems, vector algebra and vector calculas. Line integral and multiple integrals. Gauss theorem.

Unit II : Electrostatics : Coulomb's law, electric field, Gauss flux theorem in integral and differential form. Electrostatics potential, Poison and Laplace equations.

Unit III: Electrostatics fields in dielectrics : electric dipole, polarization. P and D vectors, boundary conditions. Capacitance and electrical energy.

SECTION-B

Unit IV: Magnetic fields : Biot-Stewart law, Ampere's law in integral and differential form. Contunuity equation, time of relaxation. Vector and Scaler magnetic potential, electric current, J vector.

Unit V : Magnetic fields in materials : magnetic dipole equivalent volume and plane section curve. H vector, magnetization vector M, boundary conditions between magnetic materials, inductance, Electromagnetic Energy.

Unit VI: Maxwell equations and wave equations : Displacement current, time varying fields and Maxwell's equations, plane uniform magnetic waves. Depth of penetration poynting vector.

Books Recommended

1) Engineering Electromagnetics by W.H.Hayt, J.A.Buck, TMH 7th edition 2010

2) Foundation of Electromagnetic Theory, John Reitz, F.J.Milford, R.W.Christy, Pearson education, 4th edition 2010

3) Elements of Engineering Electromagnetics, Nannapaneni Narayana Rao, Pearson education, 2006

4) Principles of Electromagnetics 4/e Mathew Sadiku Oxford University Press

5) Field Theory, D. Ganesh rao, C.K.Narayanapa PEARSON education ,2010

4EP03/4EL03/4EE 03 ANALOG AND DIGITAL CIRCUITS

SECTION-A

Unit I : Introduction to IC's : Characteristics of IC components, Operation amplifier; Block schematic internal circuits, Level shifting, overload protection, study of IC 741 op-amo, Measurement of op-amp parameter.

Unit II : Linear and Non-linear Application of Op-amp:- Inverting and noninverting amplifiers, voltage follower, integrator, differentiator differential amplifier, Sinusoidal RC-phaseshift and Wein bridge oscillators, clipping, clamping and comparator circuits using op-amps. Astable, bistable and monostable multi vibrator using op-amps.

Unit III : Other linear IC's : Block schematic of regulator IC 723, and its applications, study of 78 **, 79 ** and its applications, SMPS, Block schematic of timer IC 555 and its applications as a timer, astable, mono stable, bistable multivibrator and other applications, Operation of phase lock loop system and IC 565 PLL, its application.

SECTION-B

Unit IV : Basic Logic Circuits : Logic gate characteristics, NMOS invertor, propagation delay, NMOS logic gate, CMOS invertor, CMOS logic gates, BJT invertor, TTL, NAND gate, TTL output, state TTL logic families, ECL circuits, composition logic families.

Unit V : Combinational Digital Circuits: Standard gate assemblies, Binary adder, Arithmetic functions, Digital comparator, Parity check generator, Decoder / demultiplexer, Data selector / multiplexer, Encoder, ROM, Two dimensional addressing of ROM,ROM applications, PROM,EPROM,PAL AND PLAS.

Unit VI : Sequential Circuits and Systems: Bistable Latch, Flip-Flop clocked SR,J-K, T, D type shift Registers, counter. Design using filp-flops, Ripple and synchronous types, application of counters, Dynamic MOS shift registers, RAM, Bipolar RAM Cells.

BOOKS:-

1. Millman, Microelectronics, 2nd Ed., McGraw Hill.
2. Gayakwad, Op-Amp & LLG, 2nd Ed.
3. Malvino & Leach, Digital Principles & Applications, 4th Ed., McGraw Hill.

4. K.B.Botkar, Integrated Electronics (Khanna Publishers.)

4EP04/4EL04/4EE 04 MATHEMATICS-IV

SECTION-A

Unit I : a) Complex variables : analytic functions, Cauchy-Riemann conditions. Harmonic function, Harmonic conjugate functions, Milne's method.

b) Confirmed mapping : mapping by elementary functions of the type $W=z+c$, $W=cz$, $W=1/z$, $W=z^2$, $W=e^2$, $W=z+1/z$ and bilinear transformation. (10 Hrs.)

Unit II : Complex Integral : singular points, Taylor's series, Laurent's series, Cauchy's integral theorem and Cauchy's integral formula.

Residue : Cauchy's residue theorem. Contour integrals. Integration forms : f(x) dx, f (sinx, cos x) dx (10 Hrs.)

Unit III: Patial differential equations : first order and first degree p.d. equation type.

(i) f (p, q) = 0, (ii) f (p, q, z) = 0, (iii) f (p, q, x, y) = 0 (iv) f (p, q, x, y, z) = 0 etc.

Lagrange's form Pp + Qq = R. Clarinet's form Z = px + qv + f (p, q).

Equation reducible to standard form. Homogeneous P.D.E. of nth order. (10 Hrs.)

SECTION-B

Unit IV: Special functions : solution of Legendre's and Bessel's equations by Frobensious method, Bessel's function Ist kind generating function, recurrence relating values of $J_{1/2\,(x)}$, $J_{-1/2(x)}$, $J_{3/2\,(x)}$ etc.Legendre's function of Ist kind : generating function, Rodrigues function, recurrence relation, Legendre's polynomials and orthogonal properties. (10 Hrs.)

Unit V : Statistics & Probability : Axioms, conditional probability, Bay'e theorem, mathematical expectations, probability distributions : Binomial, Possion and Normal. (10 Hrs.)

Unit VI: a) Curve fittings by method of Least Squares. Correlation and regression.

b) Matrix differential equation : solution and integrated solution, Sylvester's theorem, solution of differential equations by matrix method and Peano Baker method. (10 Hrs.)

BOOKS RECOMMENDED :

1) Pipes : Mathematics for Engineers and Physicist.
2) P.N. Wartikar and J.N.Wartikar : A Text Book of Applied Mathematics.
3) B.S.Grewal : Advance Engineering Mathematics.

4) S.G.Gupta : Statistical Methods.
5) Speigal : Statistics (Schaum's series)
6) Speigal : Complexva (Schaum's series)

4EP05/4EX05/4EL05/4EE 05 NUMERICAL METHODS AND COMPUTER PROGRAMMING

SECTION A

Unit I : Solution of Algebraic & Transcendental equations : Floating point number representation, errors, accuracy, stability of algorithms. Bracketing methods : bisection method and False Position method.

Open methods : Newton-Raphson method, Secant method and Successive Approximation method.

Comparison of different iterative methods. Implementation of these methods in C.

Unit II : Solution of Simultaneous Algebraic equations : Iterative methods : Jacobi's method and Gauss-Seidel method. Direct methods : Gaussian elimination method & Matrix Inverse method. Finding Eigen values of a matirx, determination of largest Eigen value. Implementation of these methods in C.

Unit III : Interpolation : Evenly spaced points : formation of forward & backward difference table, Newton's forward & backward difference interpolation formulae. Unevenly spaced points : divided difference table and Newton's divided difference interpolation formula, Lagrange's method. Interpolation with Cubic splines. Implementation of these methods in C.

SECTION-B

Unit IV : Numerical Differentiation and Integration : Numerical differentiation : Taylor's series method, Richardson extrapolation method, numerical differentiation using interpolation polynomial (first & second derivative near the begining & end of the table). Numerical Integration : Trapezoidal Rule, Simpson's Rules, Romberg method, Gaussian quadrature method. Implementation of these methods in C.

Unit V : Solution of ordinary differential equations : Initial value problem : Taylor's series method, Runge-Kutta methods - second & fourth order, Euler's method, Euler's modified method. Solution of simultaneous & higher order differential equations using Runge-Kutta fourth order method. Stiff differential equations and their solutions. Boundary value problem : Finite difference method and Cubic spline method. Implementation of these methods in C.

Unit VI : Principles of Object Oriented Programming : OOP paradigm, basic concepts of OOP, benefits of OOP, basic data types, users defined data types, derived data types, operators and control statements.

Books Recommended

1) Numerical Methods with Programms in C by T.Veerarajan, T.Ramachandran TMH 2nd edition, 6th reprint 2011
2) Numerical Methods - Principles, Analysis & Algorithms Pal, Oxford University Press , 2008
3) Numerical Methods for Engineers and Scientists – Guha Oxfor University Press 2008
4) Computer Fundamentals and Programming in C – Dey and Ghosh Oxford University Press 2008
5) Chapra S.S. & Canale R.P. : Numerical Methods for Engineers, 4th edition, McGraw Hill.
6) Balguruswami E. : Object Oriented Programming with C++, Tata McGraw Hill, New Delhi.
7) Nakamura S. : Applied Numerical Methods in C, Prentice Hall.
8) Faires & Burden : Numerical Methods, 7th edition, Thomson Learning.

4EP06/4EX06/4EL06/4EE 06 ELECTRICAL MACHINES I LAB

Any TEN experiments based on contents of 4EP01/4EX01/ 4EL01/4EE 01 ELECTRICAL MACHINES-I

4EP07/4EL07/4EE 07 ANALOG AND DIGITAL CIRCUITS LAB

Any TEN experiments based on contents of 4EP03/4EL03/ 4EE 03 ANALOG AND DIGITAL CIRCUITS

4EP08/4EX08/4EL08/4EE 08 NUMERICAL METHODS AND COMPUTER PROGRAMMING

Any TEN experiments based on contents of 4EP05/4EX05/ 4EL05/4EE 05

NUMERICAL METHODS AND COMPUTER PROGRAMMING

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. to i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
ELECTRICAL & ELECTRONICS ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)

SEMESTER : FOURTH

BRANCH ABBRIVIATION :-
EX : Electrical & Electronics Engg.

4EX03 LINEAR INTEGRATED CIRCUITS

SECTION A

Unit I : **Op-amp Fundamentals:** Differential amplifiers, ac and dc analysis of differential amplifiers, review of operation amplifier- block diagram representation, basic configurations, ideal op-amp, negative feedback, non – ideal closed loop characteristics.

Unit II : **Basic op-amp Circuits:** voltage follower, sign changer, adder, subtractor etc, I to V and V to I converters, current amplifiers, difference amplifiers, instrumentation amplifiers and their applications, transducer bridge amplifier.

Uniy III : **Op-amp Parameters:** Input bias and offset current, input offset voltage, input offset error compensation, slew rate, common mode rejection ratio etc, frequency response, input and output impedance, operation limits, compensated and uncompensated op-amps, compensation techniques.

SECTION B

Unit IV : **Non-linear Circuit Applications:** Voltage comparator and its applications, Schmitt trigger and its application, precision rectifiers, limiters, analog switches, peak detectors, sample and hold circuits, integrator and differentiator, log/antilog amplifiers, practical log/antilog circuits, analog multipliers, opamp as phase detector, op-amp electronic thermometers.

Unit V : **Active Filters:** Classification, transfer function, butter worth filters. low pass, high pass, band pass, band stop, notch and all pass.

Unit VI : a] Timer: IC 555, functional diagram, monostable and astable multivibrator.

b] **Voltage regulators:** Series op-amp regulators, IC voltage regulators, switching regulators etc, IC 723.

Text Books

1) Op-amps and Linear Integrated Circuits Technology, R.A.Gaikwad,

PHI publication, 1999

2) Design of Operational Amplifier and Analog Integrated Circuits, S.Franco TMH Publication, 2002

References

1) Linear Integrated Circuits, D.Roy Chaudhari ,New Age International Publisher, 2005

2) Operational Amplifiers & Linear ICs by David A.Bell , Oxford University Press,2011

4EX04 SIGNALS AND SYSTEMS

SECTION A

Unit I : **Introduction to Signals and Systems:** Signals and Systems, Classification of Signals Classification of Systems, Systems Modeling Some Ideal Signals, Energy and Power Signals Frequency Response, Discrimination of Continuous-Time Signals Topological Models, Analysis of Continuous-Time Systems Time Domain and Frequency Domain, Properties of Elementary Signals Linear Convolution Integral, Response of Continuous-Time Systems.

Unit II : **Fourier series and Its Properties** Fourier Transform Properties of Fourier Transform, Tables of Fourier Transform Pairs Fourier Transform of Periodic Signals, Ideal Low-Pass Filter Frequency-Domain Analysis of Systems Fourier analysis of Sampled Signals

Unit III : **Analysis of LTI Discrete-Time Systems:** Time Domain and Frequency Domain, Properties of Discrete-Time Sequences Linear Convolution, Discrete-Time System Response.

SECTION B

Unit IV : **Sampling:** Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals

Unit V : **The Z Transform:** The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Unit VI : **Discrete Fourier Transform and Fast Fourier Transform**

Representation of Discrete-Time aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform. Fast Fourier Transform (FFT)

Books Recommended

1) Principles of Linear Systems and Signals, 2e (international version) – Lathi B. P. Oxford University Press

2) Signals & Syatems, Smarajit Ghosh, PEARSON education, 2006

3) Signals & Syatems,D Ganesh rao, satish Tunga, PEARSON education 2010

4) Principles of Signal Processing & Linear Systems (international version) Lathi B P. Oxford University Press

5) Signals And Systems , S.Haykin, 2nd Edition, John Wiley And Sons 1999

6) Analog And Digital Signal Processing , Ambardar A, 2/3; Thomson Learning-2005

7) Signals and systems, Oppenheim and Schafer Prentice Hall India Of India 2nd Edition 1997

4EX07 LINEAR INTEGRATED CIRCUITS LAB.

Any TEN experiments based on contents of 4EX03 LINEAR INTEGRATED CIRCUITS

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

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SYLLABUS
PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
ELECTRONICS & TELECOMMUNICATION /
ELECTRONICS ENGINEERING
SEMESTER PATTERN (CREDIT GRADE SYSTEM)

SEMESTER: THIRD

3 XT 01 / 3 XN 01 MATHEMATICS-III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D,Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's an Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform,initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity,shifting,multiplication by k,change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms,inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Prtial differential equation of first order of following form-

(i) f(p,q)=0; (ii)f(p,q,z)=0; (iii) f(x,p)=g (y,q); (iv)Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Comples Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation,magnification,inversion and bilinear transformation),singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT -VI Vector calculas:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals,irrotational and solenoidal vetor fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A text book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika Prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral Transforms by Goyal & Gupta.

3XT02 /3XN02 COMPUTER PROGRAMMING AND APPLICATIONS

SECTION-A

Unit I : Principles of object oriented Programming: OOP'S paradigm, basic concept of OOP'S Benefits of OOP'S, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++: Functions, Function over loading, Friend Functions, types of classes and its use, concept of object and its implementation, constructor and destructors.

Unit III: Operator's overloading:

Operator and their definition,overloading unary and binary opeator, Rules for overloading operators, overloading binary operators using friends and string manupalation.

SECTION-B

Unit IV : Inheritance and Polymorphism:

Defining derived classes, single and multiple inheritance,

multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual function.

Unit V : Solution of Nonlinear and Polynomial Equations:

False position, modified false position, secant, Newton Raphson Method.

Solution of Linear Systems of Equations: Gauss elimination method, L.U. factorization method, Gauss seidel iterative method.

Unit VI: Solution of differential equation: Euler's method, Runge Kutta method, Predictor Corrector method.

Numerical Integration: Trapezoidal rule, Sympson's 1/3 and 3/8 th rules.

Finite differences: Newton forward and backward interpolation formula.

Textbooks:

1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata - Graw Hill publishing Co.Ltd., New Delhi,1995.

2) Introduction to method of Numerical Analysis- S. S. Shastry, Second Edition, PHI Pvt. Ltd., New Delhi.

Reference Books:

1) Object Oriented Programming in Turbo C++ Rober Lofore Galgotia Publications Pvt.Ltd., New Delhi,1995

2) The C++ Programming Language (Third Edition) Bjarne Stroustrup Pub.Co.,New York,1995 (AddisonWesley)

3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesely Pub. Company,1995

4) Computer Oriented Numerical Methods:-V. Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.

5) Numerical Method for Mathematics Science and Engineering, John H. Mathew, PHI publication.

3XT03 /3XN03 ELECTROMAGNETIC FIELDS

SECTION-A

Unit I: Review of Vector Analysis:

Cartesian, cylindrical and spherical co-ordinate systems, vector products, Projection of Vectors, Gradient, Divergence & Curl, Stokes & divergence theorem. (08)

Unit II: Electrostatics:

Coulomb's law, Electric field intensity, Evaluation of electric field intensity due to line charge, surface charge & volume charge distribution, Electric flux density, Gauss Law,

Electrostatics potential, Potential gradient, Electric dipole & Polarization . (08)

Unit III: Magneto statics: Amper's law of forces, Biot-Savart's law, Ampere's law in integral and differential form., Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux & flux density, Magnetic dipole moment, Magnetization. (08)

SECTION-B

Unit IV: Boundary conditions & Maxwell's equations:

Boundary condition of dielectric-dielctric interface, dielectric-conductor interface, boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equation for steady & time varying fields. (08)

Unit V: Electromagnetic wave propagation:

Electromagnetic wave equation for free space, lossy dielectrics, perfect conductors, propagation constant, attenuation constant, phase shift constant, Skin depth, Concept of power flow, Poynting Theorem, , Reflection of a plain wave in a normal incidence at dielectric-dielectric interface, dielectric-conductor interface. (10)

Unit V: Radiation:

Magnetic scalar and vector potential, retarded potential, Electric & Magnetic fields Power radiated & radiation resistance, due to oscillating dipole, quarter wave monopole & half wave dipole. (08)

Text Books:

1) Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill

2) Jordan E.C. and Balamin K.C.: "Electromagnetic Waves and Radiating System " Prentice Hall of India Private Limited (Second Edition)

Reference Books:

1) Mathew N.O.Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press

2) Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)

3) Ramo S. and Whinnery R.: " Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.

3XT04/3XN04 ELECTRIC DRIVES & MEASUREMENTS

SECTION- 'A'

Unit-I : Measurement of resistance: Kelvin Double Bridge, Loss of charge method and megger. Measurement of Inductance and Capacitance: Maxwell's bridge, Hay's bridge, Anderson's bridge, Schering bridge,D Sautys Bridge and Carey Foster

bridge. Measurement of Q factor and tan ¢.

Unit-II : Measurement of active and reactive power in 3-phase balanced and unbalanced load. Electrodynamometer type power factor meter, frequency meter. Watt meter, Digital Energy Meter

Unit-III : D.C.Motors: Electrical and mechanical characteristics of motor,Speed control methods for constant torque and constant horse power. Application of D.C.motors. Braking-resistance, plugging and regenerative braking

SECTION- 'B'

Unit-IV : Inducation Motors: Characteristics, Speed control methods: Armature voltage, V/f control, rotor control, slip power recovery scheme and applications, plugging, Resistance braking, Regenarative Braking.

Eddy current coupling and its application.

Unit-V : Transformers: 3 phase ?transformers, rectifier transformers, pulse transformers. Open delta connection, Scott connection, Ferrite core transformer.

Unit-VI : Construction, principle of operation, characteristics and applications of : Tachogenerator, (DC & AC), Stepper motor, A.C.Servo motor 1 Phase ?induction motors and Universal motor.

TEXT BOOKS:

i) M.V.Deshpande:- Elements of Electrical Machines.

ii) A.K.Sawhney:- Electrical and Electronic Measurement and Instrumentation.

REFERENCE BOOKS:

i) E.W.Golding:- Electrical measurement and measuring Instrument, ELBS Pub.

ii) First Course on Electrical Drives-S.K.Pillai

iii) B.L.Theraja VOL II :- Electrical Engineering.

3XT05/3XN05 ELECTRONICS DEVICES AND COMPONENTS

SECTION A

Unit I : Construction, selection and failures of

- Resistors: Fixed type, Variable Type , Network and Chip type
- Capacitors: fixed and variable Type

Unit II

- Switches & Relays: Types, Construction and Testing
- Fuses, Cables and Connectors: Types, Construction, Specification and Application
- Introduction to Heat sink, Choke and Transformer

Unit III : Basics of Electronic Component layout, PCB material, Properties and specifications, Basic manufacturing process of PCB , Soldering and De-soldering Techniques.

SECTION B

Unit IV : P-N Junction diode theory- V-I Characteristics, Temperature dependency, Diode Resistance, Zener diode : characteristics, Avalanche & Zener breakdown, Testing of diode using Ohmmeter and CRO

Unit V: Theory, Construction, Characteristics and application of Tunnel, Varactor, Shottkey diode Opto-Devices: LED, Photo Diode, LCD

Unit VI : Theory of PNP and NPN Transistor, Transistor Configurations, Their Characteristics and current Components. Transistor as an amplifier, Testing of Transistor using Ohmmeter and CRO

Text Books:

1. Maduri Joshi, " Electronic Component and Material" 3rd Edition, Shroff Publication
2. Millman H Halkies, " Integrated Electronics" TMH Co. New Delhi

References:

1. Bosshart, " Printed Circuit Board" TMH
2. David Bell' " Electronic Devices and Circuits" Oxford University Press, 2010
3. Boylestad R, "Electronic Devices and Circuits" Prentice Hall of India Pvt. Ltd. New Delhi.

3XT06/3XN06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Minimum Eight experiments based on the 3XT2/3XN2 out of which at least four experiments should based on the last two Units.

3XT07/3XN07 ELECTRIC DRIVES & MEASUREMENTS-LAB.

Minimum Eight experiments based on **3XT4/3XN4**.

3XT08/3XN08 ELECTRONICS DEVICES AND COMPONENTS-LAB.

Minimum eight Practicals Should be conducted based on the **3XT5/3XN5**. (atleast one on PCB)

SEMESTER : FOURTH

4XT01/4XN01 COMMUNICATION ENGINEERING-I

SECTION-A

Unit I Signal and Noise : Signals: Analog & digital, Deterministic & Non-deterministic, Periodic & non periodic, Frequency response, bandwidth, bandwidth requirement for different types of signals such as telephone speech, music and video. External and Internal noise, signal to noise ratio, noise figure, noise factor measurement, equivalent noise Temperature, Friiss formula. (6)

Unit II Signal Analysis : Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Dirac Delta Function, Fourier Transform of Periodic functions, Fundamental of Power Spectral Density & Energy Spectral Density, Correlation: Auto-correlation, Cross-correlation. (9)

Unit III Probability and Random Signal Theory : Probability, Random variable, PDF Random processes, stationarity, Mean, Correlation and Covariance Functions, Ergodicity, Gaussian Process, White Gaussian Noise. (8)

SECTION-B

Unit IV Wave Propagation : Electromagnetic waves, Ground waves, Sky waves, ground waves, space waves, Ionosphere, critical frequency, maximum usable frequency, virtual height, skip distance, LOS communication, fading, single hop and multi hop propagation, duct propagation. (7)

Unit V RF Transmission Lines : Parallel and coaxial transmission line, equivalent circuit of transmission line, standing wave, characteristic(shunt) impedance, quarter wave and half wave length transform, Smith chart, Single stub (shunt) matching using smith chart, balun. (8)

Unit VI Antenna Basics & Types of Antenna : Principle of radiation, antenna power gain, beam width, polarization, bandwidth and radiation resistance, Isotropic radiator, Resonant antenna: Half wave, Folded dipole antenna, Non resonant antenna, antenna arrays, parasitic reflector, parasitic director, design of yagi-uda antenna (up to 5 elements) Long, wire, helical, rhombic, discone, log periodic, loop antenna, low, medium and high frequency antenna. (10)

Text books:-

(1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(2) Simon Haykin : Communication System, John Wiley, Eastern Ltd., New York, (Third Edition), 1994.

Reference books

(1) Collins Dennis,Collins John "Electronic Communications" (PHI)

(2) B. P. Lathi : " Modern Digital and Analog Communication systems" 3rd Edition, Oxford Uni. Press, New Delhi.

(3) Taub and Schilling D.L. : Principles of Communication Systems, Mc-Hill Co, Tokeyo, 1994 (II Ed.)

(4) Hari Bhat: "Analog communication, 2nd Edition Pearson India, 2010"

4 XT 02/4XN02 ELECTRONIC DEVICES AND CIRCUITS-I

SECTION-A

Unit I : Rectifiers : Half wave, full wave and bridge rectifiers and their analysis. Filters : Analysis of capacitor filter, Theory of L, LC & CLC (p) filter, Zener diode as a Voltage regulator.

Unit II : DC load line and operating point (Q point); Methods of biasing & stability factor; ac equivalent circuit and hybrid model analysis of CE configuration.

Unit III : Feed back Amplifier and Oscillator : Classification of amplifier: Voltage current, trans-conductance, Trans-resistance amplifier, feedback concept, effect of negative feedback in amplifier, Methodology of feedback in amplifier and analysis. Oscillators : Barkhausen's criterion for sustained oscillations; study of Harley, Collpit, RC oscillators and crystal oscillator.

SECTION-B

Unit IV : Study of multistage transistor amplifier circuit

i) RC coupled amplifier,
ii) Transformer coupled amplifier,
iii) Direct coupled amplifier,
iv) Emitter follower; Darlington emitter follower, Bootstrapping principle,
v) Cascade stage.

Unit V : Power Amplifier : Transformer coupled Class A amplifier, Transformer coupled Class B amplifier & transformer coupled Class AB amplifier, capacitor coupled and direct coupled output stages, modifications to improve power amplifier performance, Class C amplifier and analysis.

Unit VI : JEET : Theory, Construction and Characteristics; parameters (m, g_m & rds); Biasing of JEET amplifiers, MOSFET : Theory, Construction and Characteristics of enhancement & depletion type MOSFET

UJT: Theory, Construction and Characteristics; UJT as relaxation oscillator.

Text Books :

1) David Bell : Electronic Devices and Circuits, Oxford University Press, 2010.
2) Milliman H. and Halkies : Integrated Electronics, Tata McGraw Hill, New Delhi.

Reference Books :

1) Mottershead Allen : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, 1986
2) Boylestad R. : Electronics Devices & Circuits, Prentice Hall of India Pvt. Ltd., New Delhi, V Edi. 1993
3) Ramanan K.V. : Functional Electronics, Tata McGraw Hill, New Delhi, 1989
4) Milliman S., Taub H and Halkies : Electronics Devices and Circuits, McGraw Hill Int. Co., Auckland, 1982

4 XT 03 / 4 XN 03 NETWORK ANALYSIS

SECTION-A

Unit I : a] Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems.

Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by

differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
3) Electrical Circuits – David Bell, Oxford University Press, 2008
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009

5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009

6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005

7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4XT04/4XN04 INDUSTRIAL MANAGEMENT & QUALITY CONTROL

SECTION-A

UNIT- I **Principles and Techniques of Management** : Meaning of and differences among business, management, administration and organisation, Principles of management, functions of management, planning, organisation structure and relationships, direction, co-ordination, control, motivation, delegation and decentralisation, communication, leadership and decision making. (7)

UNIT- II Market and Materials Management :

A) Marketing strategy, market research, consumer behaviour, advertising and sales promotion, channels of distribution, pricing of products.

B) Classes of material, scope of material control, scope of purchasing department, purchasing procedures, order procedures, inventory control, introduction to production, planning and control. (9)

UNIT- III **Personnel Management :** Meaning and functions of personnel management, recruitment, selection, promotion, wages and salary administation, training and development, functions and scope of trade unions in Indian industries. Welfare of labour, Problems of labour turn over & retention.

Merit Rating: Job evaluation, different methods of merit ratings, wage incentives, different types of wage incentive schemes. (9)

SECTION-B

UNIT- IV Project and Financial Management :

A) Case studies of project report, preparation of profit and loss statement and balance sheet, ratio analysis.

B) Principles of costing , cost sheet preparation, variance analysis, meaning and application of various budgets, types of budgets and their importance. (9)

UNIT- V **Quality Control :** Concept of quality and quality control, elements of quality, factors controlling quality of design and conformance, process control, inspection planning and scheduling, 7QC (Seven Quality Control) techniques, vendor

inspection, sampling inspection, sampling plans, Quality audit system. (8)

UNIT- VI **Quality Management :** Concepts and applications of Kaizen, quality circle, ISO 9000 series, just-in-time, quality planning and total quality management, elements of TQM, Quality Circles. (8)

TEXT BOOKS:

1. INDUSTRIAL ENGINEERING AND MANAGEMENT ,O P Khanna ,2011 ,JAIN BOOK DEPOT,Post Box No. 51, New Delhi - 110001 (INDIA),81-899-2835-3.
2. INDUSTRIAL & BUSINESS MANAGEMENT ,Telsang Mertand.T, S.Chand & Company Limited, NEW DELHI. ,81-219-2056-6.
3. MANAGEMENT : PRINCIPLES, PROCESSES, AND PRACTICES, Anil Bhat, Arya Kumar , 2008 , Oxford University Press, NEW DELHI., 978-01-956-9445-1.
4. TOTAL QUALITY ,BHARAT WAKHLU ,2/e, 2007 ,S.Chand & Company Limited, NEW DELHI. ,81-219-2866-4.
5. TOTAL QUALITY CONTROL, 4TH ED. ,Armand V. Feigenbaum, 2005 ,Tata McGraw-Hill Education, New Delhi. ,978-00-702-2003-4.

REFERENCE BOOKS:

1. PRINCIPLES OF BUSINESS MANAGEMENT ,Dr. Virendra Sharad Sherlekar ,Prof.S.A.Sherlekar ,3/e, 2009 ,Himalaya Publishing House Pvt. Ltd, MUMBAI. ,978-81-8488-082-3 .
2. FUNDAMENTALS OF FINANCIAL MANAGEMENT ,BOSE, D. CHANDRA ,2/e ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-4074-9.
3. PRINCIPLES OF MANAGEMENT AND ADMINISTRATION • ,Chandra Bose , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-1929-5.
4. PROJECT MANAGEMENT ,Prof. Abdul Matheen ,2/e, 2009 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0694-4.
5. TOTAL QUALITY MANAGEMENT • ,Suganthi & Samuel , ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2655-2.
6. TOTAL QUALITY MANAGEMENT ,Dr. S. Kumar ,1/e, 2006 ,LAXMI PUBLICATIONS(P) LTD, NEW DELHI . ,978-81-318-0568-8.
7. QUALITY MANAGEMENT, Kaniska Bedi ,2006 ,Oxford University Press, NEW DELHI . ,978-01-956-7795-9.
8. TQM : PLANNING, DESIGN & IMPLEMENTATION, Khanna, V.K., 1/e, 2009, New Age International (P) Ltd., Publishers, NEW DELHI., 978-81-224-2233-7.

9. Fundamentals of Quality Control and Improvement, Mitra Amitava, 2/e, 2009 ,PHI Learning Private Limited, NEW DELHI. ,978-81-203-2377-3.

4XT05/4XN05 INSTRUMENTATION

SECTION-A

Unit I : Transducer & Instrumentation systems (1)Transducer classification: Active/Passive. Primary/Secondary. Analog/ Digital and transduction Principles. Basic Signal conditioning Circuits. Resistive/Capacitive/Inductive reactance bridge. Current/Voltage Sensitive Wheatstons bridges & Generalized instrumentation system with particular examples (9 Hrs)

Unit II : Static characteristics, errors & statistical parameters: (1) Static characteristics: Accuracy, Precision, Sensitivity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean Average deviation Standard deviation. Probable error, Histogram, Normal & Gaussian curve of errors. (7 Hrs)

Unit III : Electronics Instrumentation: (1,2,3):Analog & Digital data acquisition system, Analog electronic multimeter, Introduction to digital voltmeter & universal counter. Stripchart & X-Y recorders. Optical Encoders. Siesmic mass vibration transducer. (3)Introduction to microphones & loud speaker. (9 Hrs.)

SECTION-B

Unit IV : Measurement of Temperature & Strain (1,3) Temperature Sensors: LM335, RTD. THERMISTORS,

Thermocouples, Thermocouples laws & its compensation methods. Pyrometers: Total/Partial radiation & optical pyrometers. Strain Gauges, Gauge factor. Strain measurement & temperature compensation methods.

Unit V : Measurement of Displacement. Pressure & Level. Displacement Measurement: (1) using resistive, capacitive, inductive (LVDT & RVDT) & Eddy current. Pressure Measurement: (1) Elastic, Inductive, Peizoelectric & capacitive transducers, Low pressure measurement using ionization gauge, pirani gauge, thermocouple vacuum gauge. Level Measurement: (1, 3) Using ultrasonic, capacitive, inductive, resistive with float, gamma rays & eddy currents techniques. (8 Hrs.)

Unit VI : Measurement of Flow, Humidity, Velocity (1) Flow Measurement: using ultrasonic, electronaquatic & hotwire

Anemometer. Humidity Measurement : using resistive, Capacitive & Crystal transducers. Velocity Measurement: Using photo detectors (both linear & angular velocity). Introductory block diagram of smart sensors , Wave analyzer & spectrum analyzers.

Books Recommended:

1) Sawhney A.K.: A course in Electrical/Electronics Measurement & Instrumentation, Dhanpat Rai & Sons., Delhi.
2) Rangan C.S., Sharma G.R. , & Mani V.S.V.: Instrumentation Devices & System,Tata Mc-Graw Hill.
3) R. K. Rajput: Electrical & Electronics Measurement & Instrumentation.

Reference Books :

1) Patranbis D. : ' Sensors & Transducers', A.H.Wheeler & Company, Prayag, India.
2) H. S. Kalsi : Electronics Instrumentation, Tata McGraw Hill, 2nd Edition
3) U.A. Bakshi & A. V. Bakshi : Electronics Instrumentation, Technical Publication
4) Robert A. Witte: Electronics Test Instrumentation : Analog & Digital Measurement.

4 XT 06/4 XN 06 ELECTRONIC DEVICES AND CIRCUITS-I-LAB.

Any TEN experiments based on contents of 4 XT 02/4XN 02 ELECTRONIC DEVICES AND CIRCUITS-I

4 XT 07/4XN 07 NETWORK ANALYSIS - LAB.

Any TEN experiments based on contents of 4 XT 03 / 4 XN 03 NETWORK ANALYSIS

4 XT 08/4XN 08 INSTRUMENTATION-LAB.

Minimum Eight experiments based on 4XT 05/4XN 05 INSTRUMENTATION

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

SYLLABUS
PRESCRIBED FOR
FOUR YEAE B.E. DEGREE COURSE IN
INSTRUMENTATION ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
THIRD & FOURTH SEMESTER
THIRD SEMESTER

3IE 01 /3 XT 01 / 3 XN 01 MATHEMATICS – III

SECTION-A

UNIT-I Ordinary differential equations:- Complete solution, Operator D,Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's an Legendre's linear differential equations (10 Hrs.)

UNIT-II Laplace transforms: definition, standard forms, properties of Laplace transform, inverse Laplace transform,initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function, solution of Linear differential equations, Simultaneous differential equation by Laplace transform method. (10 Hrs.)

UNIT-III a) Difference equation:- solution of difference equations of first order, Solution of difference equations of higher order with constant co-efficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z-transforms (linearity,shifting,multiplication by k,change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms. (10 Hrs.)

SECTION-B

UNIT-IV a) Fourier transforms- Definition, standard forms,inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Prtial differential equation of first order of following form-

(i) f(p,q)=0; (ii)f(p,q,z)=0; (iii) f(x,p)=g (y,q); (iv)Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form Statistics:

Binomial, Poisson and Normal Distribution. (10 Hrs.)

UNIT-V Comples Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method, conformal mappings translation, rotation,magnification,inversion and bilinear transformation),singular points, expansion of function in Tayler's and Laurent's series. Cauchy's integral theorem and formula, Residue theorem. (10 Hrs.)

UNIT -VI Vector calculas:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals,irrotational and solenoidal vetor fields, Stoke's and Divergence theorem (without proof). (10 Hrs.)

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A text book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika Prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A text book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral Transforms by Goyal & Gupta.

3 IE 02 ELECTRONIC DEVICES AND CIRCUITS

UNIT-I: P-N Junction diode theory, Rectifiers - Half wave, full wave and bridge. Filters-C, LC and their analysis, Zener diode and its applications.

UNIT-II Theory and Analysis of BI Junction transistor, 'H' Parameter, Methods of biasing, their needs, 'Q' and stability factor.

UNIT-III: Study of typical transistor amplifier circuits:

i) Emitter follower,
ii) Darlington emitter follower.
iii) Bootstrap emitter follower,
iv) RC coupled amplifier,
v) Transformer coupled amplifier,
vi) Cascaded amplifier,
vii) Direct coupled amplifier,
viii) Cascade stage.

UNIT-IV: Class 'A', 'B', 'AB' and 'C' amplifiers, Configuration of audio

amplifiers, Calculations of power gain, efficiency, power dissipation and distortion, Oscillators, their criteria, Hartley, Collpit and R-C oscillators, Crystal oscillator.

UNIT-V: Theory, construction and applications of Schottky diode, Tunnel diode, Varactor diode, Selenium diode, LED, Photo diode, PIN diode, photo-transistor.

UNIT-VI: FETs (JFET & MOSFET): Types, Characteristics and parameters (u, gm & Rds), Biasing of FET Amplifiers, UJT: Characteristics, working, UJT as relaxation oscillator.

TEXT BOOK:

1) Mottershead Allen: "Electronics Devices & Circuits" Prentice Hall of India Private Limited, New Delhi, 1986.

REFERENCE BOOKS:

1) Milliman H. and Halkies: "Integrated Electronics" ,Tata Mc-Graw Hill Book Co., New Delhi.
2) Boylestad R. and "Electronics Devices & Circuits" , Prentice Hall of India Private Limited, New Delhi (Fifth Edition), 1993.
3) Ramanan K.V.: "Functional Electronics", Tata Mc-Hill Publication Co. Ltd.,New Delhi, 1989.
4) Milliman S., Tube H. and Halkies: "Electronics Devices & Ciruits", Mc-Ggaw Hill Int. Co., Auckland, 1982.

3 IE 03 ELECTRICAL MEASUREMENT

UNIT-I : Introduction: Digital MultiMate's , Kilowatt meter, Data types, Measurement standards for time , frequency, voltage , current. . Introduction to reliability and safety. Response of indicating instruments for step, linear and sinusoidal inputs.

General purpose, Cathode Ray Oscilloscope, front panel control , CRT Block schematic, controls on CRO panel, Measurement of phase, frequency, Time duration.

UNIT-II: DC Bridges: Wheatstone Bridge, Bridge sensitivity, analysis by Thevenin's theorem, Errors in bridge circuits, Null type, Current and Voltage sensitive bridges, Kelvin Bridge.

AC Bridges: Inductance bridge (Maxwell's), capacitance bridge (Hay's), Wein bridge, Anderson bridge, Schering bridge, Storage & dissipation factors & their measurements. (09)

UNIT-III: Potentiometers: Measurement of voltage & current calibration sensitivity, self balancing techniques, Multirange potentiometers.

Recorders: Curvilinear & rectilinear recording, strip-chart, X-Y recorders & Dual Trace Oscilloscopes, Synchronization, Z

modulation.

Unit-IV : Construction, working principle of AC tacho generator, DC tacho generator, Two dial DC potentiometer, Coils and chokes

Safety: safety in electrical Ckts. , fundamental safety rules and electrical system earthling

Unit- V : Arithmetic Operations & Floating point Arithmetic, Boolean Algebra, OR, AND, NOT, NOR, AND, EX-OR,EX-NOR Operation, Negative & Positive Logic, Laws of Boolean Algebra, Reduction of Boolean Functions. Different Codes and their Conversions (BCD, Octal, Hex,Excess Three, Gray),

Unit- VI : Wave and Spectrum Analyzer, Harmonic Distortion Analyzer, Heterodyne Frequency meter, Function Generator.

Text Books:

1. Electronic Instrumentation Techinques by Cooper & Helfrick.
2. Modern Digital Electronics by R.P. Jain

Ref. Book:

1. Electronic Instrumentation & Measurement by Sawhney

3 IE 04 SENSORS & TRANSDUCER

UNIT I : Transducer :Defination, Classification, Selection criteria. Errors, loading effects, Transducer specifications, calibration. Generalized Instrumentation diagram.

UNIT II: Displacement Measurement: Resistive methods, Inductive Methods, Capacitive Methods.

Force & Weight: Load cell (Electrical, Pneumatic, Hydraulic), LVDT, Piezoelectric, Vibrating wire.

Torque: Strain gauge, Inductive, Digital method.

UNIT III: Temperature Transducers: Temperature scales, Bimetallic strip, Semiconductor temperature detector (thermister , LM 335). Resistance thermometer, Thermocouples, Thermopile, Crystal, Infrared thermometers

UNIT IV : Flow Transducers: Basic measurement principles, Bernoulli's theorem, Differential pressure type (Orifice, Ventury , Anubar Pitot tube),Variable area type, Magnetic, Ultrasonic, Positive displacement type ,Mass flow meter, Anemometer, Total flow meter.

Level Transducers: - float type displacer, Diaphragm box level gauge, DP cell, Ultrasonic, Capacitive , resistive.

UNIT V: Pressure Transducers: Pressure scales , Manometers, Elastic(Bellows, Bourdon tube, Diaphragm)type, Electrical pressure sensors (LVDT, Strain gauge, load cell, Piezo-electric, Capacitive),Differential pressure sensors(Capacitive, Force

balance & vibrating cylinder type),vacuum pressure measurement, thermal conductivity & ionization type, Transducers for very high pressure measurement.

UNIT VI: Humidity Transducers: Psycrometer, Hygrometer (Hair, wire & Electrolysis type),Dew point meter .Piezo-electric humidity meter, Infrared conductance & Capacitive type probes for moisture measurement. Sound level measurement.

Text Books:

1. Sensor and Transducer by D. Patranbis
2. Sensor and Transducer by Dr. A.D. Shaligram

Ref. Books:

1. Electronics Instrumentation and measurement by A.K. Sawhney
2. Electrical and Electronics measurement and Instrumentation By R. K. Rajput
3. Process Control By B.G. Liptak
4. Industrial Instrumentation & Control By S.K. Sing.

3 IE 05 ANALYTICAL INSTRUMENTATION

Unit I : Introduction to Elements of analytical Instruments, Ultraviolet (UV) and Visible absorption instruments components, Beer-Lamberts law, monochromator : design and associated equipment, monochromator performance. UV and Visible instruments : colorimeters, spectrophoto-meters : single and dual beam, dual wavelength and double monochromator, Infra-Red (IR) spectrophotometers : basic components, types.

Unit II : Flame photometry : principle, constructional details, fuel gases, atomizer, burner, optical and recording systems.

Atomic absorption spectrometers: theoretical concepts, instrumentation: hollow cathode lamps, burners and flames, plasma excitation sources, optical and electronic systems.

Unit III: Nuclear magnetic resonance (NMR) spectrometry: principle, nuclear spin, nuclear energy levels, resonance condition, NMR absorption spectra, chemical shift, constructional details, spin decoupler, Fourier transform NMR spectroscopy.

Unit IV : Fluorimeters and phosphorimeters : principle, single and double beam filter fluorimeters, ratio fluorimeters, spectrofluorimeters, phosphorescence spectrometer.

Raman spectrometry : Raman effect, Raman spectrometer.

Photoacoustic and photothermal spectrometers.

Mass spectrometery : Principal &operation ,basic

components, gas chromatograph mass spectrometer (GCMS) system.

Electron and ion spectroscopy : Instrumentation for electron spectroscopy ,

Unit V : Radio chemical instrumentation: radio chemical methods, radiation detectors (ionization chamber, Geiger-Muller, proportional and Scintillation counters), pulse height analyzer.

X-ray spectrometry: spectrum, instrumentation, diffractometers and absorption meter.

Unit VI : Gas and liquid chromatography : classification, basic parts, carrier gas, sample injection system, thermal compartment, detectors (thermal conductivity, flame ionization, electron capture, Argon ionization), introduction to liquid chromatography.

Methods of gas analysis : oxygen, carbon monoxide, nitrogen analyzer, gas density analyzers.

Refractometry : principle, Abbe and dipping types.

Interferometry : principle, types-Rayleigh, Jamin and Twyman.

Text Books

1) R.S.Khandpur : Handbook of Analytical Instrumentation

2) Willard, Merrit and Dean : Instrumental Methods of Analysis

Ref. Book:

1. E.W.Ewing : Instrmental methods of Chemical Analysis

2. R.D.Braun : Introduction to Instrumental Analysis

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3 IE 06 ELECTRONIC DEVICES AND CIRCUITS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE02.

3 IE 07 ELECTRICAL MEASUREMENT-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE03.

3 IE 08 SENSORS & TRANSDUCER-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE04.

3 IE 09 ANALYTICAL INSTRUMENTATION-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 3IE05.

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FOURTH SEMESTER

4 IE 01 ELECTRICAL MACHINES

SECTION-A

UNIT-I: **D.C Machines**

Construction details, EMF equation, Methods of excitation, Self and separately excited generators, characteristics of series, shunt and compound generators, Principle of operation of D.C. motor, back emf and torque equation, characteristics of series, shunt, and compound motors, starting of D.C motors, types of starters, and speed control of D.C shunt motors

UNIT-II: **Transformers**

Construction details, Principle of operation, EMF equation, transformation ratio, Equivalent circuit, Loses in Transformers, Open and short circuits tests, Auto Transformers, Pulse transformer, Instrument Transformer (CT and PT),Condition of parallel operation, Connection of three phase Transformer-Star/Delta ,Delta/Star, Scott connection (Phase inversion).

UNIT-III: Synchronous Machines

a) Alternator; Construction details, synchronous speed, emf equation, winding factors, regulation by synchronous method.

b) **Synchronous Motors**:

Concept of rotating magnetic field, principle of working, effect of variation of load.

Characteristics and applications.

UNIT-IV: **Induction motor**

Construction, types, principle of operation of three phase induction motor, equivalent circuit, performance characteristics, Starting and speed control, Different types of starters, and applications.

Single phase induction motor: principle of working, type applications.

UNIT-V : **Special purpose machines**

Principle, working, Characteristic and applications of stepper motor. Principle, working, Characteristic and applications Servomotors, and Principle, working, Characteristic and applications universal motors.

UNIT-VI: **Transmission and Distribution**

Structure of electric power system, Generation, transmission ,Sub-transmission and distribution systems, EHVAC and EHVDC transmission systems, Substation layout, insulators and cables.

Text books:

1. Electrical Machines-Nagrath Kothari(Tata Mc Ggraw Hill)
2. Theory of AC Machines-Langsdrof (Tata Mc Ggraw Hill)
3. Electrical Engineering –Vol I,Direct Currents-C Dewes

Ref. books:

1 Fundamentals of Electric Machines-B.K.Gupta,Vandana Singhal
2 A Text Book of Electrical Engineering-B.L.Tharaja Volume II and III.
3 Performance and Design of DC Machine-Clayton and Hancokk

4 IE 02 COMPUTER PROGRAMMING AND APPLICATIONS

Unit I : Principles of object oriented Programming-Oops paradigm, basic concept of Oop's Benefits of Oop's, structure of C++ Programming, Basic data types, user defined data type, derived data type operator and control statement.

Unit II : Functions classes and object in C++ Functions, Function over loading, Friend and Virtual Functions, Difference between class and structures, Array of objects, object as a function argument , constructor and destructors.

Unit III: Operator's overloading Operator and their definition, overloading unary and binary operator , Rules for overloading operators, overloading binary operators using friends and string manupalation.

UNIT IV- Inheritance and Polymorphism- Defining derived classes, single and multiple inheritance, multilevel inheritance, member classes pointer to objects, pointer to derived classes, virtual base class , virtual function.

Unit V: INTRODUCTION TO SPICE/ PSPICE**:-**Description, types , circuit elements, sources, Types of analysis ,output commands, Format of files.

DC CIRCUIT ANALYSIS**:** Registors , modelling of elements, Independent & dependent sources, DC output variables, types of DC analysis.

TRANSIENT ANALYSIS **-** Capacitors & Inductors, modeling of transient sources, transient Response.

AC CIRCUIT ANALYSIS: AC output variables AC sources & analysis.

UNIT VI : SPICE COMMANDS & DEVICES SIMULATION : Advanced commands, modeling and analysis of diode, BJT & FET

TEXT BOOK :

1) Object Oriented Programming with C++ -E. Balaguruswamy, Tata Mc-Graw Hill publishing Co.Ltd., New Delhi,1995.

REFERENCE BOOKS :

1) Object Oriented Programming in Turbo C++ Rober Lofore, Galgretia Publications Pvt.Ltd., New Delhi,1995
2) The C++ Programming Language (Third Edition) - Bjarne Stroustrup Pub.Co.,New York,1995 (Addison Wesley)
3) C++ Primer - Lipman Stanley B., (Second Edition) New York, Addison Wesely Pub. Company,1995
4) SPICE FOR CIRCUITS AND ELECTRONICS USING PSPICE Muhammad H. Rashid. (PHI).

4 IE 03/4 XT 03 / 4 XN 03 / 4 BM 03 NETWORK ANALYSIS

SECTION-A

Unit I : a] Terminal Element Relationships: V-I relationship for Inductance and Capacitance- Constant Flux Linkage Theorem and Constant Charge Theorem- v-i relationship for Independent Voltage and Current Sources - v-i relationship for dependent voltage and current sources- Source Functions: unit impulse, unit step, unit ramp and inter relationship, sinusoidal input ,generalized exponential input.

b] Basic Nodal and mesh Analysis: Introduction, Nodal analysis, the super node, mesh analysis, the super mesh, nodal vs mesh analysis

Unit II : Network Theorems : Linearity and superposition, source transformations, Thevinin's theorem , Norton's theorem, Maximum power transfer theorem, Delta-wye transformations Reciprocity theorem, Milliaman's theorem, Substitution theorem, Compensation theorem, Tellegen's theorems

Unit III : Time Domain Analysis of Circuits: Linear Differential Equations for Series RC, Parallel RC, Series RL, Parallel RL, Series RLC, Parallel RLC and Coupled Circuits-Complete Solution for step/impulse/sinusoid voltage/current inputs-Natural Response-Transient Response-Time Constant-Rise and Fall times-Concept of d.c steady state and sinusoidal steady state-Frequency Response of simple circuits from steady state solution-Solution of two mesh circuits by differential equation method-Determination of initial conditions.

SECTION-B

Unit IV : a] Review of Laplace Transforms: Laplace Transform-Transform Pairs-Gate Functions-Shifting Theorem-Solution of Differential Equations by Laplace Transforms-Initial and Final Value Theorems-Laplace Transforms of periodic signals-Inversion of transforms by partial fractions-Convolution

Theorem and Convolution Integral. *(Review to be done by students. No class hour will be spent for this review.)*

b] Transformation of a Circuit into s-domain: Transformed equivalent of inductance, capacitance and mutual inductance -Impedance and admittance in the transform domain - Node Analysis and Mesh Analysis of the transformed circuit - Nodal Admittance Matrix and Mesh Impedance Matrix in the s-domain - Solution of transformed circuits including mutually coupled circuits-Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots,

Unit V : a] Sinusoidal Steady State analysis: Introduction, characteristics of sinusoids, forced response to sinusoidal functions, the complex forcing function, The phasor, phasor relationships for R L C, impedance and admittance , sinusoidal steady state analysis with phasors.

b] Fourier Series: Fourier Series representation of non-sinusoidal periodic waveforms - Fourier Coefficients-Determination of Coefficients-Waveform Symmetry-Exponential Fourier Series-Discrete Amplitude and Phase Spectra-Steady State Solution of Circuits with non-sinusoidal periodic inputs by Fourier Series

Unit VI : Two Port Networks: two port networks-characterizations in terms of impedance, admittance, hybrid and transmission parameters-inter relationships among parameter sets-Reciprocity Theorem-Interconnection of Two port networks: Series, Parallel and Cascade - Network Functions-Pole Zero plots and steady state response from pole-zero plots.

Books Recommended :-

1) Engineering Circuit Analysis, 6/e By Hayt & Kemmerly, TataMcgraw Hill, 2004
2) Network Analysis, By M.E. Van Valkenberg, PHI, 2005
3) Electrical Linear Circuits – David Bell, Oxford University Press, 2008
4) Linear Circuit Analysis, 2/e – De Carlo and Lin, Oxford University Press, 2009
5) Network Analysis, P. Ramesh babu, SCITECH Publications, Chennai, 2009
6) Circuit and Network Analysis By Sudhakar Shyammohan, Tata Mc Graw Hill, 2005
7) Circuits & Networks – Analysis, Design & Synthesis by M.S.Sukhija, T.K.Nagasarkar, Oxford University Press, 2010.

4 IE 04 ADVANCE SENSORS AND TRANSMITTERS

Unit I: Intelligent sensor: Introduction, Features , desirable on chip signal processing, present status.

MEMS Sensor: Introduction, MEMS sensor-Design challenges, MEMS sensor-generation & development.

Unit II: PH & Conductivity sensors: PH scale and standard principal of pH measurement ,different types of reference & measuring electrode .Principal of conductivity measurement, conductivity cells & bridges

Unit III: Digital transducer: Digital encoder, disc type, incremental shaft, linear displacement transducer, moir, fringe techniques, digital tachometer , digital torque sensor (inductive pickup, photo electric pickup, proximities sensor)

Unit IV: Density measurement: Introduction, various scale, hydrometer type, vibrating densitometer, gas Densitometer, ultrasonic sludge densitometer, centrifugal gas density sensor.

Viscosity measurement: Definition, capillary type, cone plate, rotameter type

Unit V: Vibration: Vibration measurement , accelerometer , sismic type, jerk meter.

Biosensor Technology: Introduction, Nanosensor: Nanotechnology Introduction, nanosensor development, future of nanosensor.

Unit VI : Transmitters: Buyancy ,differential pressure, temoerature, electro hydraulics,2 wire transmitters,

Converters:Resistance to current,voltage to current,pneumatic to electrical & electrical to pneumatic

Positioners : necessity, types and effect on performance of control valve, Actuators: pneumatic, hydraulic, electrical, electro-pneumatic, electro-hydraulic.

Text Books:

1. Sensors and Transducer by Dr. A.D. Shaligram First Edition
2. Sensors and Transducer by D. Pathanbis

Ref. Book:

1. Electronics Instrumentation and Measurement by A.K. Sawhney
2. Process Control By B.G. Liptak

4 IE 05 TELEMETRY AND TELECONTROL

Unit I : Introduction to communication systems: Basic communication systems, interface & distortion, signal characterization in time domain and frequency domain .

Unit II : Modulation Techniques: Different kinds of SSB & FM Modulators & demodulators.

Unit III: Antenna- Principle of radiation, isotropic, radiator, resonant antenna, non resonant antenna, half wave dipole antenna, folded dipole, parasitic reflector, parasitic director, antenna arrays, yagi-uda antenna, antenna power gain, beam width, polarization, radiation resistance

Unit IV: Digital communication : Sampling theorem, Nyquist frequency, Sampling techniques, & signal reconstruction, pulse modulation-(PCM) principle of delta modulation ASK, FSK, PSK coding formats.

Unit V: Multiple access Schemes: TDMA, FDMA CDMA, spared spectrum communication, D.S. spread spectrum, Frequency hoping spread spectrum, comparison

Unit VI: Smart transmitters, typical telemetry & telecontrol schemes for industrial application telemetry errors caused by noise, telemetry & carrier communication systems

TEXT BOOKS:

1) Electronic Communication D Roddy and Coolen

2) Electronics Communication System G. Kennedy TMH

3) Modern Digital and Analog Communication System B.P. Lathi, Oxford University Press, New Delhi.

Ref. Books

1. Digital Communication by K. Sam Shanmugam

2. Digital Communication by J.G. Proakis, Fourth edition.

4IE06 COMPUTER PROGRAMMING AND APPLICATIONS-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE02.

4IE07/4 XT 07/4 XN 07/4 BM 08 NETWORK ANALYSIS-LAB.

Any TEN experiments based on contents of 4 IE 03/4 XT 03/ 4XN 03/ 4BM 03 NETWORK ANALYSIS

4IE08 TELEMETRY AND TELECONTROL-LAB.

Students are expected to perform minimum 8 experiments based on Syllabus of 4IE05.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 *to* ES-4 *i.e. at the end of this syllabus.

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SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
COMPUTER SCIENCE & ENGINEERING /
COMPUTER ENGINEERING
SEMESTER PATTERN
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3KS01/3KE01 MATHEMATICS – III

SECTION-A

UNIT-I: **Ordinary differential equations**:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: **Laplace transforms**:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) **Difference equation:-** solution of difference equations of first order Solution of difference equations of higher order with constant co-efficients b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) **Fourier transforms**:- Definition, standard forms, inverse Fourier trnasforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) **Partial differential equation** of first order of following form:- (i) f (p,q)=0; (ii) f (p,q,z)=0; (iii) f (x,p)=g (y,q); (iv) Pp+Qq=R (Lagranges Form); (v) Z=px+qy+f(p,q) (Clairaut form)

UNIT-V: **Complex Analysis** :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation),singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: **Vector calculus**:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics by P.N.Wartikar and J.N.Wartikar
2) A Text Book of Differential Calculas by Gorakh Prasad.
3) Engg. Mathematics by Chandrika prasad.
4) Advancing Engg. Mathematics by E.K.Kreyzig.
5) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
6) Higher Engg. Mathematics by B.S.Grewal.
7) Control System by Gopal and Nagrath.
8) Integral transforms by Goyal & Gupta.

3KS 02/3KE02 PROGRAMMING METHODOLOGY

Objectives:

- Study of the basic concepts of Java such as operators, classes, objects, inheritance, packages and exception handling.
- Study of concepts like enumerations, generics, logging, API, assertions, Applets, AWT.
- Preparing the students to learn Object Oriented Programming Methodology.

SECTION A

Unit I: **Introduction to Object Oriented Programming**: Introduction, Need of OOP, Principles of Object-Oriented Languages, Procedural Language Vs OOP, Application of OOP, Java Virtual Machine, Java features, Program Structures. **Java Programming Constructs:** Variables, Primitive data types, Identifier, Literals, Operators, Expressions, Precedence Rules and Associativity, Primitive Type Conversion and Casting, Flow of Control.

Unit II: **Classes and Objects:** Classes, Objects, Creating Objects, Methods, Constructors, Cleaning up Unused Objects, Class Variable and Methods, this keyword, Arrays, Command Line Arguments.

Unit III: **Inheritance:** Inheritance vs. Aggregation, Method Overriding, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface, Packages, java.lang package, Enum type.

SECTION B

Unit IV: **Exception:** Introduction, Exception handling Techniques, User-defind exception, Exception Encapsulation and Enrichment. **Input/Output:** The java.io.file Class, Reading and Writing data, Randomly Accessing a file, Reading and Writing Files using I/O Package.

Unit V: **Applets:** Introduction, Applet Class, Applet structure, Applet Life cycle, Common Methods used in displaying the output, paint (), update () and repaint (), More about applet tag, get Document Base () and get Code Base () methods, Applet Context Interface, Audio clip, Graphic Class, Color, Font, Font Metrics.

Unit VI: **Event Handling:** Introduction, Event delegation Model, java.awt.event Description, Sources of events, Event Listeners, Adapter classes, Inner Classes. **Abstract Window Toolkit:** Introduction, Components and Containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Textfield and Textarea, Container Class, Layouts, Menu, Scrollbar.

Text Book:

Sachin Malhotra and Saurabh Choudhary: Programming in Java, Oxford University Press 2010.

Reference Books:

1. Herbert Schildt: Java Complete References (McGraw Hill)
2. E. Balagurusamy: Programming with Java (McGraw Hill)
3. Khalid Mughal: A Programmer's Guide to Java Certification, 3rd Edition (Pearson)
4. Liang: A text Book of Java Programming, (PHI)
5. Sharnam Shah and Vaishali Shah: Core Java for Beginners,(SPD),2010.

3KS 03/3KE03 ELECTRONIC DEVICES AND CIRCUITS

Objectives:

- Study of the basic electronic device Semiconductor diode and zener diode and its applications.
- Study of electronic device Bipolar Junction Transistors and its applications.
- Study of electronic device Field Effect Transistors and its applications.

· Study of Optoelectronic devices.

SECTION-A

Unit I: pn-Junction Diode, Characteristics and Parameters, Diode Approximation, DC load line analysis, Temperature effects, Diode AC models, Zener diodes, Half- Wave Rectifications, Full-Wave Rectifications, Half-Wave Rectifier Power Supply, Full-Wave Rectifier Power Supply, RC and AC Power Supply Filters.

Unit II: BJT operation, BJT Voltages and Currents, BJT Amplification: Current and Voltage, BJT Switching, Common-Base Characteristics, Common-Emitter Characteristics, Common-Collector Characteristics, Transistor testing.

Unit III: DC Load Line and Bias Point, Base Bias, Collector-to-Base Bias, Voltage-Divider Bias, Comparison of Basic Bias Circuits, Troubleshooting BJT Bias Circuits, Bias Circuit Design.

SECTION-B

Unit IV: Junction Field Effect Transistors, n-Channel and p-Channel JFET, JFET Characteristics, JFET Data Sheets and Parameters, FET Amplifications and Switching, MOSFETs: Enhancement MOSFET, Depletion _Enhancement MOSFET, VMOSFET, Comparision of p-Channel and p-Channel FETs.

Unit V: BJT Phase Shift Oscillators, BJT Colpitts Oscillator, BJT Hartley Oscillator, BJT Wein Bridge Oscillator, Oscillator Frequency stabilization: Frequency Stability, Piezoelectric Crystals, Crystal Equivalent Circuit, Crystals Control of Oscillators.

Unit VI: Optoelectronic Devices: Light Units, Light-Emitting Diodes, Seven-Segment Displays, Photoconductive Cells, Photodiodes and Solar Cells, Phototransistors, Optocouplers, Phtomultipler Tube, Laser Diode.

Text Book:

David A. Bell: Electronic Devices and Circuits, Fifth Edition, Oxford University Press.

Reference Books:

1. Malvino: Principles of Electronics, TMH.
2. Millman & Halkies: Electronic Devices & Circuits, McGraw Hill.
3. Millman & Halkies: Integrated Electronics, McGraw Hill.
4. Millman: Microelectronic, McGraw Hill.
5. Roberts and Sedra: SPICE, Second Edition, Oxford University Press.
6. Sedra and Smith: Microelectronic Circuits, Oxford University Press.

3KS 04/3KE04 DISCRETE STRUCTURE

Objectives:

· Learn basic terminology, formal logic, proofs, sets, relations, functions, recursion
· Use formal logic proof and logical reasoning to solve problems
· Relate the ideas of mathematical induction to recursion and recursively defined structures
· Learning graphs, trees and related algorithms
· Relate interpret and apply these concepts to various areas of Computer Science

SECTION A

UNIT I: **Mathematical Logic:** Statements & Notation, Connectives, Equivalence Formula, Duality Law, Tautological Implication, Normal forms, Parenthesized Infix notation and Polish Notations.

UNIT II: **Theory of inference:** The theory of inference for the statement calculus, Validity using truth tables, Predicate calculus, Inference theory of the Predicate Calculus.

UNIT III: **Set Theory:** Basic concepts, Venn Diagrams, Representation of Discrete Structure, Relation and ordering, Partial Ordering, Functions, Recursions, Sets and predicates.

SECTION B

UNIT IV: **Algebraic Structures:** Semi-groups and Monoids, Product & Quotients of semi-groups, Polish expression & their compilation, Groups, Product and Quotients of Groups.

UNIT V: **Lattice & Boolean Algebra:** Lattices, partially ordered sets, Boolean algebra, Functions on Boolean Algebra, Boolean Functions as Boolean Polynomials, Minimization of Boolean Functions.

UNITVI: **Graph Theory:** Basic concepts, Paths, Reachability & connectedness, Matrix representation of graphs, Trees: tree searching, Undirected trees, Minimal spanning trees.

Text Book:

J.P.Trembley,R.Manohar:"Discrete Mathematical Structures with application to Computer Science" 1988(MCG)

Reference Books:

1. C.L.Liu : "Combinational Mathematies" Mc Graw Hill, 1988
2 Stanant "Discrete Structure" Prentice Hall.
3. C.L.Liu "Element of Discrete Mathematics" Second Edition McGraw Hill, 1987
4. Norman L.Biggs "Discrete Mathematics" Second Edition,Oxford

University Press, Indian Edition.
5. N. Chandrasekaran & M. Umaparvathi, "Discrete Mathematics" PHI (EEE) 2010.
6. Purna Chandra Biswal, "Discrete Mathematics & Graph Theory" Second Edition, PHI (EEE)2009.
7. Chakraborty and Sarkar," Discrete Mathematics" Oxford University Press, Indian Edition,2011.

3KS 05 / 3KE05 COMPUTER ORGANIZATION

Objectives:

- To understand the relationship between instruction set architecture, micro architecture, and system architecture and their roles in the development of the computer.
- Be aware of the various classes of instruction: data movement, arithmetic, logical and flow control.
- Explain how interrupts are used to implement I/O control and data transfers.
- Understand how a CPU's control unit interprets a machine –level instructions.
- Identify various types of buses in Computer systems.
- Understand memory hierarchy.
- Understand various peripheral devices.

SECTION-A

Unit-I: **Basic Structure of Computer:** Hardware & Software, Addressing Methods, Program Sequencing, Concept of Memory Locations & Address, Main Memory Operation, Instructions & Instruction Sequencing, Addressing Modes, Basic I/O Operations, Stacks, Queues & Subroutines.

Unit-II: **Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Consideration, Microprogrammed Control, Microinstructions, Microprogram Sequencing, Microinstruction Pre-fetching, Emulation.

Unit-III: **I/O Organization:** Accessing I/O Devices, Interrupts, Direct Memory Access, Bus arbitration, I/O Hardware, Processor Bus and Interfacing Circuits, Standard I/O Interfaces, SCSI Bus, Backplane Bus Standard.

SECTION-B

Unit-IV: **Memory Unit:** Basic Concepts, Semiconductor RAM Memories, Internal Organization, Static & Dynamic RAMs, ROMs, Speed, Size & Cost Considerations. Cache Memories: Performance considerations. Virtual Memories, Address Translation, Memory Management Requirements.

Unit-V: **Arithmetic:** Number representation, Design of Fast Adders, Signed Addition and Subtraction. Multiplication of Positive numbers, Booth's Algorithm, Integer Division, Floating-Point Numbers and related operations.

Unit-VI: **Computer Peripherals:** Input-Output Devices like Video displays, Video terminals, Graphics input devices, Printers. Online storage devices: Magnetic disks, Magnetic tape, Systems, CD-ROM systems. Communication devices: Modems.

Text-Book:

V.Carl Hamacher & S. Zaky: Computer Organization, Fourth Edition, McGraw-Hill (ISE).

References:

1. Stallings. W: Computer Organization & Arcitecture, Fifth Edition, Pearson Education.
2. Tenanbaum A.S: Structured Computer Organization, Fifth Edition, Pearson Education.
3. Hayes J.P: Computer Architecture & Organization, Fourth Edition, McGraw- Hill.
4. M. Mano & Kime Logie: Computer Design Fundamentals, Second Edition, Pearson Education.

3KS 06 / 3KE06 Programming Methodology Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3KS 07 / 3KE07 Electronic Devices & Circuits Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

3 KS 08 / 3 KE 08 COMPUTER LABORATORY I [WEB TECHNOLOGY]

Unit I: **HTML**: HTML Coding, Basic Web Graphics, Web Page Design & Site Building, Adding Multimedia to the Web.

Unit II: **Paint Shop Pro/Photoshop**: Photoshop components, working with Photoshop, Image Basics, File Formats, color Palette, Layers, Creating New Images, Brushes, Grids & Gides, Scaling & Positioning Images, Moving & Merging Layers, Tool Palette, Screen Capturing, Grey styling, Animation.

Unit III: **Image Handling**: Scanning Images, Adding Text to the Images, Designing Icons, Creating Background Images, Color Models, Color Calibration, Creating Gradients, Oil Paint Effect.

Unit IV: **Multimedia**: Creating Clippings, Animation with Sound Effects, Adding Audio or Video, Windows Media Player Active x control, Agent Control, Embedding VRML in a web Page, Real Player Active x Control.

Unit V: **Applications**: Flash, Working with Layers, Working with Movies, The Drawing Tools, Color Selection, Symbols, Flash Buttons, Flash Menu Smart Clip, Interactivity with Action Script, Frame Actions and the Timeline, Exporting Animation, Applications in Flash.

TEXT BOOK:

1. Meenakshi G. M., "Web Graphics", Scitech Publications (India) Pvt. Ltd.,2007.

REFERENCE BOOKS:

1. Joel Sklar, "Textbook of Web Design", Cengage Learning.
2. James L. Mohler & Jon M. Duff, "Designing Interctive Web Sites", Cengage Learning.
3. Dr. Raja Subramanian, "Creating Web Sites in Engineering", University Science Press (An Imprint of Laxmi Publication Pvt. Ltd.).
4. Uttam K. Roy, "Web Technologies", Oxford University Press.

Minimum eight experiments/programming assignments must be completed based on the above syllabus covering each of the units.

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SEMESTER : FOURTH

4KS01/ 4KE01 DATA STRUCTURES

OBJECTIVES:

- Study the representation and use of primitive data types and built in data structures.
- Study how the data structures are allocated and used in memory.
- Study common applications of each of the data structures.
- Implement the user defined data structures in a high level language

SECTION A

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms. 08Hrs

Unit-II: Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multi-

demensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices. 08Hrs

Unit-III: Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists. 08Hrs

SECTION B

Unit-IV: Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues. 08Hrs

Unit-V: Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort. Path length & Huffnan's algorithm. General trees. 08Hrs

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Radix sort. 08Hrs

Text Book:

Seymour Lipschutz: Data Structures with C, Schaum's Outline Series, Mc Graw-Hill, International Editions.

References:

1. Forouzan, Gilberg, Mahalle, Jogalekar: Data Structures and Algorithms, CENGAGE Learning.
2. Reema Thareja: Data Structures using C, Oxford University Press, 2011.
3. Arpita Gopal: Magnifying Data structures, PHI(EEE), 2010.
4. Ellis Horowitz, Sartaj Sahni: Fundamentals of Data Structures, CBS Publications.
5. Trembley, Sorenson: An Introduction to Data Structures with Applications, McGraw Hill.
6. Standish: Data Structures in Java, Pearson Education.

4KS02/ 4KE02 ANALOG & DIGITAL ICS

AIM To understand the functions of various digital and analog ICs and their applications in the design of electronic circuits.

OBJECTIVES :

- To get the knowledge about the characteristics and operation of

different analog ICs.

- To study the applications of the above ICs in the design of electronic circuits.
- To get basics knowledge about digital ICs and digital systems.
- To study the design of combinational circuits and sequential circuits.

Unit-I : **OPERATIONAL AMPLIFIERS :** Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting and non-inverting amplifiers, adder/ subtractor, integrator, differentiator, Schmitt Trigger, analog multiplier.

Unit-II : **TIMERS & PHASE LOCKED LOOP :**

Timers: Block schematic of timer IC 555, Application of timer 555 as astable, monostable, bistable multivibrator, Delayed timer, Saw tooth generators. Phase Locked Loops: Operation of phase lock loop system, transfer characteristics, lock range, capture range, study of PLL IC-LM 565 and its application as AM detector, FM detector and Frequency Translator.

Unit-III. **NUMBER SYSTEMS :**

Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r s and (r-1)s Complements, Subtraction using 1s and 2s. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes.

Unit-IV : **BOOLEAN FUNCTIONS USING GATES :**

Boolean theorems, Minterm and maxterm representation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

Unit-V : **COMBINATIONAL CIRCUITS :**

Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractor, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean Expression Implementation using these ICs.

Unit-VI : **SEQUENTIAL CIRCUITS :**

Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC Specifications.

Text Books:

1. Ramakant A.Gayakwad, „OP-AMP and Linear ICs, Prentice Hall, 1994.
2. M.Morris Mano "Digital Design" (2/e) (PHI).

Reference Books :

1. R F. Coughlin;F.F.Driscoll: Operational Amplifiers & Linear Integrated Circuits, Pearson
2. Sedra & Smith : Microelectronics Circuits, 5e, Oxford University Press
3. Jain R.P. "Modern Digital Electronics" (TMH).
4. Mano M. & Kime "Logic & Computer Design Fundamentals" (2/e) (Pearson Education).

4KS03/ 4KE03 OBJECT ORIENTED PROGRAMMING

SECTION A

Unit I: **Objects & Classes in C++:** Declaring & using classes, Constructors, Objects as function arguments, Copy Constructors, Static class data, Arrays of Objects, C++ String class.

Unit II: **Operator Overloading:** Overloading Unary & Binary Operators, Data Conversion, Pitfalls of Operator Overloading, Pointers & Arrays, Pointers & Functions, New & Delete Operators, Pointers for Objects.

Unit III: **Inheritance in C++:** Derived Class & Base Class, Derived class Constructors, Function overloading, Class hierarchies, Public & Private Inheritance, Multiple Inheritance, Containership: Classes within Classes.

SECTION B

Unit IV: **Virtual Function Concepts**: Abstract Classes & Pure Virtual Functions, Virtual Base classes, Friend functions, Static Functions, Assignment & copy initialization, the this pointer, Dynamic type information.

Unit V: **Streams & Files in C++:** Stream Classes, stream errors, disk file I/O with streams, File Pointers, Error handling in file I/O, File I/O with member functions, Overloading the extractions & Insertions operator, Memory as a Stream Object, Command Line Arguments, Multifile Programs.

Unit VI: Function Template, Class template, Exception Syntax, Multiple exceptions, Exception with Arguments, Introduction to Standard Template Library, Algorithms, Sequential Containers, Iterates, Specialized iterates, associative containers, Function objects.

Text Book:

Robert Lafore: Object Oriented Programming in C++, Galgotia Publication.

Reference Books:

1. Herbert Schildt: C++: Complete Refernce,TMH.
2. Bjarne Stroustrupe: C++ Programming Language, Addision Wesley.
3. Venugopal: Mastering C++, TMH.
4. Lipmann: C++ Primer, Addision Wesley.
5. Sourav Sahay: Object Oriented Programming with C++, Oxford University Press.

4KS04/ 4KE04 ASSEMBLY LANGUAGE PROGRAMMING

SECTION-A (8 hrs/unit)

Unit I: 8086 architecture and pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation.IP & Data registers, Pointer, Index registers. Memory addresses generation.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming : Integer instructions and computations: Data transfer instructions, Arithmetic instructions and their use in 8086 programming.

Unit III: 8086 programming: logical instructions. Shift and rotate instructions and their use in 8086 programming. 8086 flag register and Flag control instructions, compare instruction, control flow and jump instructions, Loops & loop handling instructions. 8086 programming using these instructions.

SECTION B

Unit IV: The 8086 stack segment and stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Parameter passing, Concept of Macros, Status saving on stack. Concept of recursion at assembly program level. 8086 Programming using subroutines, recursion and macros.

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. 8086 I/O programming using 8255.

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts. Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation.
8086 Interrupt-driven programming using 8259.

TEXT BOOKS:

1. W. A. Triebel & Avatar Singh: The 8088/8086 Microprocessors (4e) (PHI /Pearson Education)
2. Liu & Gibson: The 8088/8086 Microprocessor (2/e) (PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
3. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall .

4KS05/ 4KE05 THEORY OF COMPUTATION

SECTION A

Unit I: Alphabet, Language, Operations, Finite State Machine, Definitions, Finite Automation Model, Acceptance of Strings and Languages. Non Deterministic Finite Automata, Deterministic Finite Automata, Equivalence between NFA and DFA. Conversion of NFA into DFA, Equivalence between two FSM's, Moore and Mealy Machines.

Unit II: Regular Sets, Regular Expressions, Identity Rules. Manipulation of Regular Expressions, Equivalence between RE and FA. Inter Conversion, Pumping Lemma, Closure Properties of Regular Sets (proofs not required), Regular Grammars, Right Linear and Left Linear Grammars, Equivalence between Regular Linear Grammar and F A inter conversion between RE and RG.

Unit III: Context Free Grammar, Derivation trees, Chomsky Normal Form, Greibach Normal Form, Push down automata, Definition, Model, Acceptance of CFL, Equivalence of CFL and PDA, Interconversion, Enumeration of properties of CFL (proofs omitted).

SECTION B

Unit IV : Turing Machine, Definition, Model, Design of TM, Computable Functions, Recursive enumerable language, Church's hypothesis, Counter machine, Types of TM's.

Unit V: Chomsky hierarchy of languages, Linear bounded automata and Context Sensitive Language, Introduction of DCFL and DPDA, Decidability of problems.

Unit VI: Undecidability: Properties of recursive & non-recursive enumerable languages, Universal Turing Machine, Post-correspondence problem, Introduction to recursive function theory.

Text books:

1. Hopcraft H.E. & Ullman J: Introduction to Automata Theory, Languages and Computation,
2. Peter Linz: An Introduction to Formal Languages and Automata (Chapter 1 to 12 except 6.3 & 7.4),

Reference Books:

1. Rajendra Kumar: Theory of Automata, Languages & Computation, TMH, 2010.
2. Rajesh K. Shukla: Theory of Computation, CENGAGE Learning, 2009.
3. K V N Sunitha and N Kalyani: Formal Languages and Automata Theory, Mc Graw Hill,2010.
4. John C. Martin: Introduction to Languages and the Theory of Automata.
5. Lewis H.P. and Papadimition C.H.: Elements of Theory of Computation.
6. Mishra & Chandrashekharan: Theory of Computation.
7. C.K.Nagpal: Formal Languages and Automata Theory, Oxford University Press,2011.

4KS06/4KE06 Data Structures Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS07/4KE07 Analog & Digital IC's Lab. : Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4KS08/4KE08 Object Oriented Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4KS09/4KE09 Assembly Language Programming Lab. : Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos.* ES-1 to ES-4 *i.e. at the end of this syllabus.

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SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
BACHELOR OF ENGINEERING
INFORMATION TECHNOLOGY
SEMESTER PATTER
(CREDIT GRADE SYSTEM)
SEMESTER : THIRD

3 IT 01/3 KS 01 / 3 KE 01 MATHEMATICS-III

SECTION-A

UNIT-I: Ordinary differential equations:- Complete solution, Operator D, Rules for finding complementary function, the inverse operator, Rules for finding the particular integral, Method of variations of parameters, Cauchy's and Legendre's linear differential equations.

UNIT-II: Laplace transforms:- definition, standard forms, properties of Laplace transform, inverse Laplace transform, initial and final value theorem, convolution theorem, Laplace transform of impulse function, Unit step function, Laplace transforms of periodic function Solution of Linear differential equations, Simultaneous differential equation by Laplace transform method.

UNIT-III: a) Difference equation:- solution of difference equations of first order Solution of difference equations of higher order with constant coefficients,

b) Z-transform:- Definition, standard forms, Z-transform of impulse function, Unit step functions, Properties of Z transforms (linearity, shifting, multiplication by k, change of scale), initial and final values, inverse Z-transforms (by direct division and partial fraction), Solution of difference equation by Z-transforms.

SECTION-B

UNIT-IV: a) Fourier transforms:- Definition, standard forms, inverse Fourier transforms, properties of Fourier transforms, convolution theorem, Fourier sine and Fourier cosine transforms and integrals.

b) Partial differential equation of first order of following form:- (i) f (p, q)=0; (ii)f (p, q, z)=0; (iii) f (x, p)=g (y, q); (iv) Pp + Qq = R (Lagranges Form); (v) Z = px+qy+f (p,q) (Clairaut form)

UNIT-V: Complex Analysis :- Functions of complex variables, Analytic function, Cauchy-Reimann conditions, Harmonic function, Harmonic conjugate functions, Milne's method conformal mappings (translation, rotation, magnification and bilinear

transformation),singular points, expansion of function in Taylor's and Laurent's series.

UNIT –VI: Vector calculus:- Scalar and vector point functions, Differentiation of vectors, Curves in space, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point function and their physical meaning, expansion formulae (with out proof), line, surface, volume integrals, irrotational and solenoidal vetor fields.

BOOKS RECOMMENDED:-

1) Elements of Applied Mathematics, Vol. II by P.N.Wartikar and J.N.Wartikar
2) Applied Mathematics, Vol. III, J.N. Wartikar and P.N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.
3) Advancing Engg. Mathematics by E.K.Kreyzig.
4) A Text Book of Applied Mathematics by P.N.Wartikar and J.N.Wartikar.
5) Higher Engg. Mathematics by B.S.Grewal.
6) Control System by Gopal and Nagrath.
7) Integral Transforms by Goyal & Gupta.

3 IT 02 PROGRAMMING METHODOLOGY

(8 Hrs. / Unit)

Unit I: Introduction to Computer and Languages, OOPS and Software development: Software Engineering and SDLC. Java Basics: Program Components, Compilation cycle. Introduction to Applet and Application, Data types and Variables

UnitII : Operators: Arithmetic operators, relational operators, Assignment operators. Control statement: Selection statement: if, nested if, switch statement. Repetition statements: while, do-while, for, nested loops. Introduction to Math class. Arrays: Basics, One dimensional, Multidimensional, Array of Objects, Passing array to method.

Unit III: Introducing classes, class fundamentals, declaring objects, methods, class data,& instance data, constructor, this keyword, access control, Introduction to String and String Buffer classes.

Unit IV: Event handling: Event handling mechanism, Delegation Event model, Event, Event Listener: Action Listener, mouse Listener, mouse Motion Listener, window Listener , Introduction to AWT, AWT classes: Button, Text Field, Label. Working with Graphics, Working with colors. AWT controls Fundamentals: Adding and removing controls, responding to control. Using

delegation Event model: Handling mouse events

Unit V: Applet class and its methods, Adapter classes, Inheritance, Polymorphism, Abstract classes and Interface, Packages. Multithreaded Programming: The java thread model, Creating a thread, Creating multiple threads.

Unit VI: Java File I/O: File, File Dialog object, Low and High level File I/O, the Stream classes, Byte Stream: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, Print Writer, Exception handling: Exception types, uncaught Exceptions using try and catch, throw, throws, finally. GUI objects programming: Frame class, menus and other GUI objects.

TEXT BOOK:

1) Herbert Schildt : Java Complete References(McGraw Hill)

REFFERENCE BOOKS :

1) C.Thomas Wu: An Introduction to OOP with Java(McGraw Hill)
2) E. Balaguruswami : Programming with JAVA (4th edition), McGraw Hill
3) Sachin Malhotra : Programming in JAVA, Oxford Press.

3 IT 03 DISCRETE STRUCTURE

(7 Hrs. / Unit)

UNIT I : Mathematical Logic : Statements & Notation , Connectives , Normal forms , The Theory of Inference for the statement calculus , Predicate calculus , The Theory of the Predicate Calculus.

UNIT II: Set Theory : Basic concepts of Set Theory , Representation of Discrete Structure, Relation and ordering, Functions , Recursion.

UNIT III : Algebraic Structures : Algebraic Systems , Semi groups and Monoids , Grammars and Languages, Polish expression & their compilation , Groups , Semi groups.

UNIT IV : Lattice & Boolean Algebra : Lattices as Partially ordered sets, Boolean Algebra, Boolean Functions, Representation of Boolean Functions , Minimization of Boolean Functions.

UNIT V: Graph Theory : Basic concepts of Graph Theory , Paths , reachability & connectedness, Matrix representation of graphs , Storage Representation and Manipulation of Graphs.Trees :Tree Traversal , Minimal spanning trees. PERT.

UNIT VI: Compultability theory :Finite state machines , Finite state acceptors and regular grammers. Turning, machines and partial recursive functions.

TEXT BOOK :

1. J.P.Trembley, R.Manohar :"Discrete Mathematical Structures with Application to Computer Science" 1988 (Tata McGraw Hill)

REFERENCE BOOKS:-

1. S.K. Chakraborty & B.K.Sarkar ;"Discrete Mathematics" OXFORD.
2 Swapan Kumar Sarkar: "A Text Book of Discrete mathematics" (S.CHAND).
3. Bernard Kolman,Robert C.Busby, Sharon Ross: "Discrete Mathematical Structures" Third Edition PHI

3 IT 04 ELECTRONICS DEVICES AND CIRCUITS

UNIT I: Semiconductor Devices: PN Junction Diode, Zener diode BJT & FET transistor. Rectifying circuits & DC power supplies: HWR, FWR, BR, and Comparison. Inductor and capacitor Filter circuits for D.C. Power supplies.

UNIT II: Transistor biasing: The CE amplifier (Simple analysis), Operating point, Stability Factor of self (Potential divider) bias Definition of Hybrid parameters. RC Oscillator: phase shift oscillator and Wein – Bridge oscillator, Transistor as a switch.

UNIT III: Opto- Electronics Devices: fundamental of light, photoconductive sensors, photodiodes, phototransistors their principle of operation & application. Opto – couplers. Introduction to P-spice: Circuit element sources in PSPICE, Modeling analysis of diode, BJT & Op-Amp.

UNIT IV: Operational Amplifier: Block diagram of op-amp, Differential amplifier, transfer characteristics, CMMR improvement, constant current source, dc level shifting, study of IC uA741. Inverting & non-inverting amplifier,

UNIT V: Linear & non-linear application of Op-Amp: voltage follower, Integrator, Differentiator, voltage to current converter, sinusoidal RC Oscillator. Comparator, Astable Monostable, & Bistable Multivibrator. 3 pin IC Voltage regulator 78XX, 79XX.

UNIT VI: Timer: block diagram of IC 555, application of Timer IC 555 as astable, monostable multivibrator, phase lock loops: operations of phase lock loop system, transfer characteristics, lock range capture range.

Text Books

1. N.N.Bhargava, D.C.Kulshreshtha, S.C.Gupta: Basic Electronics & Linear circuits, (TTTI)

2. M.H. Rasid: SPICE for circuits & electronics Using PSPICE (PHI)
3. Gayakwad R.A.: Op-Amps & Linear Integrated circuits (PHI)

Reference Books

1. Malvino: Principals of Electronics(TMH)
2. Millman & Halkins: Electronics Devices & Circuits (MC Graw Hill)
3. K.R.Botkar: Integrated circuits (Khanna P
4. D.Roy Choudhury & Shail Jain: Linear Integrated circuits (NAIL)

3 IT 05 ASSEMBLY LANGUAGE PROGRAMMING

Unit I: Microprocessor 8086 architecture-BIU and EU, pin configuration, Software model of 8086 microprocessor. Memory addresses space and data organization. Data types. Segment registers, memory segmentation. IP & Data registers, Pointer, Index registers. Memory addresses generation, Maximum and Minimum Modes.

Unit II: 8086 Instruction set overview, addressing modes. 8086 instruction formats. 8086 programming: Integer instructions and computations: Data transfer instructions, Arithmetic instructions, and logical instructions. Shift and rotate instructions and their use in 8086 programming

Unit III: 8086 programming: 8086 flag register and Flag control instructions control flow and jump instructions, Loops & loop handling instructions. Stack related instructions. 8086 I/O Address space. Subroutines and related instructions, Concept of Macros and their types. 8086 programming using these instructions

Unit IV: Memory system design: Address decoding techniques, static-RAM interfacing, Dynamic-RAM (DRAM): refreshing techniques, interfacing and DRAM controllers; direct memory access (DMA). Interfacing Chips- SRAM and EPROM with 8086, 8237 DMA: pin diagram, internal organization, modes of operation

Unit V: 8086 I/O: Types of input output, isolated I/O interface, input output data transfers, I/O instructions and bus cycles. Programmable Peripheral Interface 8255 PPI: pin diagram, internal organization, modes of operation. Programmable Interval Timer / Counter 8253: pin diagram, internal organization, modes of operation

Unit VI: 8086 Interrupts types, priority and instructions. Interrupt vector table, External hardware-interrupt interface signals & interrupts sequence. Software interrupts, Non-maskable interrupts. Programmable Interrupt Controller 8259: pin diagram, internal organization, modes of operation...

TEXT BOOKS:

1. Avtar Singh & Walter A. Triebel: The 8088 and 8086 Microprocessors, Programming, Interfacing, Software, Hardware, and Applications, PHI, 2003.
2. K.M Bhurchandi, "Advanced Microprocessor and Peripherals Architecture, Programming and Interfacing", Tata Mc Graw Hill , 2006.
3. Ray & Bhurchandi: Advanced Microprocessors & Peripherals (TMH).
4. Liu Gibson: Microcomputer Systems: The 8086/8088 Family-Architecture, Programming And Design , PHI)

REFERENCES:

1. Barry B. Brey : The Intel Microprocessor Architecture, Programming & Interfacing (6/e)(PHI)
2. John P Uffenbeck, "8086/8088 Families: Designing, Programming and Interfacing". Prentice Hall
3. D. V. Hall: Microprocessors and Interfacing, TMH.

3IT06 **Programming Methodology Lab.:** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 02 syllabus covering each of the units.

3IT07 **Electronics Devices & Circuits Lab. :** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 03 syllabus covering each of the units. At least two experiments must be conducted using PSPICE.

3IT08 **Assembly Language Programming Lab. :** Minimum Eight experiments/programming assignments must be completed based on the 3 IT 04 syllabus covering each of the units.

3IT09 **Computer Lab-I (Linux,Unix) Lab. :** Minimum Eight experiments/programming assignments must be completed based on Linux and /or Unix.

SEMESTER : FOURTH

4IT01 DATA STRUCTURES

Unit I: Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Subalgorithms. String processing: storing strings, character data type, string operations, word processing, and pattern matching algorithms.

Unit-II : Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sprase matrices.

Unit-III : Linked lists and their representation in memory, traversing a linked list, searching a linked list. Memory allocation & garbage collection. Insertion deletion opeartions on linked lists. Header linked lists, Two- way linked lists.

Unit-IV : Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, an application of stacks, Recursion. Tower of Hanoi problem. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.

Unit-V : Trees, Binary trees & and their representation in memory, Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Binary search trees, searching, inserting and deleting in binary trees. Heap and heapsort. Path length & Huffnan's algorithm. General trees, M-way search Trees.

Unit-VI : Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets & Topological sorting. Insertion Sort, Selection Sort. Merging & Merge-sort, Radix sort, Hashing.

Textbook :

Seymour Lipschutz : " Theory & Problems of Data Structures" Schaum's Outline series (Mc Graw-Hill) International Editions.

REFERENCES :

1. Reema Thareja : Data Structures Using C. (Oxford)
2. Ellis Horowitz, Sartaj Sahni – Fundamentals of Data Structures (CBS Publications)
3. Trembley, Sorenson:- An Introduction to Data Structures with Applications.
4. Aho Ullman : Analysis and Design of Algorithms.

5. Bhagat Singh, Naps : Introduction to Data Structures.

4IT02 COMMUNICATION ENGINEERING

Unit I AM Transmitters

Modulation, need of modulation, AM Modulation, Frequency spectrum, Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSBFC Transmitter, Generation of DSB-SC by using balanced modulators (FET & Diodes), DSB-SC Transmitter, Generation of SSB-SC by phase-shift method.

Unit II AM Receivers

TRF receiver, Superhetrodyne receiver, Details of each block such as RF amplifier, mixer oscillator, IF amplifier, Diode detector, Audio Amplifier. Need and type of AGC, Communication Receiver, Selectivity filter method, Phase shift method , sensitivity, Image rejection ration of communication receiver,Noise calculation in DSB-FC,DSB-SC & SSB-SC

Unit III FM Transmitters

FM Modulation, Frequency Spectrum, Circuits & Analysis for direct FM generation using FET and varactor diode. Circuit & analysis of Indirect FM generation, Narrow Band and Wide Band FM, their comparision, Pre-emphasis and De- emphasis.

Unit IV FM Receivers

Details of FM receiver, blocks such as R.F. amplifier, local oscillator, IF amplifier, Mixer, AudiQ Amp!., AGC, Limiter, FM Discriminator, Single Slope and Balanced slope detector, Analysis of Foster seeley and ratio detectors, Stereo FM receiver, Noise in FM Reception, FM threshold effect.

Unit V Pulse Modulation Technique : The sampling theorem, Sampling of Band-Pass Signal, Linear and Non linear quantization, Aliasiry effect, Aperture effect, Reconstruction of filter, Time Division Multiplexing, Pulse Amplitude Modulation, Pulse Time Modulation, PCM, DM, ADM

Unit VI Signal Analysis

Fourier Series, Exponential Fourier Series, Fourier Transform, Properties of Fourier Transform, Delta Function, Fourier Transform of Periodic functions, fundamental of Power Spectral Density & Energy Spectral Density, Correlation, auto-correlation, Cross-correlation.

Text Books

(1) Kennedy G. : "Electronic Communication System" Tata Mc-Graw Hill Co.,New Delhi (Third Edition)

(2) Taub and Schilling D.L. : Principles of Communication Systems, Mc-

Hill Co, Tokeyo, 1994 (II Ed.)

Reference books:-

(1) B. P. Latbi : "Modern Digital and Analog Communication Systems" Oxford University Press, New Delhi.
(2) Hari Bhat: "Analog Communication, 2nd Edition Pearson India, 2010"
(3) S. Kundu: " Analog & Digital Communication, Pearson India, 2010"
(4) R.P.Singh, S.D. Sapre: Communication System, Anolog and Digital, Tata Mc-Graw Hill Co., New Delhi.

4IT03 OJECT ORIENTED TECHNOLOGIES

UNIT I : Introduction to Object Oriented Programming**:** Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming. Objects & classes in C++: Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects,

UNIT II : C++ string Class. Operator overloading :Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers& Arrays. Pointer & functions. New & deleter operators. Pointers For objects.

UNIT III : Inheritance in C++ :Derived class & base class, Derived class Constructors, Function overloading, class hierarchies, public and private inheritance, multiple inheritance Containership : classes within classes.

UNIT IV : Virtual functions concepts, Abstracts classes & pure virtual Functions. Virtual base classes, Friend functions, static Functions, Assignment and copy initialization the this pointer. Dynamic type information. Introduction to C++ graphics, creating basic shapes, using colors and styles .

UNITV: Streams & File in C++: Stream classes, stream errors, disk File I/O with streams File pointers, Error handling in file I/O File I/O with members functions, overloading the extractions & Insertion operators, Memory as a stream object, command Line arguments. Multifile programs.

UNIT VI : Function Tamplate, class templates, Exception syntax Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers iterators, specialized iteratrors, associative containers Function objects.

Text Book:

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia Publications)

References:

1. E. Balaguruswamy, "Object Oriented Programming with C++", Tata McGraw-Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 - X.
2. Herbert Schildt C++ : Complete Reference (TMH)
3. BPB Editorial Board Advanced C++(BPB Publications)
4. Lipmann C++ Primer (Addison-Welsley)

4 IT 04/ 4 BM 04 SOCIAL SCIENCES & ENGINEERING ECONOMICS

SECTION - A

Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy. (9)

Unit II : Indian Parliament : composition and powers.
President of India : Election and Powers.
Council of Ministers and Prime Minister (9)

Unit III : Impact of Science and Technology on culture and Civilization. Human Society : Community Groups, Social Control : Meaning, Types and Agencies. Marriage and Family : Functions, Types and problems.

SECTION - B

Unit IV: Nature and scope of Economics : Special significance of Economics to Engineers.
Production : Factors of production, Laws of return, Various Economic systems, Forms of Business Organisation. (9)

Unit V : Banking : Functions of Central and Commercial Banks.
Taxation : Principle of taxation, Direct and Indirect taxes.
Market : Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly. (9)

Unit VI: Economics of Development : Meaning, Characterisitcs of under development, obstacles to Economic growth and vicious circle of poverty.
Economic Planning : meaning, objective and salient features of current five years plan of India.
Planning horizons, life structuring the alternatives.
Economics of comparision of different alternative projects. (10)

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. Joshi G.N. : The Constitution of India, Macmillan India Ltd.
3. Mahajan : The Constitution of India, S.Chand, New Delhi.
4. Maclaver and Page : Principle of Sociology.
5. Davis K. : Human Society
6. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
7. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
8. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
9. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
10. Dhingra I.C. : Indian Economy
11. E.Kuper : Economics of W.R.Development, McGraw Hill Co.,
12. Jemes L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

4IT05 NUMERICAL METHODS & OPERATION RESEARCH TECHNIQUES

Unit I : Error Analysis, absolute, relative and percentage errors. A general error formula and error in series approximation, Solution of Non linear and polynomial equations: Bisection Method, False Position method, secant, Newton Raphson methods.

Unit II : Solution of Linear Systems of Equation : Gauss elimination method, Gauss Jorden Method, Gauss Seidel Iterative Method, Gaussian elimination, Matrix Inversion Method, L-U factorization method. Regression, Curve fitting: Least Square Method, Correlations.

Unit III : Integration and Differential equations : Numerical Integration-Trapezoidal, Simpsons one third and three eight rules, Romberse Method. Newtons forward and backword interpolation formula. Numerical differentiation : Maximum and minimum values. Lagrange's Interpolation Method, Euler's method, Runge Kutta methods, Predictor Corrector method, Taylor Series.

Unit IV : Operations Research Models and Dynamic Programming : Operations research models- classification of problems, phases of operation research, scope and limitation of operations research. Dynamic programming : Investment

problem Stagecoach Problem, Equipment Replacement problem, conversion of final value problem into an intial value problems.

Unit V : Linear Programming and Sequencing: Linear programming – Concept of Linear Programming, simplex method, Big-M Method, Two Phase Simplex Method, concept of duality, transportation problems, Assignment Problem, Hungarian Method. Sequencing Problem: Two-Machine, N-Jobs, and Three Machine Problem.

Unit VI : PERT and CPM : Pert Networks, ET, TE, TL, SE and Critical path, Probability of completion. Decision theory : Introduction, Minimax decision procedure, Bayes decision procedure with and without data, Regret function Vs. Loss function.

TEXT BOOKS :-

1) Computer Oriented Numerical Methods : V.Rajaraman, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2) Introduction to Operation Research : Billy, E.Gillett, Tata McGraw Hill Pub. Co. Ltd., New Delhi.

REFERENCE BOOKS

1) Introduction to Methods of Numerical Analysis : S.S.Shastry, Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi.
2) Optimization Theory and Applications : S.S.Rao, Second Edition, Wiley Eastern Limited, New Delhi.
3) J. N. Kapoor- Mathematical Statistics Tata McGraw Hill Pub. Co. Ltd.

4IT06 **Data Structures Lab :** Minimum Eight experiments/ programming assignments must be completed based on the respective syllabus covering each of the units.

4IT07 **Communication Engineering Lab :** Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT08 **Object Oriented Technologies Lab :** Minimum Eight experiments/programming assignments must be completed based on the respective syllabus covering each of the units.

4IT09 **Computer Lab-II (HTML) :** Minimum Eight experiments/ programming assignments must be completed based on HTML.

This Lab is based on Web publishing. The topics to be covered include

1. Web Publishing
2. Web Page Design
3. Exposure to IE & NN Browsers

4. Dynamic HTML.

Each group of 2 students should build their own Website.

Text Book: M. Petrovsky : Dynamic HTML in Action (TMH)

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Content of the Compulsory Subject "Environmental Studies" are given on Page Nos. ES-1 to ES-4 i.e. at the end of this syllabus.

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ENVIRONMENTAL STUDIES

Total Marks : 100

PART-A

SHORT ANSWER PATTERN **25 Marks**

1. The Multidisciplinary nature of environmental studies
- . Definition, scope and importance.
- . Need for public awareness.

(2 lecture hours)

2. Social Issues and the Environment
- . From Unsustainable to Sustainable development
- . Urban problems related to energy
- . Water conservation, rain water harvesting, watershed management
- . Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- . Envionmental ethics : Issues and possible solutions.
- . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- . Wasteland reclamation.
- . Consumerism and waste products.
- . Environment Protection Act.
- . Air (Prevention and Control of Pollution) Act.
- . Water (Prevention and Control of Pollution) Act.
- . Wildlife Protection Act.
- . Forest Conservation Act.
- . Issues involved in enforcement of environmental lesislation.
- . Public awareness. (7 lecture hours)

3. Human Population and the Environment
- . Population growth, variation among nations.
- . Population explosion - Family Welfare Programme.
- . Environment and human health.
- . Human Rights.
- . Value Education.
- . HIV / AIDS.
- . Women and Child Welfare.
- . Role of Information Technology in Environment and human health.
- . Case Studies. (6 lecture hours)

PART-B

ESSAY TYPE WITH INBUILT CHOICE **50 Marks**

4. Natural resources :
- . **Renewable and non-renewable resources :**
  - . Natural resources and associated problems.
    - - Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
    - - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
    - - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
    - - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
    - - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
    - - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- . Role of an individual in conservation of natural resources.
- . Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems
- . Concept of an ecosystem.
- . Structure and function of an ecosystem.
- . Producers, consumers and decomposers.
- . Energy flow in the ecosystem.
- . Ecological succession.
- . Food chains, food webs and ecological pyramids.
- . Introduction, types, characteristic features, structure and function of the following ecosystem :-
  - - Forest ecosystem
  - - Grassland ecosystem
  - - Desert ecosystem
  - - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)

6. Biodiversity and its conservation
- . Introduction - Definition : genetic, species and ecosystem diversity.
- . Biogeographical classification of India.
- . Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- . Biodiversity at global, National and local levels.
- . India as a mega-diversity nation.
- . Hot-spots of biodiversity.

. Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
. Endangered and endemic species of India.
. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

. Definition
. Causes, effects and control measures of :-
- Air pollution
- Water pollution
- Soil pollution
- Marine pollution
- Noise pollution
- Thermal pollution
- Nuclear hazards

. Solid Waste Management : Causes, effects and control measures of
. Role of an individual in prevention of pollution.
. Pollution case studies.
. Diaster management : floods, earthquake, cyclone and landslides.

(8 lecture hours)

PART-C

ESSAY ON FIELD WORK 25 Marks

8. Field work

. Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
. Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
. Study of common plants, insects, birds.
. Study of simple ecosystems - pond, river, hill slopes, etc.

(5 lecture hours)

(**Notes :** i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net **(R)**
3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
4) Clark R.S., Marine Pollution, Clanderson Press Oxford **(TB)**

5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7) Down to Earth, Certre for Science and Environment **(R)**
8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.
9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural Histroy Society, Mumbai **(R)**
10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Ca mbridge Univ. Press 1140p
11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications **(TB)**
14) Miller T.G.. Jr., Environmental Science, Wadsworth Publishing Co. **(TB)**
15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
16) Rao M.N. & Datta A.K.,1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
18) Survey of the Environment, The Hindu **(M)**
19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science **(TB)**
20) Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media **(R)**
21) Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications **(TB)**
22) Wagner K.D., 1998, Environmental Management, W.B.Saunders Co., Philadelphia, USA 499p.
23) डॉ. विठ्ठल घारपूरे : पर्यावरणशास्त्र- पिंपळापूरे ॲन्ड कंपनी पब्लीशर्स, नागपूर.**(R)**
24) Dr. Deshpande, A.P.Dr. Chudiwale, A.D., Dr. Joshi, P.P., Dr. Lad, A.B.: Environmental Studies, Pimpalapure & Co., Publishers, Nagpur. **(R)**
25) R.Rajagopalan : Environmental Studies, Oxford University Press, New Delhi, 2005 **(R)**

(M) Magazine
(R) Reference
(TB) Textbook

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DIRECTION

No. 31/2011 Date : 10/06/2011

Subject : Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology

Whereas faculty of Engineering & Technology in its meeting held on 6th June, 2011 vide Item No. 39 accepted and recommended schemes of teaching & examinations of III to VIII/X as per Credit Grade System of various branches as per Credit Grade System in the faculty of Engineering & Technology for its implementation from the session 2011-2012 in phase wise manner,

AND

Whereas the schemes of teaching & examinations of VII & VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering & Technology were accepted by the Hon'ble Vice-Chancellor u/s Section 14 (7) of M.U. Act, 1994 on behalf on Academic Council on 9th June, 2011,

AND

Whereas this schemes of teaching & examinations of various branches as per Credit Grade System in the faculty of Engineering & Technology are required to be regulated by the Regulation,

AND

Whereas the process of making the Regulation is likely to take some time,

AND

Whereas the schemes of various branches as per Credit Grade System in the faculty of Engineering & Technology are to be implemented from the academic session 2011-2012,

AND

Whereas syllabi of various branches in the faculty of Engineering & Technology are to be sent for printing.

Now, therefore, I, Dr. Mohan K. Khedkar, Vice-Chancellor of Sant Gadge Baba Amravati University in exercise of powers confirmed upon me under sub section (8) of Section 14 of the Maharashtra Universities Act, 1994, hereby direct as under :-

1) This Direction shall be called "Schemes of teaching & examinations of III to VIII/X Semesters as per Credit Grade System of various branches in the faculty of Engineering &Technology, Direction, 2011"
2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching and examinations of III to VIII/X semesters as per Credit Grade System of the following branches shall be as per respective Appendices appended with this Direction :-

BRANCH		Appendix No.
1)	Civil Engineering	A
2)	Mechanical Engineering	B
3)	Production Engineering	C
4)	Electrical Engineering (Electronics & Power)	D
5)	Electrical and Electronics Engineering	E
6)	Electrical Engineering (Electrical & Power)	F
7)	Electrical Engineering	G
8)	Electronics & Telecommunication Engineering	H
9)	Electronics Engineering	I
10)	Instrumentation Engineering	J
11)	Computer Science & Engineering	K
12)	Computer Engineering	L
13)	Architecture	M
14)	Textile Engineering	N
15)	Chemical Engineering	O
16)	Chemical Technology (Polymer) (Plastic) Technology	P
17)	Chemical Technology (Food, Pulp & Paper, Oil & Paint and Petrochemical) Techology	Q
18)	Information Technology	R
19)	Biomedical Engineering	S

Sd/-
Dr. Mohan K. Khedkar
Vice-Chancellor

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SANT GADGE BABA AMRAVATI UNIVERSITY GAZETTE

Official Publication of Sant Gadge Baba Amravati University

PART- TWO

(Extra-Ordinary)

Tuesday, the 22th September, 2020

NOTIFICATION

No. - 61/2020 Date : 22.9.2020

Subject :- Implementation of new syllabi of Semester III to VI of Master in Computer Application (Three Year Degree Course.... Semester Pattern) as per Choice Based Credit System in the Faculty of Science & Technology from the session 2020-2021 and onwards in phase wise manner ...

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabi as per AICTE Guidelines of Master in Computer Application (Three Year Degree Course... Semester Pattern ..Choice Based Credit System) Course of Semester III & IV from the academic session 2020-2021 and Semester V & VI from the academic session 2021-2022 & onwards in phase wise manner as per '**Appendix – A' .**

Sd/-
(Dr.T.R.Deshmukh)
Registrar
Sant Gadge Baba Amravati University

Appendix – A

SYLLABUS OF MCA SEM III TO VI [C.B.C.S.]

SEMESTER III

Course Code **MCA19201**

Course Name **JAVA PROGRAMMING**

Credits **4**

Course Outcomes

1. Remember and know the use an integrated development environment to write, compile, run, and test simple Java programs and get knowledge of the structure and model of the Java programming language.
2. Understand Java as an Object oriented language and write programs that solve real-world problems.
3. Understand exception handling and multithreading in Java and apply the concepts to real problems
4. Understand Streams in Java and apply them to File handling, understand Generics
5. Understand Collection Frameworks and apply it for problem solving, design simple GUI based applications using Swing
6. Understand Event handling and analyze and apply the knowledge to develop small GUI based applications.

Units	Contents	Total Hrs
I	**Java Basics**: Program Components, Compilation cycle. Data types and Variables, Operators: Arithmetic, relational, Assignment, Shift operators. Control structures: if, nested if, switch, while,do-while, for loop, Enhanced for loops.	9
II	**Concepts of OOP**: Introduction to classes, class fundamentals, declaring objects, methods, constructor, **this** keyword, access control, Inheritance, Polymorphism, Abstract classes and Interfaces, Packages String and String Buffer classes, Math class. Arrays: Basics, One - & Multi-dimensional, Array of Objects, Passing array to methods.	10
III	**Exception handling:** Exception types, Built-in Exceptions, checked and unchecked Exceptions, using try and catch, throw, throws, finally clauses, multiple catch clauses, **Multithreaded programming:** Java thread model, creating a thread, creating multiple threads, thread priorities & synchronization.	9

IV	**Java I/O:** Stream classes, Byte Stream & Character Streams: Input stream, Output stream, File Input stream, File Output stream, Data Input stream, Data Output stream, Print Writer. **Generic Programming:** Motivation for generic programming, generic classes, generic methods, inheritance and generics, Restrictions on Generics	9
V	**Java Collections Framework:** Introduction, Collections Framework hierarchy, List, Set, Map Interface and their implementing classes and methods, Iterator/ ListIterator, Utility classes. **Introduction To Swing:** Swing Features, Hierarchy Of Java Swing Classes, Swing GUI Components, Packages Used In Swing, Swing Control Classes & Methods, Swing API.	10
VI	**Event handling:** Event handling mechanisms, Delegation Event model, Event sources &Event Listeners, Event Classes, Event Listener Interfaces. Using delegation Event model, Handling mouse events, handling Keyboard events, Adapter classes, Inner classes, anonymous inner classes.	9

Text Book: Herbert Schildt: Java The Complete Reference, Ninth Edition McGraw Hill.

Reference Books:

1. Core Java, Volume I — Fundamentals (9th Edition), Cay S.Horstmann, Gary Cornell, Prentice Hall.
2. Effective Java, Second Edition, Joshua Bloch, Addison-Wesley Educational Publishers Inc.

Course Code	**MCA19202**
Course Name	**DATA COMMUNICATION NETWORK**
Total Credits	**4**

Course Outcomes

1. Understand the concepts of Data Communication System and its components.
2. Learn various types of network topologies and their appropriateness for designing a network.
3. Understand the various standard models of networking. Acquire deeper understanding about service implementation of various protocols used during network communication.
4. Understand roles and importance of different network devices within a network.
5. Recognize the technological trends of Computer Networking.
6. Acquire introductory knowledge about digital wireless communication systems.

Units	Contents	Total Hrs
I	**UNIT-I: Data Communication:** Advantages, Basic Model of Communication System; **Data Transmission: Modes:** Simplex, Half Duplex, Full Duplex; **Methods/Types:** Parallel, Serial: Asynchronous, Synchronous, Isochronous; **Transmission Media:** Guided and Unguided; **Modulation:** Amplitude, Phase Shift, Frequency, PAM, PCM; **Multiplexing:** FDM, WDM, TDM; **Switching:** Circuit, Message, Packet; Delays in Packet Switched Network, Packet Loss; Telephone Networks, Network topologies, Types of Networks: LAN,MAN,WAN; **Network Reference Models:** ISO-OSI model, TCP/IP model	10
II	**UNIT-II: Application Layer:** Services; **Processes:** Client-Server Model, Socket Interface; Services required by Application Layer; **HTTP:** Introduction, RTT, HTTP Handshake, types of HTTP Connections, HTTP Messages, Authentication and Cookies; **FTP:** Service Model, FTP Commands; Electronic Mail; SMTP; **DNS:** Services and working	09
III	**UNIT-III: Transport Layer:** Services; Multiplexing and De-multiplexing Applications; Connectionless Transport – UDP; Principles of Reliable of Data Transfer (RDT); Stop-and-wait and Pipelined protocols; GBN protocol; Connection-Oriented Transport: TCP; Flow Control; Principles of Congestion Control; Approaches towards Congestion Control; TCP Congestion Control	10
IV	**UNIT-IV: Network Layer:** Services; Network Service Model: Datagram, Virtual Circuit; Routing Principles; Routing Algorithms: Classifications; Hierarchical Routing; Internet Protocol: IP Addressing, IPv4: Classes and Packet format, DHCP; ICMP; Routing in the Internet: RIP, OSPF, BGP; Router; IPv6; Multicast Routing.	9

V	**UNIT-V: Data Link Layer:** Services; Error Detection and Correction; Multiple Access Protocols in LANs: ALOHA, CSMA/CD; LAN Addresses and ARP; Ethernet; Hubs, Bridges and Switches; Point-to-Point Protocol.	9
VI	**UNIT-VI: Wireless Communication:** Advantages, Applications; **Signals:** Characteristics, Propagation, Fading, Multipath Propagation; Spread Spectrum; Frequency Reuse Principle, Cellular System; Medium Access Control: SDMA, FDMA, TDMA, CDMA; Wireless LAN: IEEE 802.11; Bluetooth.	9

Reference Books:

1) Computer Networking –James F. Kurose and Keith W. Ross (Pearson)
2) Data Communication and Networking – Behrouz A. Forouzan (McGraw Hill)
3) Computer Network & Internet - Douglas E. Comer(Pearson)
4) Data and Computer Communication – William Stallings(Pearson)
5) Computer Networks - Andrew S. Tanenbaum (PHI)
6) Mobile Communications - Jochen Schiller(Addison-Wesley)

Course Code **MCA19203**

Course Name **DESIGN AND ANALYSIS OF ALGORITHMS**

Credits **4**

Course Outcomes

1. Understand the factors that affect the efficiency of algorithms and analyze the performance of algorithms.
2. Learn and Understand variety of divide and conquer algorithms, analyze them and apply ideas to new situations.
3. Learn and Understand variety of greedy algorithms, find out the basic ingredients of a greedy algorithm, and how to approach arguing the correctness of such algorithms.
4. Understand and Apply variety of dynamic programming algorithms.
5. Understand and solve variety of backtracking algorithms.
6. Analyze time and space complexity.

Units	Contents	Total Hrs
I	**Iterative Algorithm Design Issue**: Introduction, Use of Loops, Efficiency of Algorithms, Estimating & Specifying Execution Times, Order Notations, Algorithm Strategies, Design using Recursion	10
II	**Divide And Conquer**: Introduction, The gteeneral method, Binay Search, Finding minimum and maximum, merge sort, quick sort, selection sort, Strassen's matrix multiplication.	9
III	**Greedy Methods**: Introduction, Knapsack Problem, Job sequencing with deadlines, Minimum Spanning Trees, Prim's Agorithms, Kruskal's Algorithm, Dijkstra's Shortest Path Algorithm.	9
IV	**Dynamic Programming** :Introduction, Multistag eGraphs, Travelling Salesman, Matrix multiplication, Longest Common Sub-Sequences, Optimal Polygon Triangulation, Single Source Shortest Paths.	10
V	**Backtracking:** Combinational Search, Search& Traversal, Backtracking Strategy, Backtracking Framework, Some typical lState Spaces.	9
VI	**Efficiency of Algorithm**: Polynomial Time & Non Polynomial Time Algorithms, Worst and Average case Behaviour, Time Analysis of Algorithm, Efficiency of Recursion, Complexity, Examples of Complexity Calculation for Various Sorting algorithms. Time-Space Trade off	9

Text Book: "Design and Analysis of Algorithms" , Dave and Dave:, Pearson Education

Reference Books:

1) Fundamentals of computer Algorithms, E.Horowitz &S.S.Sahani. (Galgotia).
2) .Aho,Hopcroft& Ullman "The Design & Analysis of Computer Algorithms ", Addison-Wesley
3) G.Brassard, P.Bratley: Fundamentals of Algorithmics" , PHI

Course Name **Elective III : (i) MIS FRAMEWORK AND IMPLEMENTATION**
Credits **4**
Course Outcomes

1. Ability recognize role of Management Information System in industry.
2. Evaluate the role of information systems in today's competitive business environment.
3. Assess the relationship between organizations, information systems and business processes, including the processes for customer relationship management and supply chain management.
4. Analyze the relationship between information systems and organizations. Evaluate the role of information systems in supporting various levels of business strategy
5. Understand and apply technology in Management Information System
6. Learn relevance of IT, MIS & BPR.

Units	Contents	Total Hrs
I	**The meaning & role of MIS:** What is MIS? MIS & Computers, Decision Support System, MIS support to management, Role & importance of management. The system view of business MIS organization within the company, manager's view of information system.	10
II	**Basics of MIS** : MIS & decision making concept, information concept & classification, method of data & information collection, value of information management & organizational behaviours, management , information & the system approach. Development of MIS choice of IT.	9
III	**Strategic & project planning for MIS**: general business planning, appropriate MIS response, MIS planning MIS planning details. Implementation, evaluation & maintenance of the MIS.	9
IV	Application of information system to business MIS application in service industries & role of MIS in source industries. **DSS:**- concepts & philosophy, deterministic systems & knowledge based expert system MIS & role of DSS.	10
V	**Technology in MIS:** - Data processing, transaction processing, application processing, information system processing, DBMS, Client-server architecture & MIS. **MIS & data warehouse**: - Architecture management & implementation of data warehousing, E-business Model, E-payment, security in E-business, MIS & E-business.	9
VI	**MIS &Network**:- Network technology, LAN, Data communication, ATM Technology, Introduction of business processing, process model of organization, value system model, relevance of IT, MIS & BPR.	9

Text Books :

1) W.S. Jawadekar: Management Information System (II Edition), TMH
2) R.G. Murdick, J.E. Ross & J.R. Clagget: Information systems for modern management, 3rd edition, PHI.

Reference Books:-

1) Kenneth C. Landan & J.P. Landan: Management Information System, 8th edition, Pearson education
2) Robert Schuithesis, Mary Sumner: Management Information System, 4th edition, PHI
3) Laudon & Laudon, V.M. Prasad: Management Information System, 9th edition, Pearson education

Course Code **MCA19204**

Course Name **Elective III : (ii) MANAGERIAL ECONOMICS**

Credits **4**

Course Outcomes

1. Acquaint with concepts and techniques used in Micro-Economics and to enable their application
2. Acquire knowledge in business decision making .
3. Develop an understanding of the applications of managerial economics.
4. Interpret regression analysis and discuss why it's employed in decision-making.
5. Understand optimization and utility including consumer behavior.
6. Evaluate the relationships between short-run and long-run costs.
7. Understand uniform pricing and how it relates to price discrimination and total revenue.

Units	Contents	Total Hrs
I	Concept, Need, Scope, Techniques and Applications of Managerial Economics.	9
II	Utility Analysis, Marshal Approach, Demand Analysis, Demand Function, Law of Demand, Elasticity of Demand and demand forecasting. Law of Supply and Supply Analysis	10
III	Production & Cost function, Production Iso-quant, Iso-cost, Expansion path, Economies and Diseconomies of scale, short run and long run cost behavior	9
IV	Theories of firm, Profit Maximization, Sales Maximization, Managerial Utility Model, Simon Satisfying Behaviour Model	10
V	Market Structure-Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition, short term pricing in these market structure.	9
VI	Cost Sheet, Costing for decision making, Relevant Costing. Marginal Costing & Absorption costing.	9

Text Books :

1) Adhikary, M. Business Economics. New Delhi, Excel Books, 2000
2) Baumol, W.J. Economics Theory and Operations Analysis 3rd ed., New Delhi, Prentice Hall Inc. 1996.

Reference Books:

1) Chopra, O.P. Managerial Economics. New Delhi, Tata McGraw Hill 1985
2) Keat, Paul G & Philips K.Y.Young, Managerial Economics, Prentice Hall New Jersey 1996.
3) Koutsoyiannis, A Modern Micro Economics. New York, Macmillan, 1991
4) Milgrom, P and Roberts J. Economics Organization and Management Englewood Clitts, New Jersey Prentice Hall Inc. 1992.
5) Maheshwari, Yogesh. Managerial Economics., P.H.I.
6) Mehta, P.L. Managerial Economics., Sultanchand& Sons. 9. Varshney, R.L. Managerial Economics., Sultanchand& Sons
7) Bhattacharya S.K. and Dearden J. Accounting for Management. Text and cases. New Delhi, Vikas, 1996.

Course Code **MCA19204**

Course Name **Elective III : (iii) OBJECT ORIENTED ANALYSIS AND DESIGN**

Credits **4**

Course Outcomes :

After completing this course students will be able to:

1. Understand the issues involved in implementing an object-oriented design
2. Analyze requirements and produce an initial design.
3. Develop the design to the point where it is ready for implementation.
4. Design components to maximize their reuse.
5. Learn to use the essential modeling elements in the most recent release of the Unified Modeling Language

Units	Contents	Total Hrs
I	**Introduction:** Two views of software Developments: SSAD and OOAD. Why Object–Orientation? **The Object Paradigm** Object and classes, Abstraction and encapsulation, Methods and Message, Interfaces, Inheritance and Polymorphism , Access Control	9
II	**Introduction to UML & Modeling** Review of the object Oriented Methodologies by Booch Rumbaugh, Cood Yourdon, Ivar Jacobson Unified Approach Diagramming and Notational Techniques using the UML. UML Diagrams and software Development Phases	10

III	**Object-Oriented Systems Development Process** Rational Unified Process : Four Major phases, Inception Elaboration, Construction, Transition. Requirements Engineering Problem analysis - Understanding Stockholders need	9
IV	**Structural Modeling** Common Structural Modeling Techniques – Approaches to find classes. Modeling Structural Elements : Classes, Relationships, Interfaces , Packages, Class Diagrams, Difference between ERD & Class Diagram, Object Diagram. **Behavioral Modeling** Common Behavioral Modeling Techniques, Interactions. Use Cases and Use Case Diagrams Interaction Diagrams : Sequence Diagrams, Collaboration Diagrams , Activity Diagrams, State chart Diagram, Forward & Reverse Engineering	10
V	**Persistent Object and Database Issues:** The Codd Data Management Domain. Object Persistence, Object-oriented Database Management System, Object- Oriented verses Relational Database. Mapping object to Relational Data structure.	9
VI	**Testing of Object Oriented applications:** Introduction to Testing Strategies Impact of Object Orientation on Testing. Testing Business Process. Patterns, Benefits of patterns. Using patterns During Analysis. Using Pattern During Design	9

Text Books:

1. Object Oriented Analysis and Design with Applications by Grady Booch., Benjamin / Cummings, 1994., Pearson Pub.
2. Object–Oriented Modeling and Design by J Rumbaugh, M B laha,W.Premerlani, PHI Pub.

Reference Books :

1) Magnifying Object Oriented Analysis and Design by Arpita Gopal and Netra Patil : PHI Publication
2) Principles of Object- Oriented Software Development - Anton Eliens , Addison Wesley.
3) Object Oriented System Development - Ali Bahrami McGRAW-HILL International Edition.
4) Object-Oriented Software Engineering - Ivar Jacobson Pearson Education INC
5) Applying UML And Pattern by Craig Larman Pearson Education INC
6) UML Distilled Martin Flowler - Pearson Education INC
7) The Unified Modeling Language User Guide -Grady Booch, James Rumbaugh, Ivar Jacobson- Pearson EducationINC
8) The Unified Modeling Language Reference Guide -Grady Booch, James Rumbaugh, Ivar Jacobson- Pearson EducationINC
9) DesignObject-OrientedSoftware-RebeceaWrifs-Brock.BrianWilkerson,LaurenWiener
10) Object Oriented Analysis and Design- Bennett , Simon McGrawHill.
11) Designing Flexible Object Oriented System with UML - Charless Richter,Techmedia
12) Instant UML – Muller – A pressLP
13) UML Instant – Thomas A Pendar – Wiley Publication
14) UML in Nutshell ,O'reilly Pub.
15) **Note**: The Subject should be taught through **case study approach**. The **focus should be on various UML diagrams**

Course Code **MCA19206**

Course Name **Lab 7 - BASED ON JAVA**

Credits **01**

Course Outcomes Ability to Apply core concepts of Java for problem solving .

The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. rite, debug and execute simple JAVA programs that demonstrate programming logic by making use of various control statements.
2. Programs to Demonstrate the understanding and application of classes and objects to real world problems
3. Programs that Demonstrate the understanding and application of interfaces.
4. Programs to Demonstrate the understanding of built in and user defined packages

5. Programs that Demonstrate the understanding and application of Exception handling using real world problems
6. Programs that Demonstrate the understanding and application of Multi-threading using Thread Class/Run able Interface
7. Programs that Demonstrate the understanding and application of synchronization using multi-threading.
8. Programs that Demonstrate use of streams for File handling,
9. Programs to Demonstrate the use and benefits of generic classes, generic methods, , inheritance
10. Programs that Demonstrate the use of few Collection classes with real world problems
11. Programs that Demonstrate the use of Swing Control Classes & Methods in GUI application development
12. Programs that demonstrate the use of Delegation Event model and benefits of Inner classes, and anonymous inner classes.

Course Code **MCA19207**

Course Name **Lab 8 - BASED ON DAA**

Credits **01**

Total Hrs: **15**

Course Outcomes **I**dentify and apply the appropriate algorithm to a given real world problem.

The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1) Write a program to perform binary search using the divide and conquer method.
2) Write a program to find out maximum and minimum using divide and conquer rule.
3) Write a program to implement merge sort using divide and conquer approach.
4) Write a program to implement quick sort using divide and conquer approach.
5) Write a program to implement selection sort using divide and conquer approach.
6) Write a program to solve knapsack problem using Greedy method.
7) Write a program to implement Greedy Algorithm for Job Sequencing With Deadlines
8) Write a program to implement prim's algorithm using greedy method.
9) Write a program to implement Kruskal algorithm using greedy method.
10) Write a program to implement Dijkstra's algorithm for the Single source shortest path problem.
11) Write a program to implement Traveling Salesman problem using dynamic programming algorithm.
12) Write a program to Program to implement All Pairs Shortest Path using dynamic programming.
13) Write a Program to implement graph traversal using Breadth First Search.
14) Write a Program to implement graph traversal using Depth First Search.
15) Write a Program to implement 8 queen's problem.

Text Books:

1) "Design and Analysis of Algorithms" , Dave and Dave:, Pearson Education
2) Fundamentals of computer Algorithms, E.Horowitz &S.S.Sahani. (Galgotia).

Course Code **MCA19208**

Course Name **Lab 9 - BASED ON SOFTWARE TESTING**

Credits **02**

Total Hrs: 30

Course Outcomes

1. Analyze requirements to determine appropriate testing strategies
2. Apply a wide variety of testing techniques and tools in an effective and efficient manner
3. Compute test coverage and yield according to a variety of criteria
4. Evaluate the limitation of given testing process and provide a succinct summary of those limitations

UNIT-I :

Introduction: Software-Testing, Terminology and Methodology, Verification and Validation. **Dynamic Testing**: Black Box Testing Techniques, White Box Testing Techniques, Static
Testing, Validation Activities, Regression Testing.

UNIT-II :
Test Management, Software Metrics, Testing Metrics for Monitoring and Controlling the Testing Process, Efficient Test Suite Management. Testing Object Oriented Software, Testing Web Based Systems, Debugging**.**

UNIT-III :
Overview of Testing Tools, Testing an Application using Win Runner, Test Script Language, Architecture and use of Silk Test, Use of Load Runner and J Meter, Source Code Testing
Utilities in Unix / Unix Environment.

Suggested Reading:

1) Naresh Chauhan, **Software Testing Principles and Practices**, Oxford University Press, 2010.
2) Dr. K.V.K.K.Prasad, **Software Testing Tools**, Dreamtech press, 2008.
3) William E. Perry, **Effective Methods for Software Testing**, 3rd Edition, Wiley & Sons, 2006.
4) Srinivasan Desikan, Gopalaswamy Ramesh, **Software Testing: Principles and Practices,** Pearson Education, 2006.

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SEMESTER IV

Course Code MCA19210
Course Name: CLIENT SERVER COMPUTING
Credits 4

Course Outcomes:
After completion of this course, student will be able to :

1. Acquire knowledge of Server Side programing by implementing Servlet and JSP.
2. Acquire the knowledge of J2EE architecture, MVC Architecture.
3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization
4. Understand and write the deployment descriptor and enterprise application deployment.
5. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter.
6. Gain knowledge of frameworks such as Struts Architecture and Hibernate Architecture
7. Distinguish JDBC and Hibernate. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Struts, Hibernate after analyzing requirements and evaluating existing system.

Pre-requisite of course: Core Java

Units	Contents	Total Hrs
I	**Java Database Connectivity:** JDBC Concepts, JDBC API, Driver Manager, Connection, Statement,Prepared Statement, Callable Statement and Result Set classes with relevant methods, Types of Result Sets. Handling queries, inserts, deletes and updates to database. Displaying the query results. Stored Procedures.	10
II	**Servlets in Java:** Servlet structure & lifecycle. Servlet A P I basics, various classes & interfaces. Servlet requirements, writing. Running of Servlets, Concepts of Cookies, Servlets & cookies. Session management with Servlet API. Server side includes and request forwarding. Servlet chaining. Jdbc Servlets	9
III	**Introduction to JSP:** Simple JSP concepts, Environment set up for JSP, Life cycle of a JSP, Elements involved with development of JSP: Scripting Elements, Directives, Implicit Objects. Java beans: Concept of Beans, Properties, Bean instances & serialization, Bean Scopes, Writing Beans, Deploying a bean, JDBC bean. Jsp Actions, Using a bean in a JSP. Java Standard Tag Library (JSTL/Advanced JSP): Types of tags, core and SQL tags in detail.	9
IV	**Introduction to Java script:** What is Java script?, Values, Types and Operators, Expressions and statements, control flow statements, Functions, Arrow Functions, HTTP and Forms, Event handling, data structures, objects	10
V	**Introduction to Hibernate:** Why Hibernate?, Architecture of Hibernate, Hibernate Query language, Hibernate O/R Mapping, Setting up the Development Environment ,Creating Database Table, Writing-> Hibernate Configuration File, Java Bean, and Hibernate Mapping File, Developing Controller Component, Developing view Component.	9
VI	**Introduction to Struts:** Explaining MVC 2 Design Pattern for Struts 2 ,The Need for Struts 2,Processing Request in Struts 2, Struts 2 Architecture,, Actions in Struts 2, Interceptors, OGNL Support, Performing Validation in Struts 2, Internationalizing Struts 2 Applications, Implementing Plug-in in Struts 2,Integrating Struts 2 with Hibernate	9

Text Books :

1) 1 Java Server Programming Java EE 7 (J2EE 1.7) Black Book(2014),. Kogent Learning Solutions Inc.
2) Core Servlets and Java Server Pages: Core Technologies by Marty Hall and Larry Brown,Java 2 Platform Enterprise Edition series, Prentice Hall

Reference Book : 1 Java EE cookbook, Elder Moraes,Packt Publishing Limited (9 April 2018)

Course Code **MCA19211**
Course Name: **ARTIFICIAL INTELLIGENCE AND APPLICATIONS**
Credits **4**

Course Outcomes:

1. Adopt an approach in view of Problem solving with AI.
2. Identify and apply suitable 'Intelligent Agents for various AI applications.
3. Identify knowledge statement and represent it.
4. Empower students for path planning of a robotic system.
5. To develop and survey embedded systems applications using machine learning.

Units	Contents	Total Hrs
I	**Introduction to Artificial Intelligence:** What is an AI, Introduction of Intelligent systems, The Foundations of Artificial Intelligence, Applications of A.I. Problem solving with AI, AI models, **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, How the components of agent programs work.	10
II	**Knowledge, Reasoning, and Planning**: Knowledge based agents, The Wumpus World, Logic, propositional logic, Representation of knowledge using rules, Predicate logic, Unction and lifting, inference in FOL, Forward Chaining, Backward Chaining, Resolution, Logic Programming. Planning problem, Planning, Algorithms for Planning as State-Space Search, Planning Graphs, simple planning agent, planning languages, blocks world problem, goal stack planning.	9
III	**Logical Agents:** Knowledge representation structures: Frames, semantic net, Scripts, Logic: Prepositional Logic, Prepositional Theorem Proving, Inference and proofs, Proof by resolution, Conjunctive normal form, Horn clauses and definite clauses, Syntax and Semantics of First-Order Logic, Symbols and interpretations, Knowledge Engineering in First-Order Logic, Unification, Resolution, and Introduction to logic programming (PROLOG).	9
IV	**Problem Decomposition and Planning:** Problem Decomposition: Goal Trees, Rule Based Systems, Rule Based Expert Systems. Planning: STRIPS, Forward and Backward State Space Planning, Goal Stack Planning, Plan Space Planning, A Unified Framework for Planning. Constraint Satisfaction : N-Queens, Constraint Propagation, Scene Labeling, Higher order and Directional Consistencies, Backtracking and Look ahead Strategies.	10
V	**Natural Language Processing and Robotics:** **Natural Language Processing:** Language Models, Steps in NLP, Syntactic Analysis (Parsing), Semantic interpretation, Discourse and pragmatic Processing, Text Classification. Discourse and pragmatic Processing, Implementation aspects of Syntactic Analysis (Parsing). **Robotics:** Fundamentals, path Planning for Point Robot, Sensing and mapping for Point Robot, Mobile Robot Hardware, Non Visual Sensors like: Contact Sensors, Inertial Sensors, Infrared Sensors, Sonar, Radar, laser Rangefinders, Biological Sensing.	9
VI	**Machine Learning:** Machine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Artificial Neural Networks, Non-parametric Models, Support Vector Machines.	9

Text Books:

1) Artificial Intelligence: A Modern Approach by Peter and Norvig.
2) Stuart Russell and Peter Norvig (1995), Artificial Intelligence: A Modern Approach," Third edition, Pearson.

Reference Books:

1. .Shai Shalev-Shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge University Press
2. Michael Jenkin, Gregory, “Computational Principals of Mobile Robotics”, Cambridge University Press.
3. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair, TMH
4. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education (India).
5. Artificial Intelligence and Intelligent Systems by Padhy, Oxford University Press.

Course Code MCA19212

Course Name: DATA WAREHOUSING AND DATA MINING

Credits 4

Course Outcomes

1. Understand the functionality of the various data mining and data warehousing components
2. Identify strengths and limitations of various data mining and data warehousing models
3. Understand the analyzing techniques of various data
4. Understand different methodologies used in data mining and data ware housing.
5. Analyze different approaches of data ware housing and data mining with various technologies.
6. Understand the use and importance of different end user applications.

Units	Contents	Total Hrs
I	Introduction, Data mining, Data mining functions, classification and major issues. Data Pre-processing: Data cleaning, data integration and transformation, data reduction, discretisation & concept hierarchy generation.	10
II	**Data mining primitives**: Data mining primitives, data mining query language. Concept description: concept description, data generalization, Analytical characterization, mining class comparison.	9
III	**Application and trends in data mining** : data mining applications, data mining systems and research prototypes, additional themes on data mining, trends in data mining .	9
IV	Data ware house and OLAP Technology for data mining: What is data ware house, multidimensional data model, data warehouse architecture, data ware house implementation.	10
V	**Data Staging:** overview, plan effectively, dimension table staging, fact table loads and ware house operations, data quality and cleansing, miscellaneous issues.	9
VI	**Building end user applications** : role of end user application, application specification, end user application development, maintaining and growing data ware house : manage the existing data ware house environment, prepare for growth and evaluation.	9

Text Books :

1) J. Han and M.Kamber: Data Mining Concepts and Techniques, Elsevier Pub. Indian Reprint, 2004.
2) R. Kimball: The Data Ware House Life Cycle Tool Kit, Wiley Press, John Wiley and Sons ASIA) Pvt. Ltd.

Reference Books :

1) Berson : Data Ware Housing, Data Mining and OLAP, Tata McGraw Hill.
2) Arun K. Pujari : Data Mining Techniques, University Press (Orient Longman)

Course Code MCA19213 (01)

Course Name: Elective IV : (i) COMPUTER GRAPHICS AND MULTIMEDIA

Credits 4

Course Outcomes:

1. Understand the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two dimensions.
2. Apply the concepts of colour models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.
3. Interpret the mathematical foundation of the concepts of computer graphics.
4. Know the fundamentals of animation, parametric curves and surfaces, and spotlighting.
5. Understand technicalaspect ofMultimediaSystems.
6. Understand the standards available for different audio, video and textapplications and Data Compression Techniques.

Units	Contents	Total Hrs
I	**An overview of Computer Graphics and Graphics System:** Video display devices, Raster-Scan systems, Random-Scan systems, Graphics monitors and workstations, input devices, hard copy devices, Graphics software.	10
II	**Output Primitives :** Point and Lines, Line drawing algorithms, loading the frame buffer, line function, circle and ellipse generating algorithms, curves, parallel curves algorithms, Pixel addressing, filled-area primitives, functions, Cell array, character generation.	9
III	**2-D Geometric Transformations:** Basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, and transformation functions, Raster methods for transformations. Two-Dimensional viewing: viewing coordinates, Window-to-viewport coordinate transformation, viewing functions, clipping: point, line, polygon, curve, and text, exterior. Projections.	9
IV	**Multimedia Authoring and Data Representations:** Introduction. Components of Multimedia. Hypermedia and Multimedia. Overview of Multimedia Software Tools, Multimedia Authoring, VRM. Graphics and Image Data Representations: 1- Bit Images, 8-Bit Gray-Level Images, 24-Bit Color Images, 8-Bit Color Images, Color Lookup Tables, Popular Image File Formats. Color in Image and Video Color Science, Color Models in Images, Color Models in Video	10
V	**Fundamental Concepts in Video:** Types of Video Signals, Component Video, Composite Video, S-Video, Analog Video, NTSC Video, PAL Video, SECAM Video, Digital Video.**Basics of Digital Audio:** Digitization of Sound, Digitization, Nyquist Theorem, Signal-to-Noise Ratio (SNR), Signal-to-Quantization-Noise Ratio (SQNR), MIDI: Musical Instrument Digital Interface. Hardware Aspects of MIDI, Structure of MIDI Messages, General MIDI, MIDI-to-WAV Conversion.	9
VI	**Multimedia Data Compression:** Lossless Compression Algorithms: Basics of Information Theory, Run-Length Coding, Variable-Length Coding, Dictionary-Based Coding, Arithmetic Coding, Lossy Compression Algorithms: Introduction, Distortion Measures, Quantization, Uniform Scalar Quantization, No uniform Scalar Quantization, Image Compression Standard: The JPEG Standard.	9

Text Books :

1) D. Hearn, M.P .Baker : Computer Graphics, II edition (Pearson Education)
2) Ze-Nian, Li, Mark S. Drew “Fundamentals of Multimedia” (Pearson Education)

Reference Books :

1) Rajan Parekh “Principles of Multimedia “ (Tata McGraw-Hill)
2) F.S. Hill : Computer Graphics Using Open GL, II edition (Pearson Education)
3) W .M. Newman & R.F. Sproul : Principles of Interactive Computer Graphics, 2/e, (McGraw Hill)
4) F .S. Hill: Computer Graphics (Macmillan)
5) Harington : Computer Graphics (McGraw Hill)

Course Code **MCA19213 (02)**

Course Name **Elective IV :(ii) CYBER SECURITY AND DIGITAL FORENSIC**

Total Credits **4**

Course Outcomes

1. Understand the concepts and foundations of Cyber Security
2. Identify security risks
3. Ability to take preventive steps
4. Investigate Cyber Crime and analysis of evidences
5. Acquire knowledge of Digital Forensics.

Units	Contents	Total Hrs
I	Cyber security concepts, Cyber security Strategy, Current Laws Involving Cyber security, International Comprehensive Cyber security Strategy, Cyber security Policy and Strategy Emerging Challenges, Cyber security, Need of Cyber security Malwares: Viruses, Trojans, and Attacks, Development of Computer Viruses, Malicious Attacks	10
II	Threat Landscape, Attack Classification, Threat Attacks, Botnets and Cyber Crime Applications , Different types of crimes, Deep Web , Vulnerabilities, Risk Assessment, and Risk Management, Random Stochastic Models ,issues of Time and Sequence, Attack Graphs, Cyber security vulnerabilities, Constraint and Simulations , Optimization and Risk.	9
III	Cyber Threat Spectrum—Cyberspace Attacks and Weapons, Cyber Threat Capability and Cyber Tools, Cyber Digital Arsenal , Rationale of Cyberspace Infrastructure Attacks Framework forImproving Critical Infrastructure Cyber security.	9
IV	Basics of Critical Infrastructure Protection ,Design and Utility of Infrastructures, Evolution of Infrastructures, Impact of Infrastructures on Society ,Random Nature of Faults, Failures, and Engineering Resilience, Fault Intolerance and Fault Tolerance, Fail-Safe.	10
V	Management Methods and Standards, Economic Impact on Regulation and Duties to Protect ,Legal Requirements and Regulations Critical Infrastructure Protection Strategies and Operations ,Physical Security ,Personnel Security, Operational Security Information Warfare Theory and Application Cost of Cyber security Contemporary Cost of Cyber Crime, Cyber security Insurance New Cyber security Models, Future Generations for Cyber security, Transformational Challenges	9
VI	Digital Forensics: Introduction of digital forensics, Need for digital forensics, Forensic process, Investigation, Digital evidence collection, Application , limitations, Legal considerations, Digital evidence, investigation tools.	9

Reference Books :

1) Cyber Security - Edited By Thomas A Johnson CRC Press.
2) CYBER SECURITY By Dr. Krishan Kumar Goyal, Prof Amit Garg.
3) The NICE Cyber Security Framework: Cyber Security Intelligence and Analytics by Izzat Alsmadi
4) Computer Forensics and Digital Investigation with EnCase Forensic v7 By SuzanneWidup
5) Digital Forensics for Network, Internet and Cloud computing By Cunt P Garrison

Course Code **MCA19213 (03)**

Course Name Elective IV:(iii) VISUAL PROGRAMMING

Credits **4**

Course Outcomes :

1. Understand the development and deployment cycles of enterprise applications.
2. Utilize the .NET framework to build distributed enterprise applications.
3. Develop ASP.NET Web Services, secure web services, and .NET remoting applications.
4. Understand the 3-tier software architecture (presentation/client tier, application tier, data tier) and develop multi-tier applications.
5. Understand and experiment with the deployment of enterprise applications.
6. Develop web applications using a combination of client-side and server-side JavaScript, HTML, HTML5, J Query, AJAX ASP.NET, ADO.NET.
7. Develop network applications using state-of-the-art RPC technologies including: .NET remoting, and Web Services (SOAP).

Units	Contents	Total Hrs
I	**Introduction**, course mechanics, .NET Overview, CLR, Assemblies (monolithic vs. component-based applications), Execution Model, Client-Side vs. Server-Side Programming, Web Technologies, A Tour of the IDE	9
II	**Basics of Front end Technologies** :HTML, HTML5, JavaScript, j Query, Need and Introduction of CSS, Creating new styles in External style sheets, Creating Embedded and Inline style sheets**. Introduction to Server Controls:** A Closer Look at ASP.NET Server Controls, Types of Controls, Standard controls, HTML controls, Data controls, Validation controls, Navigation controls, Login controls, Ajax Extensions, ASP.net State Engine..	10
III	**Introduction to Programming :** Data Types and Variables, Converting and Casting Data Types, Using Arrays and Collections, Statements: Operators, Making Decisions, Loops, Organizing Code : Methods- Functions, The App Code Folder, Organizing Code with Namespaces, Writing Comments, Object Orientation Basics, Important OO Terminology, Events	9
IV	**Consistent Page Layout with Master Pages:** Creating Master Pages, Creating Content Pages, An Introduction to the ASP.NET Page Life Cycle, **Navigation:** Different Ways to Move around Your Site: Understanding Absolute and Relative URLs, Understanding Default Documents, Using the Navigation controls: Architecture of the Navigation Controls, Examining the Website map File, Using the Menu Control, Using the Tree View Control, Using the Site Map Path Control, Programmatic Redirection: Programmatically Redirecting the Client to a Different Page, Server-Side Redirects **Validating User Input:** Gathering Data from the User: Validating User Input in Web Forms, Understanding Request Validation	10
V	**Introduction to ASP.NET AJAX:** The Timer Control, Using Web Services and Page Methods in Ajax Web Sites: What Are Web Services?, Creating Web Services, **An Introduction to j Query:** Choosing the Location for Your j Query Reference, Different Ways to Include the jQuery Library, Selecting Items Using j Query, **Modifying the DOM with j Query**: CSS Methods, Handling Events, Effects with j Query.	9
VI	**Introduction to Database**: What Is a Database? Different Kinds of Relational Databases, Using SQL to Work with Database Data, Retrieving and Manipulating Data with SQL, Creating Your Own Tables, Data Types in SQL Server, Understanding Primary Keys and Identities, Creating Relationships Between Tables, Data Controls, Data Source and Data-bound Controls Working Together, Introducing Security in ASP.NET 4, **exception Handling, Debugging and Tracing, Deploying Your Web Site.**	9

Text Book: Beginning ASP.NET4 in C# and VB,Imar Spaanjaars,Wrox Publication, 2010, ISBN 978-0-470-50221-1

Reference Books:

1) Beginning ASP.NET 4.5 in C#, Apress, 2012, ISBN-10: 1430242515
2) Pro C# with .NET 3.0, Andrew Troelsen, Apress, 2007, ISBN 978-1-59059-823-8
3) Microsoft Windows SharePoint Services 3.0 Step by Step, Olga Londer, Todd Bleeker, Penelope Coventry, James Edelen, Microsoft Press, 2005, ISBN-10: 0735623635
4) Microsoft .NET XML Web Services: Step by Step,Adam Freeman, Allen Jones, Microsoft Press, 2003, ISBN 0-7356-1720-1
5) Microsoft .NET Distributed Applications: Integrating XML Web Services and .NET Remoting, Matthew MacDonald, ISBN 0-7356-1933-6.

Course Code **MCA19213 (04)**

Course Name Elective IV:(iv) CLOUD COMPUTING

Credits **4**

Course Outcomes:

1. Understand the core concepts of the cloud computing and its benefits along with its various models and services in cloud computing.
2. Use various types of Virtualization techniques using its open source tools.
3. Handle various types of cloud file systems.
4. Install cloud computing environments.
5. Manage various stages of SLA life cycle.
6. Identify various security threats and issues in cloud environments.

Units	Contents	Total Hrs
I	**Introduction to Cloud Computing** Introduction, Defining Cloud Computing, Understanding Cloud Architecture, Benefits of Cloud Computing SOA, Web services, Web 2.0, Mash ups, Grid computing, Utility computing, Hardware virtualization, Essentials of Cloud characteristics, Challenges, Cloud economics, Role of Networks in Cloud Computing: Cloud types and service models, Primary Cloud Service models, Cloud Services brokerage, Primary cloud deployment models, cloud computing reference model, The green field and brown field deployment options.	10
II	**Virtualization** Introduction, Understanding Abstraction & Virtualization Technologies, Virtualization, Types of Virtualization, Characteristics of Virtualized environments, Taxonomy of Virtualization techniques, Pros and Cons of Virtualization, Technology examples: Xen, KVM, Vmware, Microsoft Hyper-V, Load Balancing & Virtualization, Understanding Hypervisors, Defining Baseline and metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Servers and instance types, Network Capacity, Scaling.	9
III	**Storage in Cloud** Storage system architecture, Big data, Virtualize data cente r(VDC) architecture, VDC Environment, server, storage, networking, Virtual Machine Components and Process of converting physical to VMs, Block and file level storage virtualization, Virtual Provisioning, VLAN, VSAN and befits, Network traffic management techniques in VDC, Cloud file systems: GFS and HDFS, Big Table, H Base and Dynamo. Features and comparisons among GFS, HDFS	9
IV	**Cloud computing platforms & Standards** Infrastructure as Service, best-of breed cloud infrastructure components, cloud ready converged infrastructure, Anatomy of Cloud infrastructure, Distributed management of virtual infrastructure, scheduling techniques, SLA Commitment, Google Web Services, Amazon Web Services, Microsoft Cloud services. Cloud Computing Standards Objectives, Best Practices and Standards, Practical Issues-Interoperability, Portability, Integration, Security, Standards Organizations and Groups	10
V	**Cloud monitoring and management** Introduction and architecture for federated cloud computing, Performance prediction for HPC on Cloud. SLA management: Types of SLA, Life cycle of SLA, service catalog, cloud portal and its functions, cloud interface standards, system integration and work-flow modeling, cloud service life-cycle phases: service planning, service creation, service operation, and service termination Control layer, its functions and benefits,element and unified manager, software defined approach and techniques for managing IT resources	9
VI	**Security in Cloud Computing** Introduction, Global Risk and Compliance aspects in cloud environments and key security terminologies, Data security risk, Cloud computing and identity, Digital identity and access management, Content level security, Securing the Cloud, Securing Data, Establishing Identity and Presence. Cloud Applications, Research trend in Cloud Computing, Fog Computing, Open Source and Commercial Clouds, Cloud Simulator	9

Text Books:

1) Barrie Sosinsky,"Cloud Computing", Wiley India.
2) Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication.
3) RajkumarBuyya, "Mastering Cloud Computing", Tata McGraw Hill.

Reference Books:

1) Greg Schulr,"Cloud and virtual data storage networking", CRC Press.
2) Anthony T. Velte, "Cloud Computing, A Practical Approach", TATA Mc Graw Hill
3) Pachghare V. K.,"Cloud Computing", PHI Learning
4) Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press.

Course Code **MCA19215**

Course Name **Lab-10 Based on Client Server Computing**

Credits 01 [**Total Hrs** 15]

Course Outcomes:

1. Gain knowledge of Server Side programming by implementing Servlets and JSP.
2. Gain knowledge of J2EE architecture, MVC Architecture.
3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization
4. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter.
5. Acquire knowledge of frameworks such as Struts and Hibernate
6. Distinguish between JDBC and Hibernate.
7. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Spring, Hibernate by analyzing requirements and evaluating existing system.

The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

1. **(**Use of JDBC) WAP TO:
    a. Create a database using JAVA
    b. Create a table, IN THE DATABASE
    c. Insert records in the table
2. Update records in database table based on conditions
3. Display the records in database table based on conditions
4. Write a servlet program in Java that calls a stored procedure and displays the values returned by the stored procedure.
5. Create login form and perform state management using Cookies,
6. Perform state management using HttpSession
7. Create a registration form with validations using java script
8. Create database of student subject-wise data and retrieve all data using JSP
9. Study and implement Hibernate
10. Study and Implement MVC using Struts
11. A mini project using all concepts

Course code MCA19216

Course Name **Lab- 11 - BASED ON ARTIFICIAL INTELLIGENCE AND APPLICATIONS**

Credits **01**

Total Hrs 15

Course Outcomes : Skill to develop Artificial Intelligence, Robotics and Machine Learning Applications.

The following list can be used as guidelines for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. At least 6 Practical based on LISP language.
2. At least 6 Practical based on PROLOG Language.
3. Develop chat-bot application for enquiry purpose.
4. At least 1 practical based on implementation of Natural Language Processing using any of its open source tools.
5. Use any one open source robot simulation software and perform at least 1program to demonstrate simulate robots (like line follower robot).
6. Practical to demonstrate the use of Machine Learning concept to classify any type of information based on facts as "real" or "fake".

Course Code **MCA19217**

Course Name **Lab-12 Based on Elective-4 (COMPUTER GRAPHICS AND MULTIMEDIA)**

Credits **2**

Total Hrs **30**

Course Outcomes: Apply the core concepts of computer graphics and multimedia to real world problems
Minimum Twelve practicals /experiments based on the respective syllabus, covering each of the units.
The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. To Study various in build graphics functions in C library.
2. Write a program to draw a line using DDA algorithm.
3. Write a program to draw a line using Bresenham‘s algorithm.
4. Write a program to draw a circle using midpoint algorithm.
5. Write a program to draw a circle using Bresenham‘s algorithm.
6. Write a program to draw a rectangle using line drawing algorithm.
7. Write a program to perform 2D Transformation on a line.
8. Write a program to perform shear transformation on a rectangle.
9. Write a program to rotate a circle (alternatively inside and outside) around the circumference of another circle.
10. Write a program to draw a car using in build graphics function and translate it from bottom left corner to right bottom corner of screen.
11. Write a program to draw balloons using in build graphics function and translate it from bottom left corner to right top corner of screen.
12. Write a program to draw a cube using in build library function and perform 3D transformations
i) Translations in x, y, z directions
ii) Rotation by angle 450 about z axis, rotation by 600 about y-axis in succession.
iii) Scaling in x-direction by a factor of 2, scaling in y- direction by a factor of 3.
12. Write a program to implement line clipping (Cohen Sutherland algorithm).
13. Write a program for making Bezier curve.
14. Write a program to study various in build functions for 2D drawing in MAYA software.
15. Write a program to show animation of a ball moving in a helical path.
16. Write a program to show animation of solar system.

Course Code **MCA19217**

Course Name **Lab-12 Based on Elective-4 (CYBER SECURITY AND DIGITAL FORENSIC)**

Credits **2**

Total Hrs **30**

Course Outcomes: Apply the concepts of Cyber Security to real world problems

Minimum Twelve practical experiments based on the respective syllabus, covering each of the units.
The sample list of program is given below. This list can be used as guide line but the scope of the laboratory should not be limited to the same.

1 TCP scanning using NMAP
2 Port scanning using NMAP
3 TCP / UDP connectivity using Netcat
4 Network vulnerability using OpenVAS
5 Web application testing using DVWA
6 Manual SQL injection using DVWA
7 XSS using DVWA
8 Automated SQL injection with SqlMap

Course Code **MCA19217**

Course Name **Lab-12 Based on Elective-4 (VISUAL PROGRAMMING)**

Credits **2**

Total Hrs **30**

Course Outcomes :

1. Understand and the use of the development framework to build applications.
2. Develop web applications using a combination of client-side and server-side JavaScript, HTML, HTML5, J Query, AJAX ASP.NET, ADO.NET.

3. Understand and experiment with the deployment of enterprise applications.

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes (recommended : C# language with ASP.NET)

1. Create and use the IDE for creating webform application
2. Create an informative website using HTML and HTML5
3. Create an informative website using HTML, HTML5, Java script and j Query.
4. To Study and the use of different types of CSS.
5. Create an application using ASP.NET to use standard controls.
6. Create an application to study and use login controls and navigation controls.
7. Create an application to use ASP.NET to use arrays and different control structures.
8. Create an application to use Master pages ang navigate to other webpages.
9 Create an application using ASP.NET with AJAX.
10 Create an application using ASP.NET to study and use validation controls.
11. Create an application using ASP.NET to study and use of Function.
12. Create an application using ASP.NET to study and use of ADO.NET .

Course code **MCA19217**

Course Name **Lab-12 Based on Elective- 4 (CLOUD COMPUTING - LAB)**

Credits **02**

Total Hrs **30**

Course Outcomes :

1. Develop Skill to use Cloud sim Tool to develop its Applications
2. Acquire Skill to develop applications using Hadoop Map/Reduce
3. Understand PAAS type applications
4. Ability to use Amazon, Microsoft Azure Web Services.

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. Case Study: To study cloud architecture and cloud computing model
2. Installation and Configuration of virtualization using KVM.
3. A simple example showing how to create a data center with one host and run one cloudlet on it. (use Cloud sim Tool)
4. A simple example showing how to create two data centers with one host and a network topology each and run two cloudlets on them. (use Cloud sim Tool)
5. An example showing how to create scalable simulations. (use Cloud sim Tool)
6. An example showing how to pause and resume the simulation, and create simulation entities (a Data center Broker in this example) dynamically. (use Cloud sim Tool)
7. Installation and Configuration of Hadoop.
8. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
9. Case Study: PAAS(Facebook, Google App Engine)
10. Case Study: Amazon Web Services, Microsoft Azure.

SEMESTER V

Course Code **MCA19301**

Course Name : **MOBILE APPLICATION DEVELOPMENT**

Credits **4**

Course Outcomes :

1. Identify various concepts of mobile programming that make it unique from programming for other platforms,
2. Critique mobile applications on their design pros and cons.
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
4. Program mobile applications for the Android operating system that use basic and advanced phone features.
5. Deploy applications to the Android marketplace for distribution.

Units	Contents	Total Hrs
I	Introduction to Mobile A brief history of Mobile, The Mobile Ecosystem, Why Mobile?, Types of Mobile Applications, Mobile Information Architecture, Mobile Design, Mobile 2.0, Mobile Web development, Small Computing Device Requirements. J2ME: Overview The World of Java, Inside J2ME, J2ME Architecture, MIDlet Programming, J2ME Wireless Toolkit, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite.	10
II	Introduction to Android: History of Android, Introduction to Android, Operating Systems, Android Development Tools, Android Architecture.	9
III	Development Tools: Installing and using Eclipse with ADT plug-in, Installing Virtual machine for Android sandwich/Jelly bean (Emulator), configuring the installed tools, creating a android project – Hello Word, run on emulator, Deploy it on USB-connected Android device.	9
IV	User Interface Architecture: Application context, intents, Activity life cycle, multiple screen sizes User Interface Design: Form widgets, Text Fields, Layouts, Button control, toggle buttons, Spinners(Combo boxes),Images, Menu, Dialog.	10
V	Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources. Understanding of SQLite database, connecting with the database.	9
VI	Publishing and Distributing Android Applications : The Android Software Development Process, Assessing Project Risks, Writing Essential Project Documentation, Deploying Mobile Applications, Designing and Developing Bulletproof Android Applications.	9

Text Books:

1. J2ME: The Complete Reference, James Keogh, Tata McGraw Hill
2. Android application development for java programmers. By James C. Sheusi. Publisher: Cengage Learning, 2013.
3. Lauren Darcey and Shane Conder, - Android Wireless Application Development||, Pearson Edn, 2nd edn. (2011)

Reference Books:

1) Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2) Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
3) Android Application Development All in one for Dummies by Barry Burd, Edition: I

Course Code **MCA19302**

Course Name **SOFTWARE ENGINEERING**

Credits **4**

Course Outcomes :

1. Recognize evolving role of software project management.
2. Understand and estimate cost for software project.
3. Identify & analyze aspect in s/w to manage time, process & resources effectively with quality concept.
4. Estimate software productivity using metrics and indicator & identify important issues for planning a project
5. Judge different testing techniques used to test software.
6. Evaluate the role of user and software teams.

Units	Contents	Total Hrs
I	**Evolving role of Software**. Software crises & myths. Software engineering. Software process & process models: Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts: People, Product, Process, Project. W5HH principle, critical practice.	10
II	**Measures, Metrics & Indicators**. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning: Scope, resources, estimation, decomposition technique, Tools. Software risks: identification, risk projection, refinement & RMMM plan.	9
III	**Project Scheduling:** Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.	9
IV	**System Engineering:** Hierarchy, Business Process & Product engineering: Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model & documentation.	10
V	**Software architecture:** Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User-interface design : Golden Rule. UTD, Task analysis &modlling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation	9
VI	**Software Testing Fundamentals**; test case design, Whit ebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.	9

Text Book : Pressman Roger. S. : Software Engineering, A Practitioner's Approach TMH.

Reference Books :

1) Somerville : Software Engineering (Addison-Wesley) (5/e)
2) Fairly R. : Software Engineering (McGraw Hill)
3) Davis A. : Principles of Software Development (McGraw Hill)
4) Shooman, M.L. : Software Engineering (McGraw-Hill).

Course Code	**MCA19303**
Course Name	**DISTRIBUTED SYSTEMS**
Total Credits	**4**

Course Outcomes :

1. Understand the concept and foundations of Distributed Systems.
2. Learn the principles and architectures in distributed systems.
3. Learn Distributed models, algorithms and programming used
4. Understand in detail the system level and support required for distributed system.
5. Learn issues related to clock Synchronization and the need for global state in distributed systems.
6. Understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
7. Learn how several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.
8. Understand the issues involved in process management and resource management.

Units	Contents	Total Hrs
I	Introduction of Distributed System, Middleware, Design Goals, Types of Distributed Systems, Architectures, layered architectures, system architectures, Centralized, Decentralized, Hybrid architectures, Network File System.	10
II	Processes: Threads, threads in distributed systems, Virtualization, clients, Networked user interfaces, Servers, code migration, RPC, parameter passing, Message oriented communication, Multicast communication.	9
III	Naming: Names, Identifiers, addresses, Structured Naming, Attribute based naming,, clock synchronisation, physical clocks, logical clocks, Mutual exclusion, Election algorithms, bully algorithm, ring algorithm, location systems.	9
IV	Consistency and replication: Reasons for replication, Data centric consistency models, monotonic reads and writes, Replica management, Content distribution, Consistency protocols, primary based protocol, Cache coherence protocols, Client centric consistency.	10
V	Fault Tolerance: Introduction to fault tolerance, concepts, models, Failure masking by redundancy, process resilience, Failure masking and replication, consensus in faulty systems with crash failures, ex Paxos, Client server communication, point to point communication, atomic multicast, Recovery, Recovery oriented computing.	9
VI	Introduction to Security, Security Threats, policies and mechanisms, Design issues, Cryptography, Secure Channels, Authentication, integrity, confidentiality, secure group communication, Kerberos, Access control, Firewalls, Secure Naming, Security management, Key management, Authorization management.	9

Text Book: Distributed Systems, Andrew S.Tanenbaum, Maarten Van Steen, 3rd Edn, Pearson Education

Reference Books:

1. Distributed Systems, Concepts and Design, George Coulouris, J Dollimore and Tim Kindberg, Pearson Education.
2. Distributed Systems, An Algorithm Approach, Sikumar Ghosh, Chapman & Hall/CRC, Taylor & Fransis Group.
3. Distributed Computing: Principles, Algorithms, and Systems, Ajay D. Kshemkalyani, Mukesh Singhal, Cambridge University Press.
4. Principles of Distributed Systems, VK Garg, Kluwer Academic Publishers.
5. Distributed Systems and Algorithmic Approach, Su Kumar Boss, Chamal & Hall.

Course Code **MCA 19304(01)**

Course Name **DATA ANALYTICS**

Total Credits **4**

Course Outcomes :

At the end of the course, the students will be able to:
1. Develop and maintain reliable, scalable systems using Apache, HADOOP
2. Write Map Reduce based application
3. Differentiate between conventional SQL and NoSQL
4. Analyze and develop Big Data solutions using HIVE and PIG

Units	Contents	Total Hrs
I	**Introduction** Distributed file system and its issues, Introduction to big data, big data characteristics, types of big data, traditional vs. big data approach, big data applications	**10**
II	**Hadoop** Why Hadoop? Hadoop architecture, Hadoop components HDFS and YARN, comparison between YARN 1 and YARN 2architecture, HDFS federation : Name Node, Data Node, Resource Manager, Job Tracker, Task Tracker Hadoop Ecosystem : Scoop, HIVE, PIG, Flume, Zookeeper,HBASE Hadoop installation in pseudo distribution mode, running HDFSCommands	**9**
III	**Map Reduce** Understanding Map Reduce, Map Task, Reduce Task, speculative execution, partioner and combiner in Map Reduce Running sample Map Reduce Program: Word Count. Algorithm using Map Reduce :-matrix vector multiplication, -grouping and aggregation-relational algebra operations	**9**
IV	**NoSQL** What is NoSQL? NoSQL - Case study, data architecture pattern: key value, column family, document store.HBASE overview, HBASE data model, row oriented vs. column oriented storage, HBASE architecture, HBASE shell commands	**10**
V	**HIVE** : background, architecture, warehouse directory and meta-store, HIVE query language, loading data into table, HIVE built-in functions, joins in HIVE, HIVE installation, Hive QL: querying data, sorting and Aggregation	**9**
VI	**PIG** : background, architecture, PIG Latin Basics, PIG execution modes, PIG processing – loading and transforming data, PIG built-in functions, filtering, grouping, sorting data Installation of PIG and PIG Latin commands	**9**

Reference Books :

1) Tom White, “HADOOP: The definitive Guide”, O Reilly 2012
2) Chris Eaton, Dirk deroos et al., “Understanding Big Data”, McGraw Hill, 2012.
3) Big Data Analytics – RadhaShankarmani and M. Vijayalakshmi Wiley Text book Series
4) Hadoop in Action - Chuck Lam Dreamtech Press
5) Hadoop in Practice - Alex Holmes Dreamtech Press.

Course Code **MCA19304(02)**

Course Name **BIO - INFORMATICS**

Credit **4**

Course Outcomes : **-**

1. Understand Biologists need of information in digital form for correct and meaningful interpretation.
2. Apply knowledge of Data mining and detail study of Genome analysis using different tools and databases.
3. Detail study of Gene Identification and prediction methods for micro analysis.
4. Apply knowledge of Protein and proteomics tools techniques as visualization methods in biological environment.
5. Understand knowledge of computational methods, biological system and pathways.
6. Illustrate the concept of drug discovery and implementation of bioinformatics applications.

Units	Contents	Total Hrs.
I	**Introduction:** Historical overview and definition, bioinformatics applications, major databases in bioinformatics, data management and analysis, central dogma of molecular biology	**10**
II	**Data mining and Genome analysis :**Tools for web search, data retrieval tools, data mining of biological databases, genome analysis, genome mapping, genetic mapping and linkage analysis, the human genome project	**9**
III	**Gene Identification and Prediction** Basis of gene prediction, pattern recognition, gene prediction methods, gene prediction tools, DNA microarrays, data sources and tools for microarray analysis	**9**

IV	**Protein and Proteomics** Overview of the protein structure, protein structure visualization, structure-based protein classification, protein structure visualization databases and tools, tools and techniques in proteomics, protein-protein interaction, methods of gene family identification.	**10**
V	**Computational methods for Pathways and systems Biology** Analysis of pathways, metabolic network properties, metabolic control analysis, biological mark up languages, application of computer in biology , molecular biology and bioinformatics	**9**
VI	**Drug Discovery and Bioinformatic applications** Areas influencing drug discovery, pharmacogenetics and pharmacogenomics applications, analysis of single nucleotide polymorphisms, important parameters of drug discovery, Application of bioinformatics in various different fields like biotechnology, drug development, gene therapy etc.	**9**

Text Book: Bioinformatics, Methods and Applications by S.C. Rastogi, N. Mendiratta, P. Rastogi Tata McGraw-Hill India ISBN 81-203-3062-5.

Reference Books:

1. Introduction to Bioinformatics by Arthur M. Lesk OXFORD university press ISBN 10-0-19-568525-3
2. Bioinformatics Computing by Bergeron Bryan **Prentice-Hall of India Private Limited** ISBN :81-203-2258-4
3. Fundamental Concepts of Bioinformatics by Dan E. Krane and Michael L. Raymer Pearson Education ISBN 81-7758-757-9

Course Code **MCA 19304(03)**

Course Name **GAME PROGRAMMING**

Credit **4**

Course Outcomes :

1. write survey on the gamification paradigms.
2. Solve problems using gamification and open source tools.
3. solve problems for multi-core or distributed, concurrent/Parallel environments

Units	Contents	Total Hrs
I	**Introduction:** Game Programming, Development Process of Game Programming, Programming languages used to develop, APIs and Libraries for Graphic APIs and other, Game structure. 10	
II	**3d Graphics For Game Programming:** Coordinate Systems, Ray Tracing, Modeling in Game Production, Vertex Processing, Rasterization, Fragment Processing and Output Merging, Illumination and Shaders, Parametric Curves and Surfaces, Shader Models, Image Texturing, Bump Mapping, Advanced Texturing, Character Animation, Physics-based Simulation	9
III	**Game Design Principles:** Character development, Story Telling, Narration, Game Balancing, Core mechanics, Principles of level design, Genres of Games, Collision Detection, Game Logic, Game AI, Path Finding	9
IV	**Gaming Engine Design:** Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting. Game engines - Adventure Game Studio, DX Studio.	10
V	**Gaming Platforms And Frameworks:** Flash, DirectX, OpenGL, JAVA, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS,	9

VI	**Game Development**: Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi-Player games.	9

Text Books :

1) David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann, 2 Edition, 2006.
2) JungHyun Han, "3D Graphics for Game Programming", Chapman and Hall/CRC, 1st edition, 2011.
3) Jonathan S. Harbour, "Beginning Game Programming", Course Technology PTR, 3 edition, 2009.
4) Dino Dini, "Essential 3D Game Programming", Morgan Kaufmann, 1st edition 2012.
5) Kenneth C. Finney,"3D Game Programming All in One", Premier Press

Reference Books:

1) Mike McShaffrfy, "Game Coding Complete", Third Edition, Charles River Media, 2009.
2) Ernest Adams and Andrew Rollings, "Fundamentals of Game Design", Prentice Hall 1st edition, 2006.
3) Roger E. Pedersen, "Game Design Foundations", Edition 2, Jones & Bartlett Learning, 2009.
4) Scott Rogers, "Level Up! The Guide to Great Video Game Design", Wiley, 1st edition, 2010.
5) Jason Gregory, "Game Engine Architecture", A K Peters, 2009.
6) Jeannie Novak, "Game Development Essentials", 3rd Edition, Delmar Cengage Learning, 2011.

Course Code **MCA 19304(04)**

Course Name **INTERNET OF THINGS**

Credit **4**

Course Outcomes :

At the end of the course, the students will be able to

1. Identify the use of IoT from a global context.
2. Design application using IoT.
3. Analyze the IoT enabling Technologies
4. Determine the real world problems and challenges in IoT .

Units	Contents	Total Hrs
I	**IoT Architecture** – State of the Art Introduction, State of the art, Architecture Reference Model, Introduction, Reference model and architecture, IoT reference model, IoT Reference Architecture, Introduction, Functional view, Information view, Deployment and operational view, Other relevant architectural views	10
II	**IoT Enabling Technologies** - Wireless Sensor Networks ,Cloud Computing, Big Data Analytics, Communication Protocols, Embedded Systems	9
III	**Real-World Design Constraints**- Introduction, Technical design Constraints–hardware, Data representation and visualization, Interaction and remote control	9
IV	**Open – Source Prototyping Platforms for IoT**- Basic Arduino Programming Extended Arduino Libraries, Arduino – Based Internet Communication, Raspberry PI, Sensors and Interfacing	10
V	**Data Management,** Business Process in IoT, IoT Analytics, Creative Thinking Techniques, Modification, Combination Scenarios, Decentralized and Interoperable ,Approaches, Object – Information Distribution, Architecture, Object Naming Service(ONS), Service Oriented Architecture, Network of Information,	9
VI	**Domain specific** Home Automation - Smart Lighting, Smart Appliances , Intrusion Detection , Smoke/Gas Detectors Energy-Smart Grids ,Renewable Energy Systems ,Prognostics Health & Lifestyle -Health & Fitness Monitoring ,Wearable Electronics ,Agriculture - Smart Irrigation ,Green House Control ,Retail- Inventory Management , Smart Payments ,Smart Vending Machines , Cities -Smart Parking ,Smart Lighting ,Smart Roads ,Structural Health Monitoring ,Surveillance ,Emergency Response	9

Reference Books:

1) From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, Jan Holler VlasiosTsiatsis Catherine Mulligan Stefan Aves & Stamatis Karnouskos David Boyle
2) VijayMadisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Ed., VPT, 2014
3) Getting Started with the Internet of Things by Cuno P fister
4) The Internet of Things: Connecting Objects by Hakima Chaouchi
5) FrancisdaCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition , Apress Publications, 2013

Course Code **MCA19306**

Course Name Lab 13 **BASED ON MOBILE APPLICATION DEVELOPMENT**

Credits **1**

Total Hrs **15**

Course Outcomes **Skill of Mobile Application Development using Android Studio Development tool.**

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list is to inform about minimum expected outcomes

1. Add two Edit Text. When a number is entered in Edit Text 1, the square of that number should be displayed in Edit Text 2.
2. Add an Edit Text and a button. When the button is clicked, the text inputted in Edit Text should be retrieved and displayed back to the user
3. Add two EditText and a button. When the button is clicked, the text inputted in Edit Text 1 should be retrieved and displayed in EditText2.
4. Program a calculator
5. Create a Unit convertor for height
6. Create a Unit convertor for height and weight in the same application. Selection of height/weight can be done using a spinner.
7. Add a spinner. When the spinner is selected, there should be three options (e.g., android, java, testing). When you click on each option, it should go to another page containing some other components. Each of these pages should have a "back" button, which on pressing will take you back to the page with the spinner.
8. Create applications to include Action Bar, Menus, Dialogs and Notifications.
9. Create a user login form and registration form. First time users have to register through the registration form and the details should be stored in the database. Then they can login using the login page.
10. Create a camera application, where you can click a picture and then save it as the wallpaper.
11. Create a media player which plays an mp3 song.
12. Create a media recorder which will record the sound.

References:

1. Professional Android 4 Development by Reto Meier, John Wiley and Sons, 2012.
2. Android in Action, Third Edition, by W. Frank Ableson, RobiSen, Chris King, C. Enrique Ortiz, 2012
3. Android Application Development Cookbook, by Wei-Meng Lee, John Wiley and Sons, 2013
4. Beginning Android 4, by Grant Allen, Apress, 2011.

Course Code **MCA19307**

Course Name **Lab 14 - Distributed Systems**

Credits **1**

Total Hrs **15**

Course Comes: Apply the principles and architectures in distributed systems

Minimum 12 practicals /experiments must be completed based on the respective syllabus covering each of the units.

Sr. no	List of the practicals not limited to the following:
1.	Write a program to determine class, Network and Host ID of the node address using software tool
2.	Program to implement process synchronization
3	Write a program to implement Inter process Communication
4.	Practicals to demonstrate the Remote Procedure call RPC
5.	Practicals to demonstrate the Parameter Passing
6.	Practicals based on demonstration of advanced transient messaging
7.	Practicals based on implementation of mutual exclusion algorithms
8.	Practicals based on implementation of Election algorithms
9.	Write the programs for Recovery Oriented Programming
10.	Write a program to create one or more grid users
12	Write a program to creates Gridlets and sends them to a grid resource entity
11.	Write a program to show how to keep message logging
13.	Programs demonstrating flooding based multicasting
14.	Write a program to demonstrate of how to connect two Grid entities using a link.
15.	Write a program to net user entity sends messages to test entity and test entity sends back these messages
16.	Implement the program for data security through cryptographic methods
17.	Implement the program to check the authenticity
18.	Write the program to check the Data Integrity

Course Code **MCA19308**

Course Name **Lab 15 - Based on Data Analytics**

Credits **2**

Total Hrs **30**

Course Outcomes 1. Write Map Reduce based applications
2. Analyze and develop Big Data solutions using HIVE and PIG

Minimum 12 practicals / experiments must be completed based on the respective syllabus covering each of the units. The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list.
Aim of the list to inform about minimum expected outcomes.

1 To understand the overall programming architecture using Map Reduce API
2 Store the basic information about students such as roll no, name, date of birth , and address of student using various collection types such as List, Set and Map.
3 Basic CRUD operations in Mongo DB
4 Retrieve various types of documents from students collection
5 To find documents from Students collection
6 Develop Map Reduce Work Application
7 Creating the HDFS tables and loading them in Hive and learn joining of tables in Hive

Course Code **MCA19308**
Course Name **Lab15 - Based on Bio-Informatics**
Credit **02**

Total Hrs **30**

Course Outcomes : Skill of effective use of Database search tools and computational methods.

The following list can be used as guideline for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list is to inform about minimum expected outcomes.

1. Literature databases (searching & downloading).
2. Perform any two techniques of Protein and proteomics as visualization methods.
3. Protein sequence databases PIR-PSD
4. Database searches: Sequence comparisons & alignment
5. Exploring EMBOSS series .
6. Sequence comparisons & alignment
7. Case study on Visualisation &Bio-Informatics Applications.

Course code **MCA19308**

Course Name **Lab-15 Based on Elective- 5 (GAME PROGRAMMING LAB)**

Credits **02**

Total Hrs **30**

Course Outcomes **Skill to develop Game Programming.**

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. Case study to define Game Structure
2. To develop any one 3D graphics for game programming using any one of its open source development tool.
3. To develop program on any one type of Game Logic (Like Collision Detection, etc.)
4. Use Adventure Game Studio/DX Studio and develop any application of its type.
5. Case study on OpenGL.
6. To develop any one 2D or 3D interactive small game using any one of its open source framework.

Course Code **MCA19308**

Course Name **Lab 15 - Based on Internet of Things**

Credits **2**

Total Hrs **30**

Course Outcomes : Design IoT based application

Minimum Twelve practicals / experiments must be completed based on the respective syllabus covering each of the units.

The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes.

1. Study of Raspberry-Pi, Beagle board, Arduino and other micro controller .

2. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board.

3. Study of Connectivity and configuration of Raspberry-Pi /Beagle board circuit with basic peripherals, LEDS. Understanding GPIO and its use in program.

4. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with temperature sensor. Write an application to read the environment temperature. If temperature crosses a threshold value, the application indicated user using LEDSs.

5. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor.

6. Write an application to detect obstacle and notify user using LEDs.

7. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.

8. Understanding and connectivity of Raspberry-Pi /Beagle board with a Zigbee module. Write a network application for communication between two devices using Zigbee .

9. Write an application using Raspberry-Pi /Beagle board to control the operation of stepper motor.

10. Write an application using Raspberry-Pi /Beagle board to control the operation of a hardware simulated traffic signal.

11. Write a server application to be deployed on Raspberry-Pi /Beagle board. Write client applications to get services from the server application .

12. Create a small dashboard application to be deployed on cloud. Different publisher devices can publish their information and interested application can subscribe.

SEMESTER VI

Course code **MCA19310**

Course Name **INDUSTRY PROJECT AND INTERNSHIP/START-UP**

Credits 18

Guidelines :

1. Students may opt either Industrial Project or Internship or Start-up.
2. Industrial Project: It is a software development project assigned by any registered industry/organization to the student. Student may complete the project at industry/organization or from home. Student shall submit the completion/implementation certificate issued by the Industry/organization. Students should take prior approval from the institute in this regard.
3. Internship: In the internship, students shall apply direct/through institute to the Industry/Organization for internship or take use of 'Intershala', an initiative of AICTE. The internship is placement of students in the industry/organization for which they are entitled to receive stipend. Students shall submit the appointment letter at the start of the internship and completion certificate at the end of the session well before the final examination.
4. Start-up: Students may undertake startup activity which is recognized by the Institute. Institute shall incubate the start-up using the system available at institute level and assign a mentor/guide to the student. The necessary support may be extended to the students for this activity. Students shall submit their proposal well in advance to the institute and Institute should grant its approval through available mechanism at Institute level. The registration of start-up and business proposal shall be the essential documents for this activity. Activity shall be evaluated on the basis of its profit ratio.
5. In all the three above activities, students need to submit complete Project Report to the Institute well before the final examination.

Course code **MCA19309**

Course Name Seminar / Presentation

Credits 06

Guidelines :

1. Institute shall assign mentor/guide to each student.
2. Student shall submit synopsis approved by the mentor/guide.
3. Institute shall approve the seminar topic.
4. Students shall prepare seminar report and presentation with the help of guide and submit seminar report and presentation approved by the guide well in advance to conduct final presentation/examination.
5. Students may take seminar topic based on new technology, case study, success story of start=up he/she has undertaken in the 'Industrial Project/Internship/Start-up activity.

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NOTIFICATION

No. 37/2021 Date : 01/04/2021

Subject : Implementation of new syllabi of Semester I & II of Master in Computer Application (M.C.A.) (Two Year… Semester Pattern) (Choice Based Credit Grade System) in the Faculty of Science & Technology from the session 2020-2021 and onwards..

It is notified for general information of all concerned that the auhorities of the University have accepted to implement the new syllabus of Semester I & II of Master in Computer Application (M.C.A.) (Two Year… Semester Pattern) (Choice Based Credit Grade System) in the Faculty of Science & Technology from the session 2020-2021 and onwards as per **Appendix-A :**

Sd/-
(Dr.H.R.Deshmukh)
I/c Registrar
Sant Gadge Baba Amravati University

Appendix-A

SYLLABUS OF MASTER IN COMPUTER APPLICATION

(M.C.A.) (TWO YEAR… SEMESTER PATTERN) (CHOICE BASED CREDIT GRADE SYSTEM

SYLLABUS OF MASTER IN COMPUTER APPLICATION (Two Years C.B.C.S.)
SEMESTER I

Course Code	**MCA20101**
Course Name	**Advance Computer Architecture**
Credits	**03**
Course Outcomes:	On completion of the course, the students will be able to
	1. Explain fundamentals of parallel processing and pipeline processing
	2. Analyze and classify different pipelined processors
	3. Describe architectural features of advanced processors.
	4. Demonstrate concepts of parallelism in hardware/software.

Units	Contents	Total Hrs
I	Amdahl's law, Von Neumann machine architecture, Program development tools, Operating systems. Design of ALU, Bit slice processors. Concept of instruction formats and instruction set, instruction set types, types of operands and operations, Generation of memory addresses and addressing modes, Subroutine nesting using stacks to implement subroutine calls and calling conventions, Processor organizations, Register organization, Stack based organizations, Encoding of machine instructions, General features of RISC and CISC instruction sets, modern processors convergence of RISK with CISC, Processor microarchitecture-I - Fundamental concepts for data path implementation, Processor microarchitecture-II - Data path implementation, microprogrammed execution, recent innovations in execution unit design.	10
II	Overview of Parallel Processing and Pipelining Processing, study and comparison of uni-processors and parallel processors. Conventional and EPIC architecture. Evolution of parallel processors, future trends and there architecture. Overview of Parallel Processing and Pipelining Processing Necessity of high performance, Constraints of conventional architecture, Parallelism in uniprocessor system, Evolution of parallel processors, future trends, Architectural Classification, Applications of parallel processing, Instruction level Parallelism and Thread Level Parallelism, Explicitly Parallel Instruction Computing (EPIC) Architecture. Principles of scalable performance: Performance Metrics and Measures, Speedup Performance Laws.	10

III	- Instruction pipeline, instruction pipeline hazards, overcoming hazards using a pipeline with forwarding paths, instruction set design influence on pipelining, example of pipelined CISC processor, example of pipelined RISC processor, VLIW (Very Long Instruction Word) processors, Vector processors, Multithreaded processors, Compilation techniques support to instruction level parallelism, Extracting parallelism.	10
IV	Virtual memory organization, mapping functions for translating the program pages in virtual to physical addresses space, partitioning, segmentation (superpages or page blocks) partitioning of virtual address space in to segment and page address, demand paging and swapping, cache and virtual swapping, cache and virtual memory, inverted page tables concept, protection between programs running on the same system, accessing I/O devices, programmed I/O, interrupts, direct memory access DMA, bus arbitration, interface circuits, I/O interfaces, I/O processors, external I/O devices.	10
V	Multiprocessor Architectures – Objectives, Introduction, Multiprocessor Architectures, Performance Charateristics of Multiprocessors, Multicore Architectures – Single Chip Multiprocessors, Flynn Classification, Interconnection Structures, Interconnection Networks – Dynamic and Static Multiprocessor System Interconnects, Banyan and Delta Networks (Banyan Multistage Networks), Interprocess Arbitration, Interprocess Communication, Memory Organization in Multiprocessors, Shared-memory Multiprocessor Systems, Synchronization – Memory Organization, Contention and Arbitration, Cache Coherence and Synchronization Mechanisms, Cache Coherence, Message Passing Systems, Issues in Cluster Computing	10
VI	Study of Architecture of Multithreaded processors, Latency hiding techniques, Principles of multithreading, Issues and solutions. Parallel Programming Techniques: Message passing program development, Synchronous and asynchronous message passing, Message passing parallel programming, Shared Memory Programming, Data Parallel Programming. Implementation issues of a multithreaded program.	10

Textbook :

1. Computer Architecture and Organization by Nicholus Carter &Rajkamal, Schaum Series Pub.
2. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill International Edition

Reference Books :

1. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill
2. V.Rajaraman, L Sivaram Murthy, "Parallel Computers", PHI.
3. William Stallings, "Computer Organization and Architecture, Designing for performance" Prentice Hall, Sixth edition.
4. Kai Hwang, Scalable Parallel Computing.
5. Harrold Stone, High performance computer Architecture.
6. Richard Y. Kain, Advanced Computer Architecture
7. http://www.intel.com/products/processor (for Intel Itanium Processor)

Course Code	**MCA20102**
Course Name	**Data Structure & Algorithms**
Credits	**4**
Course Outcomes :	On completion of the course, the students will be able to
	1. Explain and identify fundamental concepts of data structures
	2. Understand various data searching and sorting methods with its complexity
	3. Demonstrate operations such as insertion, deletion, searching and traversing on data structures.
	4. Design algorithms for solving problems with the help of fundamental data structures

Units	Contents	Total Hrs
I	Data structures basics, Mathematical /algorithmic notations & functions, Complexity of algorithms, Sub-algorithms. String processing: storing strings, character data type,string operations, word processing, and pattern matching algorithms.	10
II	Linear arrays and their representation in memory, traversing linear arrays, inserting & deleting operations, Bubble sort, Linear search and Binary search algorithms. Multidimensional arrays, Pointer arrays. Record structures and their memory representation. Matrices and sparse matrices.	10
III	Linked lists and their representation in memory, traversing a linked list, searching a linked list.Memoryallocation & garbage collection.Insertion deletion operations on linked lists.Header linked lists, Two- way linked lists.	10
IV	Stacks and their array representation. Arithmetic expressions: Polish notation. Quick sort, application of stacks. Implementation of recursive procedures by stacks, Queues. Deques. Priority queues.	10
V	Trees, Binary trees & and their representation in memory,Traversing binary trees. Traversal algorithms using stacks, Header nodes : threads. Heap and heapsort.Path length & Huffman's algorithm.Generaltrees.	10
VI	Graph theory, sequential representations of graphs, Warshalls' algorithm, Linked representation, operations & traversing the graphs. Posets& Topological sorting. Insertion Sort, Selection Sort. Radix sort.	10

Textbook :	
	Seymour Lipschutz: "Data Structures with C", Schaum's Outline Series.

Reference Books :	
	1. Forouzan, Gilberg: Data Structures and Algorithms, CENGAGELearning. 2. ReemaThareja: Data Structures using C, Oxford University Press,2011. 3. Arpita Gopal: Magnifying Data structures, PHI (EEE),2010. 4. Ellis Horowitz, SartajSahni: Fundamentals of Data Structures,CBS Publications.

Course Code	**MCA20103**
Course Name	**Operating System**
Credits	**4**
Course Outcomes :	On completion of the course, the students will be able to
	1. Understand the concept of programs & processes along with the need of scheduling in operating systems
	2. Recognize different states of process and schedulers to apply scheduling algorithms to meet the scheduling objectives and acquire the knowledge of dealing with deadlocks.
	3. Apply memory management techniques & virtual memory concepts to avoid page faults and computing page replacement strategies
	4. Analyze and apply various protection and security mechanisms
	5. Compare different operating system

Units	Contents	Total Hrs
I	Introduction: OperatingSystem (OS) definition, OS Evolution, OS Components and Services. Process Concept, Process Scheduling, Operations on Processes, Cooperating Processes, Interprocess Communication, Threads Overview, Multi-threading Models, Threading Issues, Java Threads.	10

II	CPU Scheduling Concepts, Scheduling Criteria and Algorithms. Process Synchronization: The Critical-Section Problem, Synchronization Hardware,Semaphores,Monitors. Deadlocks: Definition & Characterization, Deadlocks Prevention,Avoidance,Detection and Recovery from Deadlock.	10

III	Memory Management Background, Swapping, Contiguous Memory Allocation Schemes, Paging, Segmentation. Virtual Memory Management: Background, Demand Paging scheme, Process Creation, Page Replacement Policies, Allocation of Frames, Thrashing.	10
IV	File-System Interface; Directory structure, File-System Mounting, File Sharing & Protection. File-System Structure, File-System Implementation. Directory Implementation, Allocation Methods, Free- Space Management. File Recovery	10
V	I/O Systems: Overview, I/O Hardware, Application I/O Interface, and Kernel I/O Subsystem. Transforming I/O to Hardware Operations. Disk Scheduling, Disk Management,Swap – Space Management, RAID Structure.	10
VI	File protection & security: Goals of Protection, Principles of Protection, Revocation of Access Rights, Security Problem, Program Threats, Classifications, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems	10

Textbook :	
	Text Books :AviSilberschatz , P.B.Galvin, G. Gagne : “Operating System Concept” (Sixth Edition) John Wiley & Sons Publication.

Reference Books :	
	1. A .S.Tanenbaum,“Modern Operating Systems” Pearson education. 2. William Stallings,”Operating Systems”Prentice-Hall. 3. D.M.Dhamdhere ,“Operating Systems ”Tata McGraw-Hill. 4. M.Milankovic,“Operating Systems”McGraw-Hill. 5. AchuttGodbole, “Operating Systems” TataMcGraw-Hill.

Course Code	**MCA20104**
Course Name	**Data Communication & Networks**
Credits	**4**
Course Outcomes :	On completion of the course, the students will be able to
	1. Understand the concepts of Data Communication Systems and its components.
	2. Analyze various types of application layer protocols and its applicability in various domains.
	3. Generalize all transport layer protocols to understand end-to-end communication over a network.
	4. Demonstrate basic understanding of network layer protocols for data routing in network.
	5. Analyze functional & procedural means to transfer data between network entities.
	6. Acquire introductory knowledge about digital wireless communication systems.

Units	Contents	Total Hrs
I	**Data Communication:** Advantages, Basic Model of Communication System; **Data Transmission: Modes:** Simplex, Half Duplex,Full Duplex; **Methods/Types:** Parallel, Serial: Asynchronous,Synchronous, Isochronous; **Transmission Media:** Guided and Unguided; **Modulation:** Amplitude, Phase Shift, Frequency, PAM, PCM; **Multiplexing:** FDM, WDM, TDM; **Switching:** Circuit, Message, Packet; Delays in Packet Switched Network, Packet Loss; Telephone Networks, Network topologies, Types of Networks: LAN,MAN,WAN; **Network Reference Models:** ISO-OSI model, TCP/IP model	10
II	**Application Layer:** Services; **Processes:** Client-Server Model, Socket Interface; Services required by Application Layer; **HTTP:** Introduction, RTT, HTTP Handshake, types of HTTP Connections, HTTP Messages, Authentication and Cookies; **FTP:** Service Model, FTP Commands; Electronic Mail; SMTP; **DNS:** Services and working	10
III	**Transport Layer:** Services; Multiplexing and Demultiplexing Applications; Connectionless Transport – UDP; Principles of Reliable of Data Transfer (RDT); Stop-and-wait and Pipelined protocols; GBN protocol; Connection-Oriented Transport: TCP; Flow Control; Principlesof Congestion Control; Approaches towards Congestion Control; TCP Congestion Control	10
IV	**Network Layer:** Services; Network Service Model: Datagram, Virtual Circuit; Routing Principles; Routing Algorithms: Classifications; Hierarchical Routing; Internet Protocol: IP Addressing, IPv4: Classes and Packet format, DHCP; ICMP; Routing in the Internet: RIP, OSPF, BGP; Router; IPv6; Multicast Routing.	10
V	**Data Link Layer:** Services; Error Detection and Correction; Multiple Access Protocols in LANs: ALOHA, CSMA/CD; LAN Addresses and ARP; Ethernet; Hubs, Bridges andSwitches; Point-to-PointProtocol.	10
VI	**Wireless Communication:** Advantages, Applications; **Signals:** Characteristics, Propagation, Fading, Multipath Propagation; Spread Spectrum; Frequency Reuse Principle, Cellular System; Medium Access Control: SDMA, FDMA, TDMA, CDMA; Wireless LAN: IEEE 802.11; Bluetooth.	10

Textbook :	
	Data Communication and Networking – Behrouz A. Forouzan (McGrawHill)

Reference Books :	
	1. Computer Networking –James F. Kurose and Keith W. Ross(Pearson) 2. Data Communication and Networking – Behrouz A. Forouzan (McGrawHill) 3. Computer Network & Internet - Douglas E.Comer(Pearson) 4. Data and Computer Communication – WilliamStallings(Pearson) 5. Computer Networks - Andrew S.Tanenbaum(PHI) 6. Mobile Communications - JochenSchiller(Addison-Wesley)

Course Code	**MCA20105**
Course Name	**Mathematics & Statistical Techniques**
Credits	**4**
Course Outcomes :	On completion of the course, the students will be able to
	1. Understand the foundations of mathematics.
	2. Apply mathematical ideas to model real-world problems.
	3. Analyze data using Statistical Methods
	4. Identify the type of statistical situation and solve statistical problems

Units	Contents	Total Hrs
I	**Linear algebra:** **Algebraic view** - vectors, matrices, product of matrix & vector, rank, null space, solution of over-determined set of equations and pseudo- inverse) Norms and spaces, eigenvalues andeigenvectors. **Geometric view** - vectors, distance, projections, eigenvalue decomposition	10
II	**Permutations & Combinations:** Factorial Notation, Fundamental Theorem, Definition of Permutations. Definition of Combinations, Simple examples of commercial application of permutations andcombinations. **Elementary ProbabilityTheory:** Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events. Classical definition of Probability, Addition theorem (without proof), conditional probability. Simple examples	10
III	**Functions and Derivatives:** **Concept of real functions:** constant function, linear function, x^n, e^x, a^x, log x. Demand, Supply, Total Revenue, Average Revenue, Total cost, Average cost and Profit function. Equilibrium Point, Break-evenpoint. **Derivatives of functions:** Constant function, x^n, e^x, a^x, log x. **Rules of derivatives:** Scalar multiplication, sum, difference, product, quotient (Statements only), simple problems.	10
IV	M**easures of central Tendency:** Arithmetic mean, Weighted mean, Median, Mode, Quartiles, Deciles and Percentiles. Locating median and quartiles through Ogives. Histogram to locate mode and mean. Numerical problems on central tendency **Measures ofdispersion**: Range, Quartile deviation, Mean deviation from mean, Standard deviation and their coefficients. Numerical problems on Range, quartile deviation, mean deviation.	10
V	**Variance:** Definition for grouped & ungrouped data, co-efficient of Dispersion, co-efficient of variation. Numerical problems on measures of dispersion. **Bivariate Linear Correlation:** Scatter Diagram, Computation of Karl Pearson's Coefficient of Correlation, and Computation of Spearman's Rank Correlation Coefficient (case of repeated ranks upto 2 repetitionsonly) Numerical problems on Bivariate Linear Correlation.	10
VI	**Bivariate Linear Regression:** Finding Regression lines by method of least squares. Properties of Regression Coefficients- i) $r = \sqrt{byx bxy}$ ii) $(\bar{x}, \bar{y})$ is the point of intersection of two regression lines. Numerical problems on BivariateLinear Regression. **Time series :**Definition of Time series & uses of time series. Components of Time series, Additive & multiplicative models. Methods of estimating trend by moving average method graphical method, semi-average method & by least square methods. Numerical problems on Time Series	10

Textbook :	
1.	Linear Algebra and its Applications by David C Lay, Pearson
2.	Business Mathematics by Kashyap Trivedi, Chirag Trivedi, Pearson
3.	Fundamental of Mathematical Statistics by S.C. Gupta & V. K. Kapoor.
4.	Applied Statistics And Probability For Engineers by Uglas Montgomery, Wiley.

Reference Books :	
1.	Higher Engineering Mathematics by B.S. Grewal.
2.	Statistical Methods by S.P. Gupta Fundamentals of Statistics by Goon, Gupta, Dasgupta.
3.	Modern Elementary Statistics by John E. Freund Emeritus, Gary A. Simon.
4.	Fundamentals of Mathematical Statistics by S.C. Gupta V. K. Kapoor, S. Chand & Sons.

Course Code	**MCA20107**
Course Name	**Lab1- Object Oriented Programming in JAVA**
Credits	**3**
Course Outcomes :	**Development of skills for implementing core concepts of Java.**

TEXT BOOK:	
	Herbert Schildt: Java The Complete Reference, Ninth EditionJava 2 (5/e) (Tata- McGraw Hill)

Units	**Contents**	**Total Hrs**
I	Java Basics, implementing concepts of OOPs using Java, Data types and Variables, Operators, Control structures, classes, declaring objects, access control, Inheritance, Polymorphism, Abstract classes, Interfaces, Packages. Arrays: Basics, One - & Multi- dimensional.	10
II	Exception handling: Built-in,checked and unchecked Exceptions, Using try and catch, throw, throws, finally clauses, multiple catch clauses, Multithreaded programming: Java thread model, creating threads, thread priorities & synchronization.	8
III	Java I/O: Stream classes, Byte Stream & Character Streams: Input stream, Output stream, FileInputstream, FileOutputstream Generic Programming:generic classes, generic methods	8
IV	Java Collections Framework: Introduction, Collections Framework hierarchy, List, Set, Map Interface and their implementing classes and methods, Iterator/ListIterator, Utility classes. Introduction To Swing: Hierarchy Of Java Swing Classes,Swing GUI Components, Related Packages, Swing Control Classes & Methods, Handling Events in Swing GUI	8

REFFERENCES BOOKS:	
	1. Core Java, Volume I — Fundamentals (9th Edition), Cay S.Horstmann, Gary Cornell,Prentice Hall
	2. Effective Java,Second Edition, Joshua Bloch, Addison-Wesley Educational Publishers Inc
	3. S. Chavan “Programming in Java” Shroff Pub.
	4. Java Generics and Collections, by Maurice Naftalin, Philip Wadler, O'Reilly Media, Inc.

	Suggested Practical List
	The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes. 1. Write, debug and execute simple JAVA programs that demonstrate programming logic by making use of various control statements . 2. Programs to Demonstrate the understanding and application of classes and objects to real world problems 3. Programs that Demonstrate the understanding and application of interfaces. 4. Programs to Demonstrate the understanding of built in and user defined packges 5. Programs that Demonstrate the understanding and application of Exception handling using real world problems 6. Programs that Demonstrate the understanding and application of Multi-threading using Thread Class/Runnable Interface 7. Programs that Demonstrate the understanding and application of synchronization using multi-threading. 8. Programs that Demonstrate use of streams for File handling, 9. Programs to Demonstrate the use and benefits of generic classes, generic methods, 10. Programs that Demonstrate the use of few Collection classes with real world problems 11. Programs that Demonstrate the use of Swing Control Classes & Methods in GUI application development 12. Programs that Demonstrate the use of Delegation Event model .

Course Code	**MCA20108**
Course Name	**Lab2- Data Structure and Algorithms**
Credits	**1**
Course Outcomes :	On completion of the course, the students will be able to get
	Skill of applyingdifferent data structures for solvingproblem

Sr.No.	**Contents**	**Total Hrs**
	Thesamplelistofprogramisgivenbelow.Thislistcanbeusedasguidelineforproblem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes. 1. Write a program to implement SearchingAlgorithm i) Linear Search ii) BinarySearch 2. Write a program to implement SortingAlgorithm i) Bubble Sort ii) Selection Sort iii) InsertionSort 3. Write a program toperform i) Addition of Matrix ii) Multiplication of Matrix 4. Write a program to implement Linear Linked List (Insertion & Searchingoperation) 5. Write a program to implement Stack (PUSH, POP, DISPLAYOperations) 6. Write a program to implement Queue (Insertion, Deletion) 7. Write a program to implement Tree Traversal Algorithm (Inorder, Preorder,Postorder) 8. Write a program to implement Graph using AdjacencyMatrix.	30

Course Code	**MCA20109**
Course Name	**Lab3- Operating System**
Credits	**1**
Course Outcome	On completion of the course, the students will be able to
	1. Able to understand the Basics of Linux working .
	2. Able to perform the shell scripting programs .
	3. Able to create file handling utilities by using Linux shell environment.

	Contents	**Total Hrs**
	Linux : Startup, user Accounts, linux logging in logging out, Command line, simple commands, file system and related commands, shell, pipes and redirection, sh, tcsh, networking with Linux, file system administration. The sample list of program is given below. 1. Write a shell script program to display list of user currently logged in. 2. Write a shell script program to display “HELLO WORLD”. 3. Shell script program to check whether given file is a directory or not. 4. Shell script program to count number of files in a Directory. 5. Create directory, write contents on that and Copy to a suitable location in your home directory. 6. Use a pipeline and command substitution to set the length of a line in file to a variable. 7. Write a grep/egrep script to find the number of words character, words and lines in a file. 8. Write a shell script for firewall configuration using iptables. 9. Study and write a shell script for samba server for file sharing 10. Write a shell script for editing grub menu in ubuntulinux 11. To simulate First Come First Serve & Shortest Job First process scheduling algorithm 12. To simulate Shortest Job First process scheduling algorithm 13. To simulate Preemptive Shortest Job First process scheduling algorithm 14. To implement Round Robin Process scheduling Algorithm 15. To implement Priority Based Process scheduling Algorithm 16. To simulate paging technique of memory management. 17. To simulate segmentation technique of memory management. 18. To implement the FIFO page replacement policy 19. To implement FCFS Disk Scheduling algorithm 20. To implement SCAN Disk Scheduling algorithm	10

Course Code	**MCA20110**
Course Name	**Lab4- Mathematics & Statistical Techniques**
Credits	**1**
Course Outcomes :	**Students will be able to solve the problems of Mathematics and Statistical Techniques using programming logic.**

	Contents	Total Hrs
	The following list can be used as guidelines for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes. Use C/C++/Java language to develop the Programs OR implement the same Mathematical and Statistical Calculations using Data Analytic tools SAS/ R ProgrammingLanguages. 1. Problem on Linearalgebra. 2. Problem on ProbabilityTheory. 3. Problem on Permutations &Combinations. 4. Problem onDerivatives. 5. Problem on graphical & diagrammaticrepresentation. 6. Problem on measures of Central Tendency ordisperssion. 7. Problem on moments, measures of Skewness andKurtosis. 8. Problem on computation of correlation co-efficient for bivariatedata. 9. Problem on Fitting of linear & nonlinear regression lines or computation of rank correlationco-efficient. 10. Problems on timeseries	30

SEMESTER II

Course Code	**MCA20201**
Course Name	**Client Server Computing**
Credits	**4**
Course Outcomes:	On completion of this course, student will be able to:
	1. Acquire knowledge of Server-Side programing by implementing Servlet and JSP.
	2. Acquire the knowledge of J2EE architecture, MVC Architecture.
	3. Distinguish Web Server, Web Container and Application Server
	4. Understand and write the deployment descriptor and enterprise application deployment.
	5. Design and implement components like: Session, Java Beans, JSTL, Tag Extensions.
	6. Gain knowledge of frameworks such as Struts Architecture and Hibernate Architecture
	7. Distinguish JDBC and Hibernate. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Struts,hibernateafteranalyzing requirements and evaluating existing system.
	Pre-requisite of course: Knowledge of Core Java

Units	Contents	Total Hrs
I	**Java Database Connectivity:** JDBC Concepts, JDBC API, Driver Manager, Connection,Statement,PreparedStatement, CallableStatementand ResultSet classeswith relevant methods, Types of ResultSets.Handling queries, inserts, deletes and updates to database.Displaying the query results. Stored Procedures.	10
II	**Servlets in Java:** Servlet structure & lifecycle. Servlet A P I basics, various classes & interfaces. Servlet requirements, writing. Running of Servlets, Concepts ofCookies, Servlets & cookies. Session managementwith ServletAPI. Server side includes and request forwarding.Servlet chaining. Jdbc Servlets	10

III	**Introduction to JSP:** Simple JSP concepts, Environment set up for JSP, Life cycle of a JSP, Elements involved with development of JSP: Scripting Elements,Directives, Implicit Objects. Java beans: Concept of Beans, Properties, Bean instances & serialization, Bean Scopes, Writing Beans, Deploying a bean, JDBC bean. Jsp Actions, Using a bean in a JSP. Java StandardTagLibrary(JSTL/AdvancedJSP):Typesoftags,coreandSQLtags in detail.	10
IV	**Introduction to Javascript:**What is Javascript?, Values, Types and Operators, Expressions and statements, control flow statements, Functions, Arrow Functions, HTTP and Forms, Event handling, data structures, objects	10
V	**Introduction to Hibernate:** Why Hibernate?, Architecture of Hibernate, Hibernate Query language,Hibernate O/R Mapping,Setting up the Development Environment ,Creating Database TableWriting-> Hibernate Configuration File, JavaBean, and Hibernate Mapping File, Developing Controller Component,Developing view Component.	10
VI	**Introduction to Struts:**Explaining MVC 2 Design Pattern for Struts 2 ,The Need for Struts 2,Processing Request in Struts 2, Struts 2 Architecture,,Actions in Struts 2, Interceptors, OGNL Support,PerformingValidation in Struts 2, Internationalizing Struts 2 Applications, Implementing Plugins in Struts 2,Integrating Struts 2 with Hibernate	10

Textbook :	
	1 Java Server Programming Java EE 7 (J2EE 1.7) Black Book(2014),. KogentLearning SolutionsInc. Core Servlets and Java Server Pages: Core Technologies by Marty Hall and Larry Brown,Java 2 Platform Enterprise Edition series, PrenticeHall

Reference Books :	
	1) 1 Java EE cookbook, Elder Moraes,Packt Publishing Limited (9 April 2018) **Reference URLs**: www.docs.oracle.com www.tutorialspoint.com www.javatpoint.com

Course Code	**MCA20202**
Course Name	**Artificial Intelligence & Applications**
Credits	**4**
Course Outcomes:	On completion of the course, the students will be able to
	1. Adopt an approach in view of Problem solving with AI.
	2. Identify and apply suitable 'Intelligent Agents for various AIapplications.
	3. Identify knowledge statement and represent it.
	4. Empower students for path planning of a robotic system.
	5. To develop and survey embedded systems applications usingmachine learning

Units	Contents	Total Hrs
I	**Introduction to Artificial Intelligence:** What is an AI,Introduction of Intelligent systems, The Foundations of Artificial Intelligence, Applications of A.I. Problem solving with AI, AImodels, **Intelligent Agents:** Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents, How the components of agent programswork.	10
II	**Knowledge, Reasoning, and Planning**: Knowledge based agents,The Wumpus World, Logic, propositional logic, Representation of knowledge using rules, Predicate logic, Unication and lifting, inference in FOL,Forward Chaining, Backward Chaining, Resolution, Logic Programming. Planning problem, Planning, Algorithms for Planning as State-Space Search, Planning Graphs, simple planning agent, planning languages, blocks world problem, goal stackplanning.	10
III	**Logical Agents:** Knowledge representation structures: Frames, semantic net, Scripts, Logic: Prepositional Logic, Prepositional Theorem Proving, Inference and proofs, Proof by resolution, Conjunctive normal form, Horn clauses and definite clauses, Syntax and Semantics of First-Order Logic, Symbols and interpretations, Knowledge Engineering in First-Order Logic, Unification, Resolution, and Introduction to logic programming (PROLOG).	10
IV	**Problem Decomposition and Planning:** Problem Decomposition: Goal Trees, Rule Based Systems, Rule Based Expert Systems. Planning: STRIPS, Forward and Backward State Space Planning, Goal Stack Planning, Plan Space Planning, A Unified Framework for Planning. Constraint Satisfaction : N-Queens,Constraint Propagation, Scene Labeling, Higher order and Directional Consistencies, Backtracking and Look ahead Strategies.	10
V	**Natural Language Processing and Robotics:** **Natural Language Processing:** Language Models, Steps in NLP, Syntactic Analysis (Parsing), Semantic interpretation, Discourse and pragmatic Processing, Text Classification. Discourse and pragmatic Processing, Implementation aspects of Syntactic Analysis(Parsing). **Robotics:** Fundamentals, path Planning for Point Robot, Sensing and mapping for Point Robot, Mobile Robot Hardware, Non Visual Sensors like: Contact Sensors, Inertial Sensors, Infrared Sensors, Sonar, Radar, laser Rangefinders, Biological Sensing.	10
VI	**Machine Learning:** Machine Learning Concepts, methods and models, Supervised Learning, unsupervised and semi-supervised, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, Artificial Neural Networks, Non-parametric Models, Support Vector Machines.	10

Textbook:	
	1. Artificial Intelligence: A Modern Approach by Peter andNorvig. 2. Stuart Russell and Peter Norvig (1995), Artificial Intelligence: A Modern Approach," Third edition,Pearson.

Reference Books:	
	1. Shai Shalev-Shwartz, Shai Ben-David: Understanding Machine Learning from Theory to algorithms, Cambridge UniversityPress 2. Michael Jenkin, Gregory, “Computational Principals of Mobile Robotics”, Cambridge UniversityPress. 3. Artificial Intelligence by Elaine Rich, Kevin Knight and Nair,TMH 4. Deepak Khemani, “A First Course in Artificial Intelligence”, McGraw Hill Education(India). 5. Artificial Intelligence and Intelligent Systems by Padhy, Oxford UniversityPress.

Course Code	**MCA20203**
Course Name	**Advance Data Base Management Systems**
Credits	**4**
Course Outcomes:	On completion of the course, the students will be able to
	1. Describe the fundamental elements of relational database management systems
	2. Apply the SQL queries on database for intended output.
	3. Analyze the database and remove the redundancy.
	4. Explain basic database storage structures and access techniques
	5. Ensure accuracy and integrity using transaction properties.
	6. Apply the concepts of database for data analytics, big data, parallel and distributed databases.

Units	Contents	Total Hrs
I	Database System Applications, Purpose of Database System, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators, Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, The Relational Algebra.	10
II	Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Definition in SQL, Authorization, Accessing SQL from a Programming Language, Functions and Procedures, Triggers	10
III	Database Design Using the E-R Model: Overview of the Design Process, The Entity-Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features, Entity-Relationship Design Issues RelationalDatabaseDesign:Featuresof GoodRelationalDesigns, Decomposition Using Functional Dependencies, Normal Forms, Functional-DependencyTheory,AlgorithmsforDecompositionUsingFunctionalDependencies, Decomposition Using Multivalued Dependencies,More Normal forms	10
IV	Physical Storage Systems: Overview of Physical Storage Media, Storage Interfaces, Magnetic Disks, Flash Memory, RAID, Disk-Block Access Data Storage Structures: Database Storage Architecture, File Organization, Organization of Records in Files, Data-Dictionary Storage, Database Buffer, Column-Oriented Storage, Storage Organization in Main-Memory Databases Indexing: Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, Hash Indices, Multiple-Key Access, Creation of Indices, Write-Optimized Index Structures, Bitmap Indices	10
V	Transactions: Transaction Concept, Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity Concurrency Control: Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Insert Operations, Delete Operations, and Predicate Reads, Timestamp-Based Protocols, Validation-Based Protocols, Multiversion Schemes, Snapshot Isolation Recovery System: Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Failure with Loss of Non-Volatile Storage, High Availability Using Remote Backup Systems, Early Lock Release and Logical Undo Operations, ARIES	10

VI	Database-System Architectures: Overview, Centralized Database Systems, Server System Architectures, Parallel Systems, Distributed Systems, Transaction Processing in Parallel and Distributed Systems, Cloud-Based Services Parallel and Distributed Storage: Overview, Data Partitioning, Dealing with Skew in Partitioning, Replication, Parallel Indexing, Distributed File Systems, Parallel Key-Value Stores Big Data & Analytics: Motivation, Big Data Storage Systems, Overview of Analytics, Data Warehousing, Online Analytical Processing, Data Mining	10

Textbook :	
	Silberschatz, Korth, Sudarshan : Database System Concepts , McGraw Hill, 7th Edition

Reference Books :	
	1. Raghu Ramkrishnan :Database System(TMH) 2. C.J.Date : Database System, 7th ed,.(PearsonEducation) 3. Connolly &Begg, : Database System, Low Price Ed. (PearsonEducation) 4. Navathe&Elmarsi , Fundamentals of Database Systems. 4/e (PearsonEducation).

Course Code	**MCA20204**
Course Name	**Software Engineering**
Credits	**4**
Course Outcomes :	On completion of the course, the students will be able to
	1. Recognize evolving role of software project management.
	2. Understand and estimate cost for software project.
	3. Identify &analyze aspect in s/w to manage time, process & resources effectively with quality concept.
	4. Estimate software productivity using metrics and indicator & identify important issues for planning a project
	5. Judge different testing techniques used to test software.
	6. Evaluate the role of user and software teams.

Units	Contents	Total Hrs
I	**Evolving role of Software**. Software crises & myths. Software engineering. Software process & process models : Linear sequential, prototyping, RAD, Evolutionary Product & Process. Project management concepts : People, Product, Process, Project. W5HH principle, critical practice.	10
II	**Measures, Metrics & Indicators**. Metrics in process & project domains-software measurement, Metrics for software quality, small organization. Software projects Planning : Scope, resources, estimation, decomposition technique, Tools. Software risks : identification, risk projection, refinement & RMMM plan.	10
III	**Project Scheduling :**Concepts. Peoples Efforts. Task set, Task network. Scheduling. EV analysis, Project Plan. Software quality concepts. SQ Assurance, Software reviews, technical reviews, software reliability, ISO 900 L, SQA Plan. SCM process. Version control. SCM standard.	10
IV	**System Engineering:** Hierarchy, Business Process & Product engineering : Overviews. Requirement engineering, System modeling. Requirement analysis. Analysis principles. Software prototyping. Specification. Design Process. Design Principles & Concepts. Effective modular design. Design model &documentation.	10
V	**Software architecture :**Data Design, Architectural styles, Requirement mapping. Transform & Transaction mappings. User- interface design : Golden Rule. UTD, Task analysis &modlling, ID activities, Tools, design evaluation. Component level design : Structure programming, Comparison of design notation	10
VI	**Software Testing Fundamentals** ; test case design, Whitebox testing. Basis path, control structure-, Blackbox-Testing, & for specialized environments. Strategic approach to S/W testing. Unit testing, integration testing, validation testing, system testing. Debugging. Technical metrics for software.	10

Textbook :	
	Pressman Roger. S. : Software Engineering, A Practitioner's Approach TMH.

Reference Books :	
	1. Somerville : Software Engineering (Addison-Wesley)(5/e) 2. Fairly R. : Software Engineering (McGrawHill) 3. Davis A. : Principles of Software Development (McGrawHill) 4. Shooman, M.L. : Software Engineering(McGraw-Hill)

Course Code	**MCA20205**
Course Name	**ELECTIVE 1 – Computer Graphics**
Credits	**4**
Course Outcomes:	On completion of the course, the students will be able to
	1. Understand the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two dimensions.
	2. Demonstrate various algorithms for scan conversion and filling of basic objects and their comparative analysis
	3. Interpret the mathematical foundation of the concepts of computer graphics.
	4. Apply geometric transformations, viewing and clipping on graphical objects
	5. Explore solid model representation techniques and projections.
	6. Understand visible surface detection techniques and illumination models.

Units	**Contents**	**Total Hrs**
I	An overview of Computer Graphics and Graphics System : Video display devices, Raster-Scan systems, Random-Scan systems, Graphics monitors and workstations, input devices, hard copy devices, Graphics software..	10
II	Output primitives : Point and Lines, Line drawing algorithms, loading the frame buffer, line function, circle and ellipse generating algorithms, curves, parallel curves algorithms, Pixel addressing, filled-area primitives , functions, Cell array, character generation.	10
III	Attributes of output primitives : Line and curve attributes, color and grey scale levels, area fill attributes. Character attributes, bundled attributes, antialiasing.	10
IV	2-D geometric transformations : basic transformations, matrix representations, composite transformations, other transformations, transformations between coordinate systems, affine transformations, transformation functions,Raster methods for transformations. Two-Dimensional viewing : viewing coordinates, Window-toviewport coordinate transformation, viewing functions, clipping : point, line, polygon, curve, text, exterior.	10
V	Structures and hierarchical modelling : concepts, editing structures, basic modelling concepts, hierarchical modelling, GUI and interactive input methods : the user dialogue, input of graphical data, functions, initial values for input device parameters, interactive picture - construction techniques, virtual reality environments	10
VI	Three dimensional concepts : display methods, graphics, Bezier curves and surfaces, B-spline curves and surfaces, Beta-splines, three dimensional geometric and modelling transformations : translation, rotation, scaling, three dimensional viewing : viewing pipeline, viewing coordinates, projections.	10

Tex tbooks :	
	1) D. Hearn, M.P .Baker : Computer Graphics C Version, II edition (Pearson Education)
	2) Ze-Nian, Li, Mark S. Drew "Fundamentals of Multimedia" (Pearson Education)

Reference Books :	
	1.Rajan Parekh "Principles of Multimedia " (TataMcGraw-Hill) 2.F.S. Hill : Computer Graphics Using Open GL, II edition (PearsonEducation) 3.W. M. Newman & R.F. Sproul : Principles of Interactive Computer Graphics, 2/e, (McGrawHill) 4.F .S. Hill: Computer Graphics(Macmillan) 5.Harington : Computer Graphics (McGrawHill)

Course Code	**MCA20205**
Course Name	**ELECTIVE 1 – Data Security**
Credits	**4**
Course Outcomes:	On completion of the course, the students will be able to
	1. Explain different security attacks.
	2. Analyze different security issues related to operating system.
	3. Apply and understand security aspect with respect to database.
	4. Solve network threats including detection of intrusion
	5. Analyze and apply security protocols to improve the administration
	6. Summarize different issues related to computer society and attempt to solve it.

Units	**Contents**	**Total Hrs**
I	Introduction: Security- Attacks- Computer criminals- Method of defense Program Security: Secure programs- Non-malicious program errors- Viruses and other malicious code- Targeted malicious code- Controls against program threats	10
II	Operating System Security: Protected objects and methods of protection- Memory address protection- Control of access to general objects- File protection mechanism- Authentication: Authentication basics- Password- Challenge-response- Biometrics	10
III	Database Security: Security requirements- Reliability and integrity- Sensitive data- Interface, Multilevel database- Proposals for multilevel security	10
IV	Security in Networks: Threats in networks- Network security control- Firewalls- Intrusion detection systems- Secure e-mail- Networks and cryptography- Example protocols: PEMSSL- Ipsec.	10
V	Administrating Security: Security planning- Risk analysis- Organizational security policies, Physical security	10
VI	Legal and Ethical Issues in Computer Security - Protecting programs and data- Information and law- Rights of employees and employers- Software failures- Computer crime- PrivacyEthicalissuesin computer society- Case studies of ethics.	10

Textbook :	
	1. C. P. Pfleeger, and S. L. Pfleeger, Security in Computing, Pearson Education, 4th Edition, 2003 2. Matt Bishop, Computer Security: Art and Science, Pearson Education, 2003

Reference Books :	
	1. Stallings, Cryptography And Network Security: Principles and practice, 4th Edition, 2006 2. Kaufman, Perlman, Speciner, Network Security, Prentice Hall, 2nd Edition, 2003 3. Eric Maiwald, Network Security : A Beginner's Guide, TMH, 1999 4. Macro Pistoia, Java Network Security, Pearson Education, 2nd Edition, 1999 5. Whitman, Mattord, Principles of information security, Thomson, 2nd Edition,2005

Course Code	**MCA20205**
Course Name	**ELECTIVE 1 – Optimization Techniques**
Credits	**4**
Course Outcomes :	On completion of the course, the students will be able to
	1. Understand the importance of optimization of industrial process management
	2. Apply basic concepts of mathematics to formulate an optimization problem
	3. Analyze and appreciate variety of performance measures for various optimization problems

Units	Contents	Total Hrs
I	**Introduction:** Classification of problems in OR, Mathematical Modeling, **Dynamic programming problems:** Investment problem, Equipment replacement, stage coach.	10
II	**Linear Programming Problems:** Introduction, concept of linear programming model, Graphical Method, Simplex Method, Big M Method, Two phase Method. Duality Concept.	10
III	**Transportation Problem:** Introduction to transportation problem, mathematical model, types of transportation problem, Optimization techniques for transportation problem, methods to find basic solution, Northwest Corner cell Method (NWCM), Least Cost cell Method (LCM), Vogel Approximation Method (VAM). Optimizing the basic feasible solution using U-V method.	10
IV	**Assignment Problem:** Introduction, zero-one programming model for Assignment problems, type of assignment problems. **Sequencing Problem:**NJobsandTwomachinesequencingProblems,Njoband three machine sequencing problem.	10
V	**Decision Theory:** Introduction to decision theory, minimax, minimin, maximin and maximax decision procedure, Bayes decision procedure. Regret function versus loss function. **Game Theory:** minimax, maximin, pure strategies, mixed strategies & expected payoff, solution of 2 × n games, m × 2 games. Brawn's Algorithm.	10
VI	**Network Analysis:** Critical Path Method (CPM), Critical Path, Time estimates as EST, EFT, LST and LFT and Floats. Project Evaluation and Review Technique (PERT) Network, ET, TE, TL, SE, critical path, probability of completing events on schedule.	10

Textbook :	
	1. B.E Gillelt , Introduction to Operation Research TMHEdition 2. R.Panneerselvam “Operation Research”PHI. 3. Operations Research, KantiSwarup, Gupta. P. K. & Man Mohan, S. Chand & Sons.

Reference Books :	
	1. J.K. Sharma “ Operation Research” (2/e)Macmillan. 2. Tata Hamdy, “ Operations Research- An Introduction” (5/e), PHI. 3. Taha H. A. “Operation Research”Macmillan. 4. Operations Research by PK Gupta and D.S Hira. S. ChandPublication

Course Code	**MCA20207**
Credits	**1**
Course Name	**Lab 5-Client Server Computing**
Course Outcomes :	On completion of the course, the students will be able to
	1. Implement Servlets and JSP to understand Server-Side programming.
	2. Design program to understand J2EE architecture, MVC Architecture.
	3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization
	4. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter.
	5. Acquire knowledge of frameworks such as Struts and Hibernate
	6. Distinguish between JDBC and Hibernate.
	7. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Spring, hibernate by analyzing requirements and evaluating existing system.

	Contents	**Total Hrs**
	The sample list of programs is given below. This list can be used as a guideline but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes. **(**Use of JDBC) WAPTO: 1. Create a database usingJAVA 2. Create a table, IN THEDATABASE 3. Insert records in thetable 4. Update records in database table based onconditions 5. Display the records in database table based onconditions 6. Write a servlet program in Java that calls a stored procedure and displays the values returned by the storedprocedure. 7. Create login form and perform state management using Cookies, 8. Perform state management usingHttpSession 9. Create a registration form with validations usingjavascript 10. Create database of student subject-wise data and retrieve all data usingJSP 11. Study and implementHibernate 12. Study and Implement MVC usingStruts **13.** A mini project using allconcepts	**30**

Course Code	**MCA20208**
Course Name	**Lab 6-Artificial Intelligence &Applications**
Credits	**1**
Course Outcomes:	Students will be able to develop basic Artificially Intelligent, Machine Learning and Robotics Applications

	Contents	Total Hrs
	The following list can be used as guidelines for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes. 1. At least 6 Practical based on LISPlanguage. 2. At least 6 Practical based on PROLOGLanguage. 3. Develop chat-bot application for enquirypurpose. 4. At least 1 practical based on implementation of Natural Language Processing using any of its open sourcetools. 5. Use any one open source robot simulation software and perform at least 1program to demonstrate simulate robots (like line follower robot). 6. Practical to demonstrate the use of Machine Learning concept to classifyanytype of information based on facts as "real" or "fake".	**30**

Course Code	**MCA20209**
Course Name	**Lab 7- Elective- 1 [Computer Graphics]**
Credits	**1**
Course Outcomes:	Students will be able to apply the core concepts of computer graphics to real world problems

	Contents	Total Hrs
	Minimum Twelve practicals/experiments based on the respective syllabus, covering each of the units. The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aimof the list to inform about minimum expectedoutcomes. 1. Study various in build graphics functions in Clibrary. 2. Write a program to draw a line using DDAalgorithm. 3. Write a program to draw a line using Bresenham‘salgorithm. 4. Write a program to draw a circle using midpointalgorithm. 5. Write a program to draw a circle using Bresenham‘salgorithm. 6. Write a program to draw a rectangle using line drawingalgorithm. 7. Write a program to perform 2D Transformation on aline. 8. Write a program to perform shear transformation on arectangle. 9. Write a program to rotate a circle (alternatively inside and outside) around the circumference of anothercircle. 10. Write a program to draw a car using in build graphics functionandtranslate it from bottom left corner to right bottom corner of screen. 11. Write a program to draw balloons using in build graphics function and translate it from bottom left corner to right top corner ofscreen. 12. Write a program to draw a cube using in build library function and perform 3Dtransformations 13. Translations in x, y, zdirections 14. Rotation by angle 450 about z axis, rotation by 600 about y-axis in succession. 15. Scaling in x-direction by a factor of 2, scaling in y- direction by a factor of3. 16. Write a program to implement line clipping (Cohen Sutherland algorithm). 17. Write a program for making Beziercurve. 18. Implement polygon clipping algorithm(atleast one) 19. Program to represent a 3D object using polygon surfaces and then perform 3D transformation. 20. Program to perform projection of a 3D object on Projection Plane : Parallel and Perspective.(*)	30

Course Code	**MCA20209**
Course Name	**Lab 7- Elective- 1 [Data Security]**
Credits	**1**
Course Outcomes:	On completion of the course, the students will be able to:
	Explain different security attacks.
	Analyze different security issues related to operating system.
	Apply and understand security aspect with respect to database.
	Solve network threats including detection of intrusion
	Analyze and apply security protocols to improve the administration
	Summarize different issues related to computer society and attempt to solve it.

	Contents	**Total Hrs**
	The following list of can be used as guidelines for basic understanding but the scope of the laboratory should not be limited to this list. Aimof the list to inform about minimum expectedoutcomes. 1. Study of fundamental of Network Security 2. Study of System threat attacks - Denial of Services. 3. Study of Sniffing and Spoofing attacks. 4. Study of Techniques uses for Web Based Password Capturing. 5. Study of Different attacks causes by Virus and Trojans. 6. Study of Anti-Intrusion Technique 7. Study of Symmetric Encryption Scheme 8. Implementation of any algorithm for data encryption 9. Implementation of any Asymmetric Encryption Scheme 10. Study of IP based Authentication.	30

Course Code	**MCA20209**
Course Name	**Lab 7- Elective- 1 [Optimization Techniques]**
Credits	**1**
Course Outcomes:	Students will be able to solve the problems of Optimization Techniques using programming logic.

	Contents	**Total Hrs**
	The following list can be used as guidelines for creating problem statements but the scope of the laboratory should not be limited to this list. Aim of the list to inform about minimum expected outcomes. Use C/C++/Java language to develop the program. 1. Write a program to demonstrate the North West cornermethod. 2. Write a program to demonstrate the Least CostMethod. 3. Write a program to demonstrate Vogal's ApproximationMethod. 4. Write a program for gametheory. 5. Write a program to find optimal period of replacement. (Equipment replacementproblem). 6. Write a program to solve investmentproblem. 7. Write a program to demonstrate the Critical PathMethod. 8. Write a program to prepare the loss-regrettable. 9. Write a program to calculate PERT. Write a program to prepare the payofftable.	30

Course Code	**MCA20210**
Course Name	**Lab 8- Mini Project**
Credits	**1**
	Mini project-the student's needs to complete at the end of the semester in order to strengthen the understanding of fundamentals through effective application of the course.

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