M.E. (FULL-TIME) /
M.TECH. (FULL-TIME)

Prospectus No.111736

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

अभ्यासक्रमिका

(FACULTY OF ENGINEERING & TECHNOLOGY)

PROSPECTUS

Prescribed for
Post Graduate Two Year Degree Course
Master of Engineering
(Full-Time)
Credit Grade System
I & II Year Examinations
2010 - 2011 & Onwards

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1) **M.E. Civil (Structural Engineering)**
2) **M.E. Mechanical (CAD/CAM)**
3) **M.E. Digital Electronics**
4) **M.E.Electrical (Electrical Power System)**
5) **M.Tech. Chemical Technology (Membrane & Separation Tech.)**
6) **M.Tech. (Chemical Engg.)**
7) **M.E. (Computer Sc. & Engg.)**
8) **M.E. (Information Tech.)**
9) **M.E. (Electronics & Tele.)**
10) **M.E. (Computer Engg.)**

2010

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Amravati 444 602

SANT GADGE BABA AMRAVATI UNIVERSITY AMRAVATI

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 Ordinances 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. 6/2008	:	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

SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING
(FULL TIME)
CIVIL ENGINEERING
(STRUCTURAL ENGINEERING)
SEMESTER : FIRST

1SFSE1 INTRODUCTION TO EARTHQUAKE ENGINEERING

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

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, crumble section ,stair case etc, twisting of building, seismic effects on structures, inertia forces, horizontal & vertical shaking

Indian seismic codes, Behavior of masonry structure during earthquake, bands & reinforcement in masonry building opening in walls, importance of flexible structures, Behavior of R.C. building in past earthquakes

Concept of earthquake Resistant design, design philosophy, four virtues of EQRD: Stiffness, Strength, ductility and Configurations, Introduction to Capacity design concepts, Introduction to IS: 1893
Introduction to Soil liquefaction. Geotechnical design considerations.

Reference Books:

1. Dowrick, D. J.; Earthquake Resistant Design for Engineers & Architects; John Willey & Sons; 2nd Edition; 1987
2. Housner, G.W. & Jennings, P.C.; Earthquake Design Criteria, Earthquake Engineering Research Institute; Oakland; California; USA; 1982
3. Newmark, N.M. & Hall, W.J.; Earthquake Spectra & Design; Earthquake Design Criteria, Earthquake Engineering Research Institute; Oakland; California; USA; 1982
4. Wakabayshi, M.; Design of Earthquake Resistant Buildings, McGraw Hill Books Company; 1986
5. Okamoto, S.; Introduction to Earthquake Engineering; University of Tokyo press; 2nd Edition; 1984

6. Kramer, S.L.; Geotechnical Earthquake Engineering; Prentice Hall; New Jersey; 1996
7. Bolt, B.A.; Earthquakes; W. H. Freeman & Company; NY; 1988
8. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

1SFSE2 THEORY OF PLATES AND SHELLS

Governing differential equations of thin rectangular Plates with various boundary conditions and loadings.

Introduction, Moment of curvature relation in pure bending, metrical bending of circular plates (Lateral loaded, uniformly loaded with clamped)

Laterally loaded rectangular plates, Differential equation of the deflection surface (Lagrange's equation), Boundary conditions, simply supported plates under sinusoidal loading, Navier's solution.

Finite differential method, differential equation to bent surface of anisotropic plate, Application to grid.

General shell geometry, classifications, stress resultants, equilibrium equation, Membrane theory for family of shells (Parabolic, Quaternary, Cycloid, Circular, hyperbolic).

Classical bending theories of cylindrical shells with and without edge beams, Finster Walder Theory, Schorer's Theory
Approximate analysis & design of cylindrical shells.

Reference Books:

1. Timoshenko, S. P. & Kriegar, W.; Theory of Plates & Shells; McGraw Hill; NY; 1970
2. Szilard, R.; Theory and Analysis of Plates; Prentice Hall; 1974
3. Novozhilov, V.V.; Thin Shells; Noordho of Groningen; 1964
4. Ramaswamy G. S., Design of Concrete Shells; Krieger Publication Co.; 1984
5. Chandrasekhar K.; Theory of Plates; University Press India Ltd.; Hyderabad; 1st Edition; 2001

1SFSE3 COMPUTER METHODS OF STRUCTURAL ANALYSIS

Objective:
The objective of this course is to understand the basic of structural analysis using stiffness approach, understand the concept of mathematical model of structure and hand on training on computer to solve problems.

Syllabus:
Memory problems in large structural systems: Incore & outcore techniques, half band storage and solution, sky line storage technique and solution, frontal technique

Flexibility method (structure approach) - flexibility coefficient. , physics meanings, basic determinant or released structure, choice of redundant, geometrical compatibility conditions. Matrix formulations, hand solution of simple problems on truss, beams, frames, with loads

Introduction to stiffness and flexibility approach, Stiffness matrix for spring, Bar, torsion, Beam (including 3D), Frame and Grid elements, Displacement vectors, Local and Global co-ordinate system, Transformation matrices, Global stiffness matrix and load vectors, Assembly of structure stiffness matrix with structural load vector, Analysis of plane truss, plane frame, plane grid and space frames subjected to joint loads.

Analysis for member loading (self, Temperature & Imposed) Inclined supports, Lack of Fit, Initial joint displacements. , Plane frame with effect of shear deformation, Global load vector for rigid jointed plane frame.

Reference Books:

1. Cheng, F.Y.; Matrix Analysis of Structural Dynamics; M. Dekke; NY; 2000
2. Kanchi M. B.; Matrix Methods of Structural Analysis; John Willey & Sons; 2nd Edition; 1999
3. Bathe, K.J.; Finite Element Procedures; Springer; 2nd Edition; 2002
4. Kasmali Aslam; Matrix Analysis of Structures; Brooks/Cole Publishing Co.; 1999
5. Cook R. D. et. al; Concepts and Applications of Finite Element Analysis; John Willey & Sons; NY; 1995
6. Gere W. and Weaver J. M.; Matrix Methods of Structural Analysis, 3rd Edition; Van Nostrand Reinhold; New York; 1990
7. Martin; H.C.; Introduction to Matrix Method of Structural Analysis; McGraw Hill Book Co.; 1966

Pre-requisite:
Knowledge of Matrices, Solution of simultaneous equations by using Gauss-Seidal, Gauss elimination & Crout's Method.

1SFSE4 STRUCTURAL DYNAMICS

Sources of vibration, types of excitations, Spring action and damping; Degrees of freedom; Application of Newton's laws, D'Alembert's 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.

Single degree freedom system, response to impulsive loading, rectangular, triangular pulses, Duhamel Integral. Response to general dynamic loading, Numerical schemes such as Wilson-Theta, Newmark-Beta, constant linear acceleration & time domain and frequency domain analysis.

Multi-degree freedom system, stiffness and flexibility approaches, Lumped-mass matrix, free vibrations fundamental Frequencies and mode shapes, orthogonality of, response to dynamic loading, Formulations of equations of motion, mode superposition method, modal matrix, numerical scheme of iteration method.

Vibration of Continuous Systems: Free vibrations of Continuous systems-axial and transverse vibration of bars / beams. Response of continuous systems to dynamic loads. Rayleigh-Ritz method.

Structural response to earthquake, Response spectrum design earth quake, IS code provisions for multistory frames.

Reference Books:

1 Chopra, A. K.; Dynamics of Structures; Prentice Hall; 1995
2 Clough, R.W.; & Penzin, J.; Dynamics of Structures; McGraw Hill; 1993
3 Humar J. L.; Dynamics of Structures; Prentice Hall; 1990
4 Mario, Paz; Structural Dynamics; CBS Publ.; N-Delhi; 1995
5 Timoshenko, S.; Advanced Dynamics; McGraw Hill Book Co; NY; 1948
6 Meirovitch L.; Elements of Vibration Analysis; 2nd Edition; McGraw Hill International Edition; Singapore; 1986
7 Biggs, J.M.; Introduction to Structural Dynamics; McGraw Hill; NY; 1964

1SFSE5 EARTHQUAKE RESISTANT DESIGN OF REINFORCED CONCRETE STRUCTURES

Review of Limit State Design of RC members. Confinement of concrete Philosophy of earthquake resistant design, Ductility, Redundancy & Over strength, Damping, Supplemental Damping, Base Isolation, Codal Provisions. Seismic behaviour of concrete,

Beams (Flexural, Shear and torsion)

Uni-axial and biaxial Beam-column (Axial, shear and moments)

Building frames, frame-shear wall buildings, Braced Buildings, Preliminary sizing and Mathematical modeling of buildings with different structural systems with and without diaphragms,

Earthquake, wind and other (i.e. blast, snow) load calculations along with dead load and live loads and their combinations.

Special aspects in Multi storied buildings: Effect of torsion, flexible first story, P-delta effect, effect of soil-structure interaction on building response, drift limitation.

Analysis and Design of multi-storied buildings with masonry infill,

Reference Books:

1. Paulay T. and Prestiley M.J.N.; Seismic design of R C & Masonry Buildings; John Willey & Sons; 2nd Edition; 1999
2. Booth, E.; Concrete Structures in Earthquake Regions; Longman Higher Education; 1994
3. Raynolds C.E.; Reinforced Concrete Design Handbook; 9th Edition; Rupa & Company; Calcutta; 1981
4. Raynolds, C.E.; Basic Reinforced Concrete Design; Vol.-II; Conc. Publications Ltd.; 1962
5. Fintel M.; Handbook of Concrete Engineering; 2nd Edition; CBS Publishers, Delhi; 1986
6. Park and Paulay; Reinforced Concrete Structures, John Wiley and Sons
7. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

1SFSE6 EARTHQUAKE RESISTANT DESIGN OF REIN FORCED CONCRETE STRUCTURES: LABORATORY

Complete Design calculations and Drawings to be developed for a multi-storied building based on the above syllabus.

1SFSE7 COMPUTER AIDED ANALYSIS & DESIGN OF STRUCTURES: LABORATORY

- Introduction to Computer systems and facilities. Operating systems, Software, Software development processes.
- Introduction to software packages like STAADPRO, STRUDS, SAP-2000, Etab and ANSYS

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SEMESTER : SECOND

2SFSE1 FINITE ELEMENT METHOD

Introduction to Finite element method, History, Principles & discretization, Applications

Introduction to Rayleigh Ritz Method, Stress strain relationship, strain displacement relationship, Equilibrium equations (Total potential approach, Virtual work approach)

Shape function, Stiffness matrix, load vector for 2-D elements (Plane stress, Plane strain & Axi-symmetric) using Displacement formulation. Cartesian and Iso-parametric element formulation. Numerical Integration, convergence of Isoperimetric elements.

Formulation of 1-D elements (BAR, TORSION, BEAM) and 3-D solid elements.

Computer Implementation of FEM procedure for plane truss, Plane stress, Plane strain and Axi-symmetric problems.

Constraint Equations (Penalty, Lagrangian Method), Patch test, Mathematical modeling of structures.

Reference Books:

1. Zienkiwicz O. C. & Taylor, R. L.; Finite Element Method; Vol-I, II & III; Elsevier; 2000
2. Hughes, T .R. J.; Finite Element Method; Dover Publication; 2000
3. Bathe, K.J.; Finite Element Procedures; Pringor; 2nd Edition; 2002
4. Reddy, J. N.; Finite Element Method; John Willey & Sons; 1982
5. Buchanan, G.R.; Finite Element Analysis; McGraw Hill Publ.; NY; 1995
6. Belegundu A.D. & Chandrupatla T.R.; Finite Element Method in Engineering; Prentice Hall India; 1991
7. Pilkey W.D. & Wunderlich W.; Mechanics of Structures, Variation and Computational Methods; CRC Press; 2nd Edition
8. Cook, R. D. et. al; Concepts and Applications of Finite Element Analysis; John Willey & Sons; NY; 1995
9. Prathap G.; Finite Element Method; Kluwer Academic Publ.; Dordrecht; 1993
10. Irons, B. & Ahmad, S.; Techniques of Finite Elements; Elliswood, London; 1980

2SFSE2 ADVANCED DESIGN OF STEEL STRUCTURES

Introduction to Allowable Stress Design, Plastic design, Limit state Design

Loadings as per IRC, IRS, IS (IS:800-2007, IS: 875 part 1-V, IS: 1893) applicable to various steel structures.

Design of Beams, Beam-column, Plate Girders, Open web structures and Space structures by limit state method.

Bridges, Industrial Buildings including crane girders by using Limit State method

Welded and riveted connections.

Composite structures.

Reference Books:

1. Owens, G.W. & Knowles, P.R.; Steel Designers Manual; Blackwell; 1994

2. Gaylords E.H. & Gaylords, C. N.; Design of Steel Structures; McGraw Hill Publ.;1998
3. Steel Design Manual; ELBS and Granada Publishers; London
4. Johnson, R.P.; Composite Structures of Steel and Concrete; Volume-I; Granado Publishing Ltd.; London; 1975
5. Salmon and Johnson; Steel Structures – Design and Behaviour, Harper and Collins Publishers.
6. Subramanian N., Design of Steel Structures, Oxford University Press 2008
7. IS 800-2007, BIS

2SFSE3 REPAIRS & RETROFITTING OF STRUCTURES

Principles of Repair and Retrofitting, Terminology in Repair, Restoration, Strengthening and Rehabilitation, Criteria for Repair, Restoration and Retrofitting; Repair Materials; In-situ testing methods for RC and masonry structures; Seismic Hazard Evaluation; Techniques of repair and retrofitting of masonry buildings; Seismic evaluation of RC building-Demand capacity method, pushover analysis and performance based approach; Techniques of Repair and Retrofitting in RC buildings; Retrofitting of buildings by seismic base isolation and supplemental damping; Retrofitting of heritage structures; Retrofitting of bridges; Case studies in retrofitting.

Reference Books:

1. Pankaj Agrawal & Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall India.
2. Duggal S. K., Earthquake Resistant Design of Structures, Oxford University Press 2007

2SFSE4 DESIGN OF PRESTRESSED CONCRETE STRUCTURES

1. Introduction to pre-stressing, Analysis for pre-stress, Load balancing.
2. Partial pre-stressing, Grouting of beams, fire resistance of beams, special problems like stress corrosion, fatigue under dynamic loading etc.
3. Basic design for flexure (Type I structures), Introduction to Limit state method.
4. Limit state of collapse: Shear, Bond, deflection & cracking in pre-stressed concrete member
5. Comprehensive design of a rectangular and/or a T-section by limit state method.
6. Design of Poles, Piles and Sleepers.
7. Design and analysis of pre-stressed concrete pipes and circular tank.

8. Analysis and design of end block.
9. Comprehensive design of post-tensioned girders.
10. Analysis and design of continuous beams up to two spans linear transformation, concordant cable.
11. Analysis and design of portal frame, single storey and limited to two bays.

Reference Books:

1. Krishna Raju, N.; Prestressed Concrete Structures; TMH; Delhi; 1981
2. Lin, T.Y. and Burns, N.H.; Design of Prestressed Concrete Structures; 3rd Edition; John Wiley & Sons; NY; 1981
3. Ashok Jain, R. C. C. Design
4. P. Dayaratnam, Prestressed Concrete Structures, Oxford & IBH
5. Latest relevant BIS codes

2SFSE5 Elective

(1) SUBSTRUCTURES AND FOUNDATION DESIGN

Analysis and design of Piers, Abutments and Retaining walls.

Shallow foundations: Individual and combined footings for axial and bending loads (Uniaxial and biaxial), Loss of contacts.

Rafts, Annular Footings, Rigid and flexible foundations, Beams and slabs on elastic foundations.

Deep Foundations: Piles and Wells foundations.

Design of Machine Foundations.

Reference Books:

1. Hetenyi M.; Beam on Elastic foundation; University of Michigan Press; 1946
2. Bowles, J. E.; Foundation Analysis & Design; McGraw Hill; 5th Edition; 1996
3. Swami Saran; Soil Dynamics and Machine Foundations, Galgotia Publications (P) Ltd, New Delhi, 1999
4. Srinivasulu P, Vaidyanathan C V ; Handbook of Machine Foundation
5. Kurian N P; Modern Foundations – Introduction to advanced Techniques

2SFSE5 Elective

(2) EARTHQUAKE RESISTANT DESIGN OF BRIDGES AND DAMS

Bridges:

Performance in past earthquakes, Types of bridge superstructure and introduction to their design, sub-structure, bearings, IRC / IRS Bridge loadings and other codal recommendations, Performance of Bridges in past earthquakes.

Seismic design philosophy for Bridges, State of art Modeling of bridges, Seismic Design of Substructures, Capacity design of substructures and ductile detailing,

Seismic design of well and pile foundations

Dams:
Performance of concrete and masonry gravity dams, seismic design considerations, dynamic analysis of dams. Dam-foundation-reservoir interaction, bending, shear and finite element method of analysis.

Reference Books:

1 Chen W.F. and Duan L., Bridge engineering Handbook; CRC Press; 1999

2 Fintel, M.; Handbook of Concrete Engineering; 2nd Edition; CBS Publishers Delhi; 1986

2SFSE5 Elective

(3) THEORY OF ELASTICITY AND STABILITY

Stress at a point, relationship between stresses and strains, Elastic modulii, Basic equations of theory of Elasticity. Plane stress-strain, Airy's stress function, strain-displacement relationship, Principal Planes and Principal stresses in three dimensions, equilibrium and compatibility in rectangular coordinates and other coordinate systems,

Simple applications in tension, bending and torsion.

Concept of Stability, Axial buckling of columns by Energy Criteria of Stability & approximate methods, lateral torsional buckling of beams and beam columns, Coupled axial torsion and flexural buckling.

Buckling of rectangular thin plates.

Reference Books:

1. Timoshenko, S. P.; Theory of Elasticity; McGraw Hill; 3rd Edition; NY; 1970
2. Timoshenko, S. P.; Theory of Elastic Stability; McGraw Hill; 2nd Edition; NY; 1961

3. Trahair N.S.; Flexural Torsional Buckling of Structures, E&FM SPON; London
4. Chen, W.F.; theory of Beam-Column-Space Behaviour and Design; 2nd Vol.; McGraw Hill;

2SFSE5 Elective

(4) DESIGN OF ENVIRONMENTAL STRUCTURE

1. Analysis and design of cylindrical shaped E.S.R, supported peripherally & internally making the tank floor a solid continuous slab system, Analysis and design of staging.
2. Design of underground water tanks, swimming pools, Jacks well
3. Design of Water Treatment Plant units, aeration tank, Clari-floculator, flash mixers.
4. Design of water sumps, filters, Design of digestion tank.

Reference Books:

1. Paulay T. & Park R.; Reinforced Concrete structures; John Willey & Sons
2. Krishna Raju N., Advanced R.C.C. Design, TataMcGraw Hill, New Delhi Reynolds C.E.; Reinforced Concrete Design Handbook; 9th Edition; Rupa & Company; Calcutta; 1981
3. Punmia B. C., R. C. C. Design, Laxmi publications
4. Datta N. P., Waste Water Treatment, Oxford & IBH Publication

2SFSE6 ADVANCED DESIGN OF STEEL STRUCTURES: LABORATORY

Complete Design calculations and Drawings to be developed for the following structures based on syllabus For the relevant theory subject (2SFSE2)

1. Design of a steel bridge
2. Design of an Industrial shed

2SFSE7 DESIGN OF PRESTRESSED CONCRETE STRUCTURES: LABORATORY

Complete Design calculations and Drawings to be developed for the following structures based on syllabus For the relevant theory subject (2SFSE4)

1. Comprehensive design of a pre-tensioned Pole
2. Comprehensive design of a post-tensioned Girder
3. Field visit report

3SFSE1 & 4SFSE1 SEMINAR AND DISSERTATION

A Dissertation on Recent Trends in Structural Engineering to be submitted. Marks shall be based on Seminar, dissertation. and Viva-Voce on dissertation.

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SYLLABUS PRESCRIBED FOR TWO YEAR P.G. COURSE IN MASTER OF ENGINEERING (FULL TIME) MECHANICAL- CAD/CAM SEMESTER-I

1MCC1 COMPUTER AIDED DESIGN

Section-A

Introduction to computer technology, Introduction to CAD systems, Computer Aided Design workstation and peripherals, Graphics input/ output devices

Design process and CAD models: Computers for design, benefits of CAD

ICG: Configuration of graphic workstations, Vector and Raster displays, Geometric modeling and transformations.

Section-B

CAD software: Graphics system and functions of a graphics package, Graphics databases structure and handling, Operating features, wireframe, solid and surface modeling, approaches to solid modeling.

Computer aided drafting and documentation: Principles and concepts of automated drafting, drafting packages, Introduction to CADD packages like AutoCAD, SOLIDWORKS, CATIA. Graphics standards like GKS, PHIGS, IGES etc

Practical : Five practical based on above syllabus

References:

1) CAD/CAM by Groover and Zimmers
2) Computer Aided Design in Mechanical Engineering by V. Ramamurti
3) CAD by Krishnamoorthy and Rajiv
4) CAD Principles and Applications by Barr, Krimger and Lazaer
5) CAD/CAM Handbook by Teicholz

1MCC2 COMPUTER AIDED MANUFACTURING

Section-A

Numerical control (NC): Fundamentals of NC, merits and demerits of NC, classification of NC systems, basic components of NC systems, instructions, NC tape and coding, control units, features of machine tools and system devices.

Computer Numerical Control CNC: Problems in conventional NC, NC controller technology, computer numerical control, designing CNC systems. NC/CNC machine tools: Types and features, DDA

integrator, DDA hardware interpolator, software interpolators, reference word interpolator, point to point, straight line and contouring control loops

Section-B

NC/CNC part programming: Introduction, computer-aided part programming (APT), CNC part programming

Ddirect numerical control (DNC), Types of DNC Systems. combined DNC/CNC systems,

Adaptive control: ACC and ACO systems, optimization of AC

Practical: Five practical based on above syllabus

References:

1) Yoram Koren- Computer control of manufacturing, McGraw Hill.
2) Mikell P. Groover- CAD/CAM-Prentice-Hall of India pvt. Ltd.
3) Kundar T.K., Rao P.N., Tewari N.K.-Numerical control and computer aided manufacturing; Tata McGraw Hill.
4) D. Kochan- CAM Development in computer integrated manufacturing-Springer Verlag, Berlin

1MCC3 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.

References:

1) Groover M.P.- Automation, Production Systems and CIM.
2) David Bedworth, M.R. Handerson & Philip Wilze- Computer Integrated Design and manufacturing

1MCC4 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.

Section-B

Automatic loading and unloading devices, magazines, bunkers, orientors, feeders, separators, etc.

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.

References:

1) Mechatronics by HMT
2) Introduction to Mechatronics and Measurment Systems by Michal B. Histand & David G. Aiciatore.
3) Industrial Automation by Turgam, Mir Publication.
4) Pneumatics and Hydraulics by Stewart.

1MCC5 ELECTIVE-I

1. CONCURRENT ENGINEERING

Section-A

Introduction : Principles, traditional versus concurrent approach, schemes and tools of concurrent engineering, Applications of computers in practice of CE

Basic process issues : Process models, types, importance, relation between models, specifications, technology, automation and process improvement.

Concurrent engineering approach in manufacturing systems: System design procedure, features, assembly resource alternatives, tasks assignments.

Section-B

Concurrent automated fabrication systems : Introduction, methodology, preliminary and details work content analysis, human resource considerations, 'Technical Economic' performance evaluation.

Assembly work stations: Strategic issues, technical issues, economic analysis.

Case studies of concurrent engineering practice.

References:

1) David Bedwarth, M.R. Handerson & Philip Wilze- Computer integrated Design and manufacturing.
2) J.L. Nevines and D.E. Whitney-Concurrent Design of Products and Processes.
3) Procedding of the "Summer school on Application of Concurrent Engineering to Product Development" at P.S.G. College of Technology.

1MCC5 ELECTIVE-I

2. ENGINEERING EXPERIMENTAL TECHNIQUES

Section-A

Generalized measuring systems, different transducers for measurement of different mechanical parameters such as thickness (length), temperature, pressure, force, torque, etc., their design consideration, characteristics, limitation and uses.

Intermediate stage instrumentation, Impedance matching, selection of intermediate instrumentation equipments.

Terminating stage devices- characteristics, limitations

Section-B

Dynamic response of instruments, Effect of different instruments used in the measuring system on the accuracy, sensitivity and performance of the instrument designed to measure a particular mechanical parameter.

Experimental planning, parliamentary, intermediate and final stages, a experimental investigations, selection of instruments based on static, dynamic characteristics and allowable errors, analysis of experimental data, curve fitting, report writing.

References:

1) Experimental methods for engineering by J.P. Holman
2) Measurement System, Application and Design by E.D. Doeblein

1MCC5 ELECTIVE-I

3. MANAGEMENT INFORMATION SYSTEMS

Section-A

Objectives and cost benefits of Management Information Systems (MIS). Decision and MIS. A decision environment model, Decision strategies. Characteristics of information: Measurement and amount of Information, Information search, storage and retrieval, Information feed back systems. Planning techniques: Project proposals, reporting and controlling, Determination for information needs and sources, development of conceptual design, development of detailed design, selection of final design, design report, organization for implementation, training of operational personnel, forms and files for data collection, evaluation control and maintenance of information system.

Section-B

Computer Based Information System, MIS and CBIS family, MIS in total CBIS environment, an MIS model and dimensions of MIS model, an overview of tele-processing system(TPS):Techniques for TPS processing models, MIS and TPS, decision support system : definition : characteristics of DSS difference in DSS and development of DSS and its applications, production of sub-systems : Marketing sub-systems, finance sub-systems, personnel sub-system, office automation system : definition, importance, planning and implementation of Automated computer based office communication system.

References:

1) Essentials of MIS by K.C. Laudon, J.P. Laudon; PH
2) Strategic Management and MIS: An Integrated Approach by W. Robson; Pitman Pub.
3) Information systems for Managers by G.W.Reynolds; West Pub.
4) IT for Management by Turban E and McLean E; John Wiley Pub.
5) Foundations of Information systems by Zwass V; Irwin/ McGraw Hill

1MCC 5 ELECTIVE-I

4. OPTIMIZATION TECHNIQUES

Section-A

Classical Optimization Techniques: Single-variable and Multi-variable Optimization, Hessian Matrix, Saddle Point, Lagrange Multipliers Method, Kuhn-Tucker Condition

Single-variable Optimization Techniques: Unrestricted Search, Exhaustive Search, Dichotomous Search, Interval-halving Method, Fibonacci Method, Golden-section Method, Quadratic Interpolation Method, Newton Method, Quasi-Newton Method, Secant Method

Multi-variable Optimization Techniques: Evolutionary Optimization Method, Simplex Search Method, Pattern Search Method, Conjugate Direction Method, Steepest Descent Method, Newton's Method, Conjugate Gradient Method, Davidon- Fletcher-Powell Method

Section-B

Constrained Optimization Techniques: Interior Penalty Function Method, Exterior Penalty function Method.

Genetic Algorithm, Simulated Annealing, Artificial Neural Networks.

Theory of Constraints: Introduction to TOC, Optimized Production Technology (OPT), Nine principles of OPT, Five Focusing Steps (The 5FS) of TOC, Capacity Constrained Resources and the Time Buffer, Modeling the Time Buffer, Modeling Return-On-Investment (ROI) in TOC, Comparison of TOC and Local Optimization Approaches

References:

1. Deb K (2004). Optimization for Engineering Design: Algorithms and Examples, Prentice Hall of India.
2. Dennis J Jr, Schnabel R (1996). Numerical Methods for Unconstrained Optimization and Nonlinear Equations, Society for Industrial and Applied Mathematics.
3. Rao S (1996). Engineering optimization, Theory and Practice, New Age International Publishers
4. Ravindran A, Ragsdell K and Reklaitis G (2006). Engineering Optimization: Methods and Applications, 2nd edition, John Wiley and Sons Inc.
5. Goldratt, E. M. and Cox, J. (2004). The Goal: A Process of Ongoing Improvement. 3rd Edition, North River Press. ISBN-10: 0884271781, ISBN-13: 978-0884271789
6. Dettmer, H. William (1997). Goldratt's Theory of Constraints: A Systems Approach to Continuous Improvement, American Society for Quality. ISBN 0873893700, 9780873893701

1MCC 5 ELECTIVE-I

5. DESIGN FOR MANUFACTURE, ASSEMBLY AND ENVIRONMENT

Section-A

Introduction: General design principles for manufacturability, Strength and mechanical factors, Mechanism selection, Evaluation method, Process capability, Feature tolerances, Geometric tolerances, Assembly limits - Datum features, Tolerance stacks.

Factors influencing form design: Working principle, Material, Manufacture, Design, Possible solutions, Materials choice, Influence of materials on form design , Form design of welded members, Forgings and castings.

Component design-machining consideration : Design features to facilitate machining, Drills, Milling cutters, keyways, Doweling procedures, Counter sunk screws, Reduction of machined area, Simplification by separation, Simplification by amalgamation, Design for machineability, Design for economy, Design for clampability, Design for accessibility, Design for assembly.

Section-B

Component design - casting consideration: Redesign of castings based on parting line considerations, Minimizing core requirements, machined holes, Redesign of cast members to obviate cores. Identification of uneconomical design, Modifying the design, Group technology, Computer Applications for DFMA.

Design for the environment: Introduction, Environmental objectives, Global issues, Regional and local issues, Basic DFE methods, Design guide lines, Applications, Lifecycle assessment: Basic method, AT&T's environmentally responsible product assessment, Weighted sum assessment method, Lifecycle assessment method, Techniques to reduce environmental impact, Design to minimize material usage, Design for disassembly: Design for recyclability, Design for remanufacture, Design for energy efficiency, Design to regulations and standards.

BOOKS RECOMMENDED:

1. Bralla, "Design for Manufacture handbook ", McGraw hill, 1999.
2. Boothroyd, G, Heartz and Nike, "Product Design for Manufacture", Marcel Dekker, 1994.
3. Dixon, John. R, and Corroda Poli, "Engineering Design and Design for Manufacture and Structural Approach", Field Stone Publisher, USA, 1995.
4. Fixel, J. "Design for the Environment", McGraw Hill., 1996.
5. Kevien Otto and Kristin Wood, "Product Design", Pearson Publication, 2004.

SEMESTER-II

2MCC1 FINITE ELEMENT ANALYSIS

Section-A

Introduction: Discretization, going from part to whole approach, Conventional Numerical methods- finite difference method , method of least squares Ritz method, boundary value problems, displacement method, the equilibrium method, the mix method of solid mechanics, Finite element formulation, variational methods.

Finite Elements- types: triangular, rectangular, quadrilateral, sector curved, isoparametric elements

General procedure of FEM: Discretization, element shapes, interpolation functions, shape functions, element stiffness matrix, global stiffness matrix, application of boundary conditions, solutions.

Section-B

FEA of 2-D single variable problems, application of Heat transfer, fulid mechanics, solid mechanisms, plane elasticity, analysis of structural vibrations

Applications: Free vibration of thin plates, cylindrical shells, transient heat conduction, torsion of prismatic shafts, motion of fluid in flexible container, flow of ideal fluids, viscous fluids, sheep structures.

Softwares in FEM: Introduction and study of FEM packages like ASKA, SAP, NASTRAN, ANSYS, COSMOS, NISA, ANIDA

Practical: Five practical based on above syllabus

References:

1) Introduction to Finite Element Methods by C.S. Desai & J.F. Abel.
2) Concept and application of Finite element analysis by Robert Cook.
3) Finite element analysis by C.S. Krishnamoorthy.
4) Finite element methods by J.N. Reddy.

2MCC2 SIMULATION THEORY AND APPLICATIONS

Section-A

System models and studies: Concepts of a system, system environment, stochastic activities, continuous and discrete systems, system modeling, types of models, principles used in modeling, sub-systems, types of system studies.

System simulation: The techniques of simulation, Monte Carlo method, comparison of simulation and analytical methods, Analog computers and methods, hybrid computer, simulators, continuous system simulation languages, system dynamics, growth models, logistic curves, multi-segment models, probability concepts in simulation, system simulation, events, representation of time, arrival pattern.

Section-B

Analysis of simulation output : Estimation method, simulation run statistics, replications of runs, elimination of initial bias, batch means, regenerative techniques, time series analysis, spectral analysis, auto regression.

Applications of simulation in manufacturing

Practical : Five practical based on above syllabus

References:

1) Geoffrey Gordon- System Simulation
2) Narsingh Deo- System Simulation with Digital Computers.
3) Naylor T.H. et. Al.- Computer Simulation Techniques.
4) Gottfried B.S- Elements of Stochastic Process Simulation

2MCC3 ROBOTICS AND ROBOT APPLICATIONS

Section-A

Introduction: Definition, need, robot classification, terminology and systems, benefits and limitations.

Robot system: Robot physical configuration, basic robot motions, end effectors work cell control and interlocks.

Robot sensors: Vision tactile and proximity, voice, robot control, kinetics and necessary control systems.

Section-B

Robot applications: General considerations and problems, material transfer, machine loading, welding, spray coating, processing operations, assembly, inspection, robo in FMS and automation.

Robot arm kinematics: Homogenous transformation matrix.

References:

1) Handbook of Industrial robotics.
2) Aures R.U. & Miller S.M.- Robotics applications and social implications.
3) Tanner W.R. – Industrial Robots Vol.-1 & Vol.-2.
4) Groover M.P. and Zimmer E.W.- Computer Aided Design and Manufacturing

2MCC4 INDUSTRIAL PRODUCT DESIGN

Section-A

An approach to industrial design, Technical requirements, Ergonomic requirements, Aesthetic requirements.

Ergonomic and industrial design Man- Machine relationship, Anthrometric data, Ergonomical design aspects of M/c tools testing M/cs, Instruments, automobile process equipment, etc.

Aesthetic concepts: Concepts of unity, concept of order with variety, concept of purpose, style and environment, Aesthetic continuity, proportions, rhythm, radiance.

Section-B

Design for Producibility, design for Assembly & Disassembly, Design for Maintenance

Computer aided Product Design

Industrial Design in Graphics: general design situations, Specifying design requirements, rating the importance of Industrial Design.

Design & development for Generative Manufacturing Processes.

Product Patenting.

References:

1) Industrial Design for Engineers by W.H. Mayali.
2) Design Engineering by John Diwan .
3) Problems of Product Design development by C.Hearn Bucle Pergaman Press.

4) Product Design & Manufacture by John Lindbeck , Prentice Hall International.
5) Integrated Product & Process Design by Edward Magrab, RC Press.

2MCC5 ELECTIVE-II

1. FLEXIBLE MANUFACTURING SYSTEMS

Section-A

FMS an overview: types and configuration, concept, types of flexibility and performance measures, functions of FMS, FMS host and area controller function distribution.

Development and implementation of FMS: Planning phases, integration, system configuration, FMS layout, FMS project development steps.

Section-B

Automated material handling and storage: Functions- types- analysis of material handling equipments design on conveyors and AGV systems.

Automated Storages: Storage system performance- AS/RS- carausal storage system- WIP storage system- interfacing handling, storage with manufacturing.

Modeling and Analysis of FMS: Analytical, heuristic, queuing, simulation and petrinet modeling techniques- scope, applicability and limitations

References:

1) Groover M.P.- Automation, Production Systems and CIM.
2) Ranky P.G.- The Design and Operation of FMS.
3) Parrish D.J.- Flexible Manufacturing.

2MCC5 ELECTIVE-II

2. VIRTUAL MANUFACTURING

Section-A

Virtual reality in engineering, rapid prototyping and near net shape manufacturing, visualization, environment construction technologies, modeling technologies, metamodeling, integrated infrastructure and architecture, simulation, integration of ligacy data, manufacturing characterization, verification, validation and measurement, work flow, cross functional treads.

Section-B

Design centered and production centered VM, CAD data translation, manufacturing resource models for distributed manufacturing, design of production systems, Virtual manufacturing over INTERNET, IMACS (interactive manufacturability analysis and critiquing system), optimal selection of partner in Agile Manufacturing, Virtual reality modeling languages.

References:

1) Considine D.M. and Considine G.D. – Standard Handbook of Industrial Automation.
2) Kusiak A.- Intelligent Manufacturing Systems.
3) Fundamentals of Industrial Automation by Turgan.

2MCC 5 ELECTIVE-II

3. INDUSTRIAL AUTOMATION

Section-A

Introduction to Industrial Automation: Automation in production systems, Opportunities of automation and computerization in a production system, Automated manufacturing systems, Computerized manufacturing support systems, reasons for automating, automation principles and strategies, basic elements of an automated system, advanced automation functions, levels of automation.

Industrial Control Systems**:** Process industries, discrete manufacturing industries, continuous and discrete control, computer process control and the forms of computer process control, sensors, actuators and other control system components.

Automated Manufacturing Systems**:** Fundamentals of automated production lines, applications of automated production lines, transfer lines, automated assembly systems.

Section-B

Modelling and Simulation for Plant Automation: Need of system modeling, uses of system simulation, mathematical modeling of a plant, model evaluation and improvement, modern tools for modeling and simulation of systems, applications.

Industrial Control Applications: Introduction, cement plant, thermal power plant, water treatment plant, irrigation canal management, steel plant, etc.

Intelligent Controllers: Introduction, model based controllers, predictive control, artificial intelligence based systems, expert controller, fuzzy logic system, fuzzy controller, fuzzy logic tools, artificial neural networks, neural controllers, VLSI implementation of neural networks, neuro-fuzzy control systems.

Books :

1. Automation, Production Systems and Computer-Integrated Manufacturing, by M. P. Groover, Pearson Education Pub.
2. Computer-Based Industrial Control, by Krishna Kant, Prentice Hall of India.

2MCC 5 ELECTIVE-II

4. 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:

1. Pham, D.T. & Dimov.S.S., “Rapid manufacturing”, Springer -Verlag, London, 2001.
2. Terry wohlers, “Wohlers Report 2007”, Wohlers Associates, USA, 2007.
3. Ghosh A., “Rapid Protopyping: A Brief Introduction”, Affiliated East West,
4. Kenneth G. Cooper, “Rapid Prototyping Technology: Selection and Application”, CRC Press, 2001.
5. Chua Chee Kai, Leong Kah Fai, Lim Chu -Sing, “Rapid Prototyping: Principles and Applications”, World Scientific, 2003.

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SEMESTER-III

3MCCS Seminar

Project

SEMESTER-IV

4MCCP Project (Dissertation and viva-voce)

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SYLLABUS PRESCRIBED FOR

TWO YEAR P.G. DEGREE COURSE IN

MASTER OF ENGINEERING (FULL TIME)
DIGITAL ELECTRONICS

FIRST SEMESTER

1UMEF1/1UMEP1 DIGITAL INSTRUMENTATION

SECTION A

Unit-I **Digital time measurement techniques:**
Vernier technique for small time interval measurement, Measurement of periodic time, Measurement of phase, capacitance, quality factor, time constant & decibel .
Digital frequency measurement techniques:
Measurement of ratio, product & difference between two frequencies, High frequency measurement, Maxima & Minima frequency measurement , Peak Frequency measurement, Fast low frequency measurement.

Unit-II: **Electronic instrument for signal analysis:**
Signal Analyzer: Spectrum analyzer, Network analyzer, Wave analyzer, Distortion analyzer, Logic Analyzer, Protocol analyzer.
Automated Measurement Systems:
Need & requirement of Automatic test equipment (ATE), Computer based & computer controlled ATE, ATE for PCB, Component testing. IEEE-488 electronic instrument Bus standard, Field Bus application. Instrumentation in Hazardous area.

SECTION B

Unit-III: **Microcontroller & PC based Data acquisition system:**
Data acquisition system: Introduction to smart sensors, digital sensors, Case studies of real time PC based instrumentation system, Virtual instruments, Intelligent instrument & Role of software.
Computer control: Hierarchy of computer control for industry, Direct digital control, Distributed computer control: System architecture & implementation concepts, buses & communication networks of DCCS, SCADA system.

Unit-IV: **Advanced medical instrumentation systems:**
Microprocessor interfacing & computer based Medical instrumentation System, Real time digital conditioning of monitored bio-medical signals such as EEG, ECG, EMG, & VEP .
Intelligent controllers:
Discrete State Process control, Relay Sequencer & Ladder Diagram Programmable logic controllers, PLC programming

techniques, Introduction to fuzzy logic & Neural network controllers.

Text Books:

1. Digital Measurement Techniques, 1996 by T.S.Rathore, Narosa publishers,New Delhi Second Edi.
2. Instrumentation & Process, Critis Johnson (PHI Publication)

Reference Books :

1. Electronic Instruments Handbook (3/e), 1997 by Clyde E. Coombs, McGraw Hill International
2. Applied Electronics Instrumentation & Measurement, 1992 by McLachlan & Buchala, Prentice Hall International
3. Khandpur R.S., Handbook of Bio-medical Instrumentation (3/e)
4. Computer Based Industrial Control by Krishnkant , PHI , 5TH Edition.
5. Digital Signal Processing by Cavicchi (John Willey Publication)

1UMEF2/1UMEP2 ADVANCED DIGITAL SIGNAL PROCESSING

SECTION - A

Unit I : Introduction : Overview of Discrete time signals and systems: Convolution, correlation, Time Bandwidth Relationships, Introduction to Random signal Processing and Statistical Signal Processing. Different transforms, use of DFT in linear filtering, filtering of long data sequences, Algorithm for convolution and DFT. FFT algorithms.

Unit II : Digital filter Design: FIR and IIR Filter Design techniques, Introduction to Multirate Digital Signal , Implementation of Sampling Rate Converter, Filter Bank Implementation, Sub-band Coding.

SECTION - B

Unit III : Adaptive Digital Signal Processing: Spectral Estimation using Least Square(LS), Least Mean Square (LMS), Recursive Least Square (RLS) Algorithms. Applications to Speech and Audio Signal Processing

Unit IV : Issues involved in DSP processor design, Architecture and programming of TMS 320 C67XX, Applications of DSP to Biomedical Signal Processing.

Text Books :

1) Digital Signal Processing: Principles , Algorithms and Applications by J G Proakis, D.G. Monalikis PHI (3rd Edition)
2) Discrete Time Signal Processing, A.V. Oppenheim and Schafer, PHI.

Reference Books :

1) Discrete Time Signal Processing A practical Approach, E.C. Ifeacher & B.W. Jarvis Pearson Education 3rd Edition.

2) A Course in Digital Signal Processing, Porat ,Boaz John Willey and Sons
3) Digital Signal Processing, S.K. Mitra, TMH(2nd Edition)
4) Digital Signal Processing, T. J. Cavicchi, John Willey and Sons
5) DSP Handbook Vijay Medisetti & D.B. Williams CRC Press
6) Adaptive Filter Theory, Simon Haylein Jhon Wiley
7) Fundamentals of Statistical signal Processing by Steven Key, Pearson Education.

1UMEF3/1UMEP3 ELECTIVE –I

1) Modern Electronics Design Technique

Unit – I : Amplifiers & Regulators System Design : Digital isolation techniques, high speed clamping amplifiers, programmable gain amplifiers, auto – zero amplifiers, lock – in amplifiers, switch mode regulator topologies like buck, boost, buck boost their control techniques and selection of passive, active (IGBT, GTO, MOSFET, Diode) and magnetic components for these regulators, simulation of these systems using PSIM and related software.

Unit – II : Communication and control system design : Electronic navigation systems, underwater sound systems, phase lock loop design, direct digital synthesis, radio systems and auto pilot systems in aircraft, digital engine control and motion control systems for automobiles, simulation of these systems using related software's.

Unit – III : Portable Electronics system design : Types and characteristics of modern batteries, smart battery management systems, portable devices like mobile TV, VolP phones, glucose meter, pulse oximetry, cardio pulmonary resuscitation systems , ultrasound systems, Barcode readers, payment terminals.

Unit–IV : Electronic system design for production : Layout and grounding for analog & digital systems, safety, testablility, reliability and thermal management in electronic systems, quality, reliability, testing and environmental aspects in printed circuit board design, design of enclosures for electronic products, EMC of electronic products.

Text Books :

1. Linear Circuit Design Handbook by Zumbahlen Elsevier, Analog Devices Corp.
2. Circuit Design, Knowit All by Ashby, Baker Elsevier

Reference Books :

1. Demystifying switching power supplies by Mach., Elsevier 2.Standard handbook of Electronic Engg. (5th Ed) by Chritiansen & Alexander MGH
3. Digital Frequency synthesis Demystified by Goldberg LLH Pub.
4. Aircraft Digital Electronic & Comp. System by Tooley Elsevier
5. Aircraft Electricity and Electronics by Bent.
6. Battery operated devices and systems by Pitoia, Elsevier
7. Understanding Automotive electronics (6th Ed) by Ribbens Elesevier
8. Grounding & Shielding Ckt & interfacing (5th Ed) by Morrison Wiley
9. Printed Ckt. Boards by Khandpur MGH

1UMEF3/1UMEP3 ELECTIVE –I

2) RF SYSTEM DESIGN

UNIT-I ACTIVE RF COMPONENTS AND THEIR MODELING

Active RF Components: Semiconductor Basics: Physical properties of semiconductors, PN-Junction, Schottky contact. **Bipolar-Junction Transistors:** Construction, Functionality, Temperature behavior, Limiting values. **RF Field Effect Transistors:** Construction, Functionality, Frequency response, Limiting values. **High Electron Mobility Transistors:** Construction, Functionality, Frequency response. **Active RF Component Modeling:** Transistor Models: Large-signal BJT Models, Small-signal BJT Models, Large-signal FET Models, Small-signal FET Models.

UNIT-II FILTER and AMPLIFIER DESIGN

RF filter Design methods: Image Parameter Method, Insertion Loss Method, Microstrip Filter Design **Filter Implementation:** Unit Elements, Richard's Transformation, Kuroda's Identities and Examples of Microstrip. **High frequency amplifier design:** Bandwidth enhancement, neutralization and unilateralisation, cascaded amplifiers. **RF power amplifier design:** Class A to Class F amplifiers and modulation characteristics.

UNIT-III LNA, Mixers and oscillators design

LNA topologies and their design, linearity and large signal performances, multipliers and sub sampling mixers, High Frequency Oscillator Configuration: Fixed Frequency Oscillator, Voltage Controller Oscillator and Dielectric Resonator Oscillator

UNIT-IV PLL design

Linearized PLL models, Noise properties of PLLs, Phase detectors, Sequential phase detectors, Loop filters and charge pumps, design examples

Text Books :

1. Microwave Transistor Amplifiers, Analysis and Design by G. Gonzalez; Prentice Hall
2. RF Circuit Design-Theory and Applications by Reinhold Ludwig and Pavel Bretchko; Pearson Education

Reference Books :

1. Thomas Lee, " The Design of CMOS RF ICs", Cambridge second edition
2. Microwave Engineering by David M. Pozar; Wiley & Sons (ASIA) Pvt. Ltd.
3. Radio Frequency and Microwave Electronics by Matthew M Radmanesh
4. Microwave Circuit analysis and Amplifier Design by S. Y. Liao; Prentice Hall

1UMEF3 /1UMEP3 ELECTIVE –I

3) COMPUTER COMMUNICATION NETWORKS

Section - A

Unit I **Review of computer networking concepts:** *(Introductory portion removed)* OSI/ISO Reference Model, TCP/IP reference models, Point to point protocols.

ARQ: Retransmission strategies.

Functional elements : Multiplexing, Switching , Networks Management & traffic controls. Delay models in Data Networks Switching techniques: Performance measures & architectural issues.

Unit II **Internetworking :** TCP/IP Internet architecture, IPV4, IPV6, IP addressing & related issues, IP address resolution techniques (ARP). IP datagram & forwarding, *Queuing Models*, *Routers*, routing algorithms.

Section - B

Unit III **Multiple access techniques:** CSMA/CD, CSMA/CA, CDMA, OFDM, Delay throughput characteristics, WLAN-Protocols**, multiple access Protocols**, Ad-hoc networks, WAP, Bluetooth Specifications, *3G Evolution and Architecture.*

Unit IV **Network security issues :** Ciphers, DES, Public key cryptography, RAS algorithm, Digital Watermarking, Attacks and Counter Measures , Service Authentication Proforma.

Text Books :

1. Communication Networks – Leon Garcia & Wadeja, Tata McGraw Hill Publication.
2. "Computer Networks and Internetworking"D.E.Comer, Pearson Education

Reference Books :

1) "Data Networks" Dimitri Bertisekas & Robert Gallager, PHI
2) "Local Area Networks", Gerd E Kieser – Mc-Graw-Hill
3) "Cryptography and Network Security: Principles and Practice", William Stallings, Pearson Education
4) "GSM, CDMA and 3G Systems" , Steele,, Wiely Students Edition

1UMEF4 /2UMEP1 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 spectral of linear modulated signal, CPFSK & CPM Signals, Correlation demodulator, Match filter demodulator, Optimum detector, Probability of error for binary & M-array signals.

Unit – II Source & channel coding: Discrete stationary sources, Lampel Ziv algorithm, Coding of analog sources, Rate distortion functions, Scalar quantization & vector quantization, Temporal & spectral waveform coding, BCH codes, Reed – Solomon 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 banc limited signal for zero ISI, Nyquist criterion, design of band limited signal for controlled ISI, partial response signal. Data detection for controlled ISI, Linear Equalization – peak distortion criteria, mean square error (MSE) criteria, decision feedback equalization, coefficient optimization, adaptive linear equalization, zero forcing 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.

Text Books :

1. J G Proakis, " Digital Communication" Fourth Edi. MGH
2. Shu Lin & Costell , " Error Control Coding – Fundamentals & applications," Addison Wessley Pub.

Reference Books :

1. Bernard Sklar, " Digital Communication" Fundamental & application, Second Edi. Pearson education, Asia.

2. Simon Haykins ; Digital Communication" John Wiley & Sons.
3. J P Proakis, M Salehi, " Communication System Engineering" Second Edi. Pearson Edition (LPE)
4. Salvatore Gravano, " Introduction to Error Control Codes", 1st Edition, Oxford Press.
5. Stephen Wicker, " Theory of Error Correcting Codes", PHI
6. K S Shanmugan; " Digital & Analog Communication System" John Wiley & Sons.

1UMEF5/2UMEP2 EMBEDDED SYSTEM DESIGN

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, Organisation, analog, digital & high speed I/O for embedded systems, interfacing SRAM, DRAM, 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 & char & data types, storage class – static & extern, volatile keyword, operation on bits, functions, ARM / Thumb procedural call standard, pointers & arrays, conditional statements – of-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 C OS – 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 on – chip components like ADC and interfacing external peripherals like keyboard, LCD, Stepper motor.

Text Books :

01) Embedded Systems (2nd Edi) by Rajkamal (Tata McGraw Hill)
02) Embedded Real-time Systems Programming by Lyer & Gupta (Tata McGraw Hill

Reference Books :

01) ARM System on chip architecture (2nd Ed) by Furber (Pearson India)
02) Intro. To Embedded systems by K.V. Shibu (MGH)
03) Philips NXP LPC 2148 user manual
04) Scheduling in Real time systems by Cottet, Delacroix & Mammeri (John Wiley & Sons)

1UMEF6 /2UMEP3
DIGITAL COMMUNICATION TECHNIQUES-LAB.

1UMEF7/2UMEP4
EMBEDDED SYSTEM DESIGN-LAB.

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SECOND SEMESTER

2UMEF1/3UMEP1 DIGITAL IMAGE PROCESSING

Section A

UNIT I Image processing fundamental: Basic image processing Steps, Digital image representation,Image acquisition for grey scale and color, ,Human visual system Image types . Image Transforms: 2D DFT, Walsh transform ,Hadamard transform,Slant transform, Discrete transform ,KL transform, Radon transform and Multiresolution wavelet transform.

UNIT II Image Enhancement: Image enhancement in spatial domain ,Enhancement through point operation,Types of point operation, Histrogram Manipulation, linear/nonlinear grey-level transformation,Local or neighbourhood operation, median filter,spatial domain high-pass filtering,bit-plane slicing,Image enhancement in the frequency domain,homomorphic filter,zooming operation ,image arithmetic.

Section B

UNIT III Image Restoration and Denoising : Image degradation models, Types of image blur, image restoration model, linear image restoration,nonlinear image restoration techniques, blind deconvolution and classification technique ,image denoising, noise in image, median filtering, trimmed metrices in image restoration, Application of biomedical imaging

UNIT IV Image segmentation: , region approach to image segmentation, clustering technique, image segmentation based on thresholding, edge-based segmentation , edge detection ,edge linking, Hough transform ,active contour, watershed transformation, shape representation and classification. Morphological techniques, Object & pattern recognition & interpretation method.

Image Compression : Lossy block truncation & vector quantization , lossless Huffmon coding, runlength coding & block coding , transform coding.

Text Books :

1) "Digital Image Processing By R.C Gonzales & Woods –Addison Wesley IIIrd Ed
2) "Digital Image Processing" by S Jayaraman, S Esakkirajan,T Veerakumar- Tata Mc Graw Hill.

Reference Books :

1) "Fundamental Digital Image Processing "by A.K.Jain –Prentics Hall Inc.
2) "Digital Image Processing" By W.K Pratt IIIrd ed John Wiley
3) "Digital Image Processing and Analysis" by B Chanda and D. Mujumdar-PHI new Delhi

2UMEF2/3UMEP2 CMOS VLSI DESIGN

Unit I: CMOS design methods, CMOS Testing, CMOS subsystem design, CMOS system case studies. Fault tolerant VLSI architectures.

Unit II: ASIC Construction: Physical design, CAD tools, system partitioning, ASIC size estimation, Power dissipation issues, FPGA partitioning methods

Unit III: Floor planning, Placement, physical design flow, information formats, global routing, detailed routing, special routing, circuit extraction and DRC

Unit IV: CMOS Analog and RF Integrated Circuits: High speed comparators, Switch capacitor filters, RF power amplifier, Mixer, PLL.

Text Books :

1) "Application Specific IC" Michael John Sebastin, Smith Addison – Wesley Publication
2) "The Design of CMOS Radio-Frequency Integrated Circuits" Thomas H. Lee – Cambridge University press

Reference Books :

1) "Principles of CMOS VLSI Design" Neil Weste and Eshraghian – Person Education
2) "CMOS Analog Circuit Design" Phillip F. Allen, Douglas R. Holberg – Oxford University Press
3) "VLSI Design" M. Michael Vai – CRC press

2UMEF3/4UMEP1 PARALLEL COMPUTING

Section A

Unit I : **Introduction**
Parallel Computer Models, Flynn's classification, system attributes, multiprocessors and multicomputers, condition of parallelism, program partitioning and scheduling, program flow mechanism, performance metrics and measures, parallel processing applications, speed up performance laws.

Unit II : **Pipelining and superscalar Techniques**
Linear and non linear pipeline processors, reservation and latency analysis, collision free scheduling, instruction pipeline design, arithmetic pipeline design, superscalar and superpipeline design.

Section B

Unit III : **Parallel and scalable architectures**
Multiprocessor, Multicomputers, multivector and SIMD computers, scalable, multithread and dataflow architecture.

Unit IV : **Parallel Program Development and Environment**
Programming Parallel Computers, Parallel Programming environments, Synchronization and multiprocessing modes, multitasking,. Microtasking, autotasking, shared variable program structure, semaphores and applications, message passing program development, control decomposition techniques, heterogeneous processing.

Text Books :

1) "Advanced Computer Architecture", Kai Hwang, Parallelism, Scalability, Programmability", McGraw Hill Inc. Ed. 1993.
2) "Computer Architecture and Parallel Processing", Kai Hwang, F. A. Briggs, McGraw Hill, 1985

Reference Books :

1) "Elements of Parallel Computing", V. Rajaraman, PHI, 1990
2) "Computer organization & Architecture", William Stallings, PHI, New Delhi, 6th edition.
3) "Kalsuk' Advanced computer Architectures", Dezso' Sima, Terence Fountain & Peter Pearson's Edation. (2nd Edition)
4) "Parallel Processing for Supercomputers and AI", Hwang and Degroot (Eds) McGraw Hill.

2UMEF4/4UMEP2 ARTIFICIAL INTELLIGENT SYSTEM

Unit I : Fuzzy set Theory, Introduction to Fuzzy sets, Fuzzy relation,Membership functions, fuzzification, defuzzification, fuzzy logic, fuzzy rule based system, fuzzy inference system.

Unit II : Fuzzy Decision Making, Fuzzy modeling, Adaptive neuro fuzzy inferencesystem, cognitive neurofuzzy modelling, Neuro fuzzy control, Application of neuro fuzzy control.

Unit III : Artificial neuron model, single and multilayer perceptron neural network (MLP), Learning process: training by backpropagation, swarm particle optimization, genetic algorithm, simulated annealing, basic concept of bidirectional associative memory (BAM), self organization feature map, optical neural network.

Unit IV: Recurrent networks, Hamming network, support vector machine**,** counter propagation networks, cluster discovery network (ART), Applications of neural network in characters recognition, forecasting, robot kinematics, biomedical signals.

Text Books :

1) "Neural Networks", S. Hykin ,Pearson Education.
2) "Fuzzy sets and Fuzzy logic Theory and Applications", George J. Klir, Bo Yuan, PHI

Reference Books :

1) "Artificial Neural Networks", Zurada
2) "Neuro Fuzzy and Soft computing", Jang, Sun, Mezutani
3) "Introduction to Neural networks using MATLAB 6.0", S.N.Sivanandan, S. Sumathi, S.N. Deepa, McGraw Hill.
4) "Neural networks, Fuzzy logic and genetic algorithms synthesis and applications", S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI
5) Intelligent Systems & controls , Laxmidhar Behera, Indrani kar (Oxford)

2UMEF5/4UMEP3 ELECTIVE - II

1) BIOINFORMATICS

Unit I : Intro. To bioinformatics, databases in bioinformatics, characterization in bioinformatics databases, categories of bioinformatics databases & navigating databases.

Unit II : **Biological sequence database :** Nucleotide database, literature database, protein database, Gene expressing database.

Unit III : **Tools :** Data submission tools, PDB, MMDB, CATH, FSSP, DALI & SCOp.

Unit IV : **Data Analysis Algorithms :** Sequence comparison algorithms, substitution matrics, sequence alignment algorithms.
Prediction Algorithms : Gene prediction algorithms, phyrogenetic prediction algorithms, protein structure prediction.

Text Books :

1. Bioinformatics databases, tools and algorithm by Orpita Bosu & Simminder Kaur Thukral, Oxford Uni. Press

2. Bioinformatics principles & application by Zhumur Ghosh & Bikekanand Mallick, Oxford Uni. Press.

Reference Book:

1. Intro. To Bioinformatics by Artur M. Lesk, Oxford Uni. Press.

2UMEF5 /4UMEP3 ELECTIVE - II

2) Micro Electro Mechanical Systems

UnitI : Development of MEMS technology, present and future, challenges, Starting Materials-substrates, etching processes & patterning, material doping, bulk micromachining processes-SCREAM, PennSOIL, integration of Electronics and MEMS technology, technology characterization.

Unit II: Scaling issues of MEMS, Scaling of physical systems, computational & fabrication issues of scale. Design realization tools for MEMS : SUMMiT technology layout, design rules.

Unit III: Electro Mechanics: structural mechanics, damping, electrical system dynamics.

Unit IV: MEMS sensors: Capacitive, piezo-resistive, sensor noise. Actuators : Electrostatic, thermal, Lorentz force actuation, MEMS reliability theory & terminology.

Text Book :

1) "Micro Electro Mechanical System Design" James J. Allen - CRC Press

Reference Books:

1) "MEMS and nanotechnology based sensors and devices for communications medical and Aerospace applications", Jha A. R. - CRC Publications.
2) "MEMS Design and fabrication" Mohamed Gad-El-Hak – CRC Press
3) "MEMS : A Practical Guide to Design, Analysis and Applications" Jan G Korvink, Oliver Paul – Springer-Verlag

2UMEF5/4UMEP3 ELECTIVE - II

3) HIGH SPEED DIGITAL SYSTEM DESIGN

Unit I: The Importance of Interconnect Design, Ideal Transmission Line Fundamentals, Crosstalk

Unit II: Non ideal Interconnect Issues, Connectors, Packages, and Vias, Nonideal Return Paths, Simultaneous Switching Noise, Power Delivery

Unit III: Buffer Modeling, Digital Timing Analysis, Design Methodologies

Unit IV: Radiated Emissions Compliance and System Noise Minimization, High-Speed Measurement Techniques

Text Books :

1) "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices" Stephen H. Hall Garrett W. Hall, James A. McCall - John Wiley & Sons, Inc.
2) "High-Speed Digital Design: A Handbook of Black Magic" Howard Johnson – Prentice Hall publication

Reference Books:

1) "High Speed Signal Propagation: Advanced Black Magic" Howard W. Johnson
2) " Signal Integrity Issues and Printed Circuit Board Design" Douglas Brooks – Prentice Hall
3) "Signal Integrity – Simplified" Eric Bogatin – Prentice Hall
4) " Noise Reduction Techniques in Electronic Systems" Henry Ott - John Wiley & Sons.

2UMEF6/3UMEP3 DIGITAL IMAGE PROCESSING-LAB.

2UMEF7/3UMEP4 CMOS VLSI DESIGN-LAB.

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3UMEF1/5UMEP1 THIRD SEMESTER
SEMINAR AND DISSERTATION
AND TECHNICAL PAPER WRITING

4UMEF1/6UMEP1 FOURTH SEMESTER
SEMINAR AND DISSERTATION
AND TECHNICAL PAPER WRITING

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SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF ENGINEERING
(FULL TIME)
ELECTRICAL ENGINEERING
(ELECTRICAL POWER SYSTEM) EXAMINATION
SEMESTER : FIRST

1 SEPS 1 POWER SYSTEM OPTIMIZATION

SECTION-A

1) Introduction to optimization and classical optimization techniques
2) Linear Programming : Standard form, geometry of LPP, Simplex Method pf solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.
3) Non-Linear Problem (NLP) : One dimensional methods, Elimination methods, Interpolation methods
4) Non-Linear Programming(NLP): Unconstrained optimization techniques-Direct search and Descent methods, constrained optimization techniques, direct and indirect methods

SECTION-B

5) Dynamic Programming: Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem.
6) CPM and PERT
7) Genetic Algorithm: Introduction to genetic Algorithm, working principle, coding of variables, fitness function. GA operators; Similarities and differences between Gas and traditional methods; Unconstrained and constrained optimization using Genetic Algorithm, real coded gas, Advanced Gas, global optimization using GA.
8) Applications to Power system: Economic Load Dispatch in thermal and Hudro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. optimal power flow, LPP and NLP techniques to Optimal flow problems.

References:

1. "Optimization - Theory and Applications", S.S.Rao, Wiley-Eastern Limited
2. "Introduction of Linear and Non-Linear Programming ", David G. Luenberger, Wesley Publishing Company
3. "Computational methods in Optimization ", Polak, Academic Press
4. "Optimization Theory with Applications" Pierre D.A., Wiley Publications

5. "Optimization for Engineering Design: Algorithms and Examples", Kalyanmoy deb, PHI Publication
6. "Genetic Algorithm in Search Optimization and Machine Learning ", D.E. Goldberg, Addision-Wesley Publication, 1989
7. "Advanced Power System Analysis and Dynamics " L.P. Singh, Wiley Eastern Limited.
8. "Power System Analysis ", Hadi Saadat, TMH Publication.
9. " Electrical Energy System : An Introduction ". Olle I.Elewgerd, TMH Publication, New Delhi.

1 SEPS 2 GENERATION PLANNING AND LOAD DISPATCH

SECTION - A

Generation- Fossil fules, Hydropower and Nuclear power generation systems. Chronological Load Curves, Power duration curve, Integrated duration curve, Hydrography, Flow duration curve, Mass curve for Hydro Power generations. Co-ordination of steam, Hydro and Nuclear power stations. Optimum Generation allocation-Line losses neglected and including the effect of transmission losses for thermal power generations. Long range and short range Hydro generation scheduling. The short term and long term Hydro-thermal scheduling of generation.

Load Forecasting & Generation Planning - Classification of loads -Load forecasting methodology-Energy forecastingpeak demand forecasting-Weather sensitive and Non-weather sensitive forecasting - Total forcast - Annual and Monthly peak demand forecast.

SECTION-B

Generation system cost analysis:

Cost analysis -capacity cost, production cost. Production analysis-production costing, production analysis involving nuclear unit, production analysis involving hydro unit. Fuel inventories-energy transaction and off-peak energy utilization.

Generation System Reliability Analysis – probabilistic generating Unit-Model and Load model, effective load- Reliability analysis for isolated system-Interconnected system-Reliability analysis of interconnected system.

Load dispatch & System Communication – Consideration for centralized control of system operations. Requirements of the central load dispatch centre.

Telementry-Remote control and data transmission, etc. Power system reforms, deregulation of electric utilities, energy management & conservation.

REFERENCES:

1) Power System Planning - R.L. Sullivan, McGraw Hill.
2) Economic Control of Interconnected System -Kirchmayers, L.K.,John Wiley and Sons, New York.
3) Generation of Electrical Energy - B.R. Gupta, Euresia Publishing House Pvt., Ltd., New Delhi.
4) Power System Restructing and Deregulation - by Loi Lei Lai
5) Restructed Electrical Power Systems - by Mohammad Shahidehopur, Muwaffaq Alomoush.
6) Privatization, Restructing, and Regulation of Network Utilities (Walras-Pareto Lectures) : by David M. Newbery.
7) Power to the People : Electric Power Deregulation : An Expose : Jack Duckworth
8) Understanding Electric Utilities and De-Regulation, Power Engineering : Lorrin Philipson, et al
9) Power Generation, Opearion and Control : A.J. Wood and B.F. Wollenberg:, John Wiley 1996
10) Understanding Electric Utilities and De-Regulation (Power Engineering) : by Lorrin Philipson, H. Lee Willis, Lorrion Philipson
11) The End of a Natural Monopoly : Deregulation and Competition in the Electric Power Industry : by P.Z.Grossman, D.H. Cole, P.Z. Grossman, D.H. Cole

1SEPS 3 MICROPROCESSOR AND MICROCONTROLLER

SECTION – A

Overview of Intel 8085 microprocessor. 8086 : Architecture, instruction including I/O instructions, bus timing diagram, interrupt structure, ISR minimum and maximum mode, Assembly Language Programming. Hardware and Software debugging aids: 1 Pass and 2 Pass assemblers, cross assemplers, circuit emulators, simulators, linkers, loaders, compiler, cross compiler, logic analyzers.

Types of interfacing devices

SECTION B

8051 Architecture : 8051 Microcontroller Hardware, Input/Output. Pins, ports, and circuits, External Memory, Counter and Timers, Serial Data input/output, Interrupts

Assembly language programming concepts : The mechanics of programming, The assembly language programming process, PAL instructions, Programming tools and techniques, Programming the 8051

Moving Data : Addressing modes, external data moves, code memory read only data moves, push and pop -op codes, data exchanges

Logical Operations : Byte level logical operations, bit level logical operations, rorate and swap operations

Arithmetic Opearions : Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic

Jumps and Call Instructions : The jump and call program range, jumps, calls and subroutines, interrupts and returns

8051 Microcontroller Design : Microcontroller specification, microcontroller design, testing the design, timing subroutines, look up tables for the 8051, serial data transmission

Applications : Keyboard, displays, pulse measurement, D/A and A/D conversion, multiple interrupts

Serial Data Communication : Network Configuration, 8051 Data Communication.

Books Recommended :

1. Kenneth J.Ayala, The 8051 Micro Controller : Architecture, Programming, Penram International, Mumbai.
2. Intel Embeded Micro Controller Data Book, Intel Corporation.
3. D.V.Hall, Microprocessor and Digital Systems, ELBS Publication, London.
4. B.P.Singh, Advance Microprocessors and Micro Controllers, New Age International, New Delhi.
5. D.V.Hall, Microprocessors and Interfacing, Tata McGraw Hill Publication, New Delhi.
6. Y.C.Liu, Gibson, Microcomputer Systems: the 8086/8088 Family, Architecture, Programming and Design, Prentice Hall of India Publications, New Delhi.
7. Lance A. Leventhal, Introduction to Microprocessor, Software, Hardware and Programming.
8. Ramesh S.Gaonkar, Microprocessor Architecture, Programming and Applications with the 8085, Penram International, Mumbai.

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1SEPS 4 POWER SYSTEM DYNAMICS

SECTION-A

INTRODUCTION

Reliable electrical power service, Stability of Synchronous machines, Tie-line oscillations, Method of simulation. Synchronous Machines: Review od synchronous machine equations, parameters, Equations in a-b-c phase co-ordinates and Park's co-ordinates, Representation of external system, Low and High orderstate models, Choice of state variables. Initial state equivalent circuit, Phasor diagram p.u. reactances. System Response to Large Disturbances: System of one machine against infinite bus, Classical Model, Mechanical and electrical torques, Critical clearing angle and time, Automatic reclosing, Precalculated Swing curves and their use.

SECTION-B

System Response to Small Disturbances: Two machine system with negligibe losses, Clarke diagram for two machine series reactance system, Extention of Clarke diagram to cover any reactance network, Equation for steady State Stability limit, Two- Machinesystem with losses, Effect of inertia. Effect of governor, action, Conservative criterion for stability, Effect of sallency, saturation and short circuit ratio on steady state power limits.

Regulated Synchronous Machines: Demagnetising effect of armature reaction and effect of small speed changes, Modes of oscillations of unregulated multimachine system. Voltage regulator and governor coach with delay Distribution of power impacts.

Effect of Excitation on Stability: Effect of excitation on generator power limits, transients and dynamic stability, Examination of dynamic stability by Routh's criterian, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilising Signals, Linear analysis of stabillised generator.

REFERENCES:

1. Synchronous Machines by C.Concordia, John Wiley & Sons.
2. Power System Stability by E.W.Kimbark, Dover Publication, Vol.-3
3. Power System Control & Stability by Anderson, Galgotia Publ.
4. Power System Stability by S.B. Crary, John Wiley & Sons.

1SEPS 5 DIGITAL SIGNAL PROCESSING

SECTION-A

Digital Signal Processing

Characterization & Classification of Digital Signals. Digital Signal Processing of continuous signals. Discrete time signals - sequences, representation of signals on orthogonal basis, sampling, aliasing, quantization & reconstruction of signals.

Discrete systems-attributes, z-transform, analysis of LTI system.

Frequency analysis, inverse systems, Discrete Fourier transform, Fast Fourier implementation of discrete time system.

Digital filters - structures, sampling, recursive, non-recursive A to D & D to A conversion. FIR, IIR & lattice filter structures, Design of FIR digital filters. Window method, Park-McCellan's method. Design of IIR digital filters. Butterworth, Chebyshev.

SECTION-B

Elliptic approximations, low-pass, band-pass, band-stop & high-pass filters. Effect of finite register length in FIR filter design. Multirate signal processing-motivation-application, decimation & interpolation, sample rate

conversion, polyphase implementation of sampling rate conversion, Filter bank theory-DFT filter banks, Adaptive filtering theory.

DSP Processors and Applications - DSP Microprocessor architectures, fixed point, floating point precision, algorithm design, mathematical, structural and numerical constraints, DSP programming, filtering, data conversion; communication applications. Real time processing considerations including interrupts.

Refernce Books :

1. J.G.Proakis and D.G.Manolakis 'Digital Signal Processing Principles, Algorithm and Applications' Prentice Hall 1997
2. A.V.Oppenheim, R.W.Schafer, 'Discrete Time Signal Processing' John Wiley.
3. J.R. Johnson, ' Introduction to Digital Signal Processing Prentice Hall 1992
4. D.J.Defatta, J.G.Dulas. Hodgekiss, 'Digital Signal Processing' J. Wiley and Sons Singapore, 1988
5. L.R.Rabiner & B. Gold - 'Theory & Applications of Digital Signal Processing', Prentice Hall, 1992

1 SEPS 6 POWER SYSTEM LAB.-I

Indentify and perform minimum 16 (sixteen) experiments based on syllabus of subjects form Semester-I

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SECOND SEMESTER

2SEPS1 ADVANCED POWER SYSTEM PROTECTION

SECTION-A

Review of principles of power system equipments protection, configuration of various solid state protection scheme, evaluation of digital relays from electromechanical relays, performance & operational characteristics of digital protection, Basic elements of digital filtering, analog multiplexers, conversions of system: the sampling theorem, signal aliasing error, sample & hold circuit, multiplexers, analog to digital conversion, digital filtering concepts, A digital relay. Hardware & Software.

SECTION – B

Mathematical background to protectional algorithm, first derivative (Mann & Morrison) algorithm, Fourier algorithm- full cycle window algorithm, fractional cycle window algorithm, Walsh function based algorithm, least square based algorithm, differential equation based algorithm, travelling wave based technique. Digital differential protection of transformer, digital line differential protection, recent advances in digital protection of power system.

Books Recommended :

1) Digital Protection for Power System : A.T.Johns and S.K.Salman, Peter, Published by Peter Peregrinus Ltd. on behalf of the IEE, London, U.K.
2) Power System Protection and Switchgear : Badri Ram and D.N.Vishvakarma, Tata McGraw Hill, New Delhi.
3) Transmission Network Protection : Theory and Practice, Y.G.Paithankar, Marcel Dekker, New York, U.S.A.
4) Fundamentals of Power System Protection : Y.G.Paithankar and S.R. Bhide, Prentice Hall of India, New Delhi.

2 SEPS 2 HIGH VOLTAGE TRANSMISSION

SECTION-A

Introduction of EHV-AC transmission, Tower configuration, Thermal ratings of lines & cables, circuit breakers, insulators for A.C. transmission, Voltage gradients of conductors, Cuona effects, power loss & audible noise, radio interferences, electrostatic field of transmission lines, Insulation characteristics of ling air gaps. Design of EHV lines based upon steady state limits, transient overvoltages & voltage stability, series shunt compensation, active & reactive power flow control, basics of static VAR compensators

SECTION-B

H.V.D.C. Transmission:

General aspects of comparison between HVDC & HVDC transmission schemes and terminal station layout. Operation of converters as rectifier and as an inverter. Equivalent circuit and operating chart of converter. Control of the converters (ccc & cca) Harmonics and its control, faults protection of line and terminal equipment.

Parallel operation of HVDC and AC, Multiterminal HVDC Systems

REFERENCE BOOKS :

1. Weedy, B.M. : Electric Power Systems, John Wiley & Sons.
2. EHV Transmission Line Refernce Book : Edison Electric Inst.
3. Adamson, C & Hingorani N.G. . HVDC Power Transmission, Garraway Publications.
4. Kimbark, E.W. : Direct Current Transmission, Vol.I, John Wiley & Sons.
5. Uhlman, E. : Transmission by D.C.
6. Rakosh Das Beganudre : Extra High Voltage AC Transmission Engineering.

2 SEPS 3 POWER SYSTEM MODELLING & CONTROL

SECTION-A

Transient response and concept of stability in Electrical Power System. Modelling of Power System. Control of voltage, frequency and tie-line power flows, Q-v and P-f control loops, mechanism of real and reactive power control. Mathematical model of speed governing system. Turbine governor contrate as affecting the power system dynamics. Transion and steady state response in the interconnected power systems. (multimedia systems). Excitation systems. Transformation model of exciter system. Analysis using block diagrams. Power systems stabilizers. Dynamic stability (small disturbances), effect of excitation control and turbine dynamics, characteristic equation, method of analysis of the stability of power system. Multi machine systems, Flux decay effects. Multi machine systems with constant impedance loads, matrix representation of a passive network in the transient state, converting to a common reference frame. Converting machine co-ordinates to system reference, relation between machine current and voltages, system order, machine represented by classical methods, multi machines systems study.

SECTION-B

Net interchange tie-line bias control. Optimal, sub-optimal and decentralised controllers. Discrete mode AGC. Time - error and inadvertent interchange correction techniques. On-line computer control. Distributed digital control. Data acquisition systems. Emergency control, preventive control, system, system wide optimization, SCADA.

Self excited electro-mechanical oscillations in power system and the means for control.

REFERENCES :-

1) V.Venlkov : Transient Processes in Electrical Power System, Mir Publication, Moscow.
2) Olle I.Elgard : Electric Energy Systems Theory, Tata McGraw Hill Pub. Co., New Delhi.
3) Anderson P.M. & Foaud A.A. : Power System Control and Stability, Galgotia Pub.
4) Nagrath I.J., Kothari D.P. : Modern Power System Analysis, Tata McGraw Hill Pub. Co., New Delhi.

2SEPS 4 COMPUTER METHODS IN POWER SYSTEM ANALYSIS

SECTION - A

1. Representation of power systems for computerised analysis: Mathematical models of synchronous generator for steady state and transient analysis, Transformer with tap changer, transmission line, phase shifter and loads.

2. Topology of Electric Power System-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.
3. Formation of bus impedance and admittance matrices by algorithm - Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix. Three phase network elements-transformation matrix -incidence and network matrices for three phase network. Algorithm for formulation of 3 - phase bus impedance matrix.

SECTION-B

4. Short Circuit Studies : Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multi node power systems using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuits bus impedance and look impedance matrices.
5. Load flow studies : Sleek bus, loop buses, voltage control buses, Load flow equations, Power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods - sensitivity analysis, Second order N-R method, fast mecouple load flow method - Sparsity of matrix. Multi area power flow analysis with the line control.
6. Stability studies of Power System - Development of mathematical model for multi machine system stability analysis-Formation of equations and method of solution. Transient stability analysis including synchronous machines, system network and loads. Solution of state equation by modified Eular method and solution of network equations by Gauss-Seidal interactive method.

REFERNCE BOOKS :

1) Computer Methods in Power System Analysis : G.W.Stage A.H.Elabiad, McGraw Hill Book Co.
2) Computer Techniques in Power System Analysis : M.A. Pai, Tata McGraw Hill Publication.
3) Electric Energy System Theory : O.I.Elgard, Tata McGraw Hill Publication.
4) Computer Aided Power System Operation and Analysis: R.N.Dhar, Tata McGraw Hill Publication.
5) Modern Power System Analysis : I.J.Nagrath, D.E.Kothar, Tata McGraw Hill, New Delhi.

2SEPS 5 FACTS AND POWER QUALITY

SECTION-A

Steady state and dynamic problems in AC systems, Flexible AC transmission systems (FACTS), principles of series shunt compensation, description of

static var compensation (SAC), thyristor controlled series compensation (TCSC) static phase shitters (SPS), static condenser (STATCON), static synchronous series compensator (SSSC) and unified power flow controller (UPFC), modelling and analysis of FACTS controllers, control strategies to improve system stability.

SECTION-B

Power quality problems in distribution systems, Harmonics, Harmonics creating loads, modelling, harmonic propagation,series and parallel resonance, harmonic power flow, mitigation of harmonics, filters,passive filters, active filters,shunt and series hybrid filters, voltage sag ans swells, voltage flicker, mitigation of power quality problems using power electronics conditioners, IEEE standards.

Books Recommended :

1) G.T.Heydt : Power Quality, Stars in a Circle Publication, Indiana, 1991.
2) E.J.E.Miller : Static Reactive Power Compensation, John Wiley & Sons, New York, 1982.
3) Recent Publications on Power Systems and Power Delivery.

2 SEPS 6 POWER SYSTEM LAB.-II

Identify and perform minimum 16 (sixteen) experiments based on syllabus of subjects form Semester-II.

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THIRD SEMESTER

3SEPS1 SEMINAR AND DISSERTATION
(as per given scheme)

FOURTH SEMESTER

4SEPS1 SEMINAR AND DISSERTATION
(as per given scheme)

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SYLLABUS PRESCRIBED FOR
TWO YEAR P.G. COURSE IN
MASTER OF TECHNOLOGY (FULL TIME)
CHEMICAL TECHNOLOGY
(MEMBRANE & SEPARATION TECHNOLOGY)

FIRST SEMESTER

1 MST 1 ADVANCES IN ABSORPTION AND ADSORPTION SEPARATION TECHNOLOGIES

Absorption, fundamentals, applications, multicomponent absorption, Non-isothermal absorption, mass transfer in packed towers for gas absorption, capacity, height of tower, plate towers, absorption equipments & recent developments.

Adsorption isotherm models, break through curve, steady state & unsteady state adsorption, adsorption equipments, structure of adsorbents, kinetic effects, equilibrium, non-equilibrium isothermal and non isothermal operation, regeneration of adsorbent.

BOOKS :

1) Chemical Engineering, Vol.I & II : Coulson & Richardson.
2) Handbook of Separation Techniques for Chemical Engineers : P.A.Schweitzer.
3) Mass Transfer Operations : R.E.Treybal.
4) Absorption, Fundamentals and Applications : Zarzycki R.,Chacuk A.
5) Gas Separation by Adsorption Process : R.T.Yang.

1 MST 2 MEMBRANE SEPARATION PROCESS

Membrane transport and separation mechanism, Basic transport equations, solute transport parameters, surface force-pore flow model, prediction of membrane performance, physico-chemical criteria of membrane process, material science of RO/UF membranes, aqueous & non-aqueous solution systems, module design and analysis, membrane process design and systems, membrane process in water, waste water, biotechnology process, food industries etc., membrane bioreactor, pervaporation techniques in alcohol concentration, gas separation application, by permeation under pressure through membrane, membrane fouling and compaction, liquid membranes, pollution control by membrane process. RO treatment of non-aqueous solutions in liquid phase.

BOOKS :

1) RO/UF Principles and Applications : S.Sourirajan, R.Matsscera, Canada.

2) UF Applications Handbook : Munir Cheryon.
3) Membrane Separation Process : Stratumann, Germany.
4) Filtration and Separation : J.Wakeman, Elsevier.
5) Handbook of Separation Process Technology : Koros W.J., Rousseau R.W., Wiley, New York.

1 MST 3 CHEMICAL ENGINEERING ANALYSIS

Chromatographic techniques for chemical analysis for measuring thermodynamic, kinetic & physico-chemical properties, process chromatography, production chromatography, laboratory or preparative chromatography, gas chromatography, liquid chromatography, Elution chromatography, Gas-Liquid chromatography, chromatographic equipments, process design & optimization, counter current techniques, HPLC, ion exchange chromatography, electrophorasis, electrodialysis, lypholisation, equipment, recent advances. Basic principles of mass spectrometry, its application for molecular structure determination, magnetic rosonance spectroscopy, NMR chemical shift, Fourier transfer IR, Coulometric analysis, basic of electronic circuitvy for chemical instruments, computer applications and programming in chemical analysis and instrumentation.

BOOKS :

1) Chromatographic Methods : Braithwaite A., Smith F.J., Chapman & Hall.
2) New Developments in Gas Chromatogrphy : Purnell J.H., Wiley Production Scale GC.
3) Preparative Liquid Chromatography : Bidlingmeyer R.A., Elsevier.
4) High Performance Liquid Chromatography : Brown P.R., Hartwick R.A., Wiley.
5) Chemical Engineering, Vol. I to IV : Coulsion V. Richardsons.
6) Separation Techniques : Schoew H.M., New Chemical Engg., Intersciences Pub.
7) Separation Processes : C.J.King, Tata McGraw Hill.
8) Instrumental Methods of Chemical Analysis : Willard H.N., East West Press.
9) Instrumental Methods of Chemical Analysis : Ewing G.W., McGraw Hill.

1 MST 4 ADVANCED ENERGY TECHNOLOGIES

Energy intensive chemical process, energy balances, energy consumption & audit, recovery of energy, energy recovery units related to gas-gas, gas-liquid, liquid-liquid systems, waste heat recovery units, Energy planning, energy conservation.

Energy resources - conventional, non-conventional, renewable / alternate sources of energy, using water, wind, tide, solar, biomass, geothermal, etc. and their applications, energy related pollution control technologies, combustion process, removal of Nitrogen, Sulphur containing gases, acid gas removal.

BOOKS :

1) Chemical Technology, I to IV : Venkateshwaralu D.
2) Energy Conservation in Petrochemical Industries : S.B.Pandya, Tata McGraw Hill.
3) Conventional Energy Technology : S.B.Pandya, Tata McGraw Hill.
4) Practical Techniques of Saving Energy in Chemical Industry : Sitting M., Noyes Data Corp, USA.
5) Fuels & Fuel Technology : Francis W., M.C.Peter, Pergamon Press.
6) Fuel Combustion Energy Technology : S.N.Saha, Dhanpat Rai Pub. Co, New Delhi.

1 MST 5 ADVANCES IN ABSORPTION AND ADSORPTION SEPARATION TECHNOLOGIES-LAB.

PRACTICALS : based on above syllabus.

1 MST 6 MEMBRANE SEPARATION PROCESS-LAB.

PRACTICALS : based on above syllabus.

1 MST 7 SEMINAR-I

Presentation of critical apprisal of literature survey on the topic related to recent development, advances, reserach work in the field of membrane and separation technologies.

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SECOND SEMESTER

2 MST 1 ADVANCED DOWNSTREAM TECHNOLOGY FOR CHEMICAL RECOVERY AND WASTE UTILIZATION

Centrifugal separation - theory, application, equipments, power requirement, chemical separation for Gas-Liquid system, Gas-Solid system. Super critical fluids extraction in food, pharmaceutical, environmental and petroleum applications, water treatment, desalination, Bio separation, dialysis, industrial dialysis.

Cryogenic distillation for refinery, petrochemical off gases, natural gases, gas recovery-Olefin, Helium, Nitrogen, Desulfurization - coal,

flue gases, Azeotropic & extractive distillation - residue curve maps, homogeneous azeotropic distillation, pressure swing distillation, Column sequences, hetro geneous azeotropic distillation.

Energy conservation in separation processes - energy balance, molecular sieves - zeolights, adsorption, catalytic properties, manufacturing processes, hydrogel process, application, New trends.

Separations process synthesis for nonazeotropic mixtures, non ideal liquid mixtures, separation synthesis algorithm, Ion exchange - manufacture of resins, physical & chemical properties, capacity, selectivity, application, regeneration, equipment, catalysis use.

BOOKS :

1) Perry's Chemical Engg. Handbook : McGraw Hill Pub.
2) Conceptual Design of Chemical Processes : Douglus J.M., McGraw Hill
3) Recent Developments in Chemical Process & Plant Design : Liu Y.A., John Wiley & Sons Inc.
4) Cryogenic Process Engg. : Timmerhaus K.D., Plenum Press.
5) Encyclopedia of Separation Technology, Vol I & II : Kirk Othmer, Wiley Interscience.

2 MST 2 INDUSTRIAL BIOTECHNOLOGY

Advanced termentation process for industrial production, Fermentation products, Biochemistry and bio chemical engineering aspects, kinetics of growth & model of fermentation process, industrial microbiology, fermentation types and mechanism, recent development in fermentation design, measu rement and control devices, instrumentation in fermentar, liquid media and air sterilization techniques, heat load of fermentation, enzyme engineering, industrial production and applications of enzymes, immobilization of enzymes of whole cells, bioenergy utilization, bioconvertion of renewable resources to organic chemicals, application of bio technology in petroleum, oil, paper, food & chemical industries, production of high value products using biotechnology, production of antibiotics, vaccine, vitamins, surfuctants, polysaccharides by microbial fermentation, their isolation, purification.

BOOKS :

1) A Comprehensive Practise in Biotechnology : Rehrn H.J. & Reed S., Vevlacs Chemie, Weinheim.
2) Biochemical Engineering & Biotechnology Handbook : Atkinson B., Mavituna F., The Nature Press, New York.
3) Pollution Control in Process Industries : Mahajan S.P., Tata McGraw Hill.

2 MST 3 ELECTIVE

1) ADVANCED MATERIAL TECHNOLOGY

Packings in crystals, ceramic structure, silicate materials, refractory material, structure sensitive materials, polymeric materials, structure, rheology, mechanical properties, instruments used for determination of structure, detects, advances in polymeric materials, metals like carbon, steel, alloy steel, effect of cooling & heating on structure of metal structure, strengthening mechanism, rubber and composite materials.

Stress characteristics, reinforced material, plastics in packaging, containers for pharmaceutical, beverage, food, oil, detergent, etc. industries, BOPP film in food packaging, laminated, heat seable, flame proof polyester fibers, flame retardant polyolefin fibers, polymer alloys and their applications, nylon, pc, pvc, polysulphur etc., alloys, materials of construction for handling specific chemicals, Lining of equipment, inspection & testing, corrosion, fatigue, protection & testing, nanomaterials.

BOOKS :

1) Process Design of Equipments, Vol. I & II : Dawande S.D., Central Techno Pub., Nagpur.
2) Hydrocarbon Processing- Journal
3) Corrosion Engineering : Fontana M.G., McGraw Hill.
4) Chemical Engg. - World Journal.
5) Chemical Age of India.

2) ADVANCE SURFACE COATING TECHNOLOGY

Synthesis of surface coating binders like acrylics, silicones, epoxies etc., formulations of binders for different applications, inorganic binders, development in pigments in typical functional applications. Concept of eco-friendly pigments in surface coatings, different testing methods.

Books Recommended :-

1) Hydrocarbon Processing : Journal
2) Process Design of Equipments, Vol I & II : Dawande D.S., Central Techno Pub., Nagpur.
3) Corrosion Engineering : Fontana, M.G., McGraw Hill
4) Chemical Engg. : World Journal
5) Chemical Age of India.

3) Speciality Plastics

Polymer synthesis and characterization for high temp. application, engineering polymers, photo resist polymers in solar energy utilization, biodegradable polymers, hydrolysis and other new types of polymers.

Books Recommended :-

1) Chemical Engg. : World Journal
2) Process Design of Equipments, Vol I & II : Dawande D.S., Central Techno Pub., Nagpur.
3) Hydrocarbon Processing : Journal
4) Corrosion Engineering : Fontana, M.G., McGraw Hill
5) Chemical Age of India.

4) Insulation Coatings

Fundamentals of electrical insulations, classification of electrical insulation from polymeric materials, properties and structural requirements of polymeric electrical insulation, different types of polymers for electrical insulation, ingredients in formulation, formulation principles, other insulations :- thermal, aquatic and vibrational. Testing of electrical insulation and application methods of electrical insulation.

Books Recommended :-

1) Corrosion Engineering : Fontana, M.G., McGraw Hill
2) Process Design of Equipments, Vol I & II : Dawande D.S., Central Techno Pub., Nagpur.
3) Hydrocarbon Processing : Journal
4) Chemical Engg. : World Journal
5) Chemical Age of India.

2 MST 4 ADVANCED REACTOR DESIGN

Basic concept of design of reactors, types, optimisation techniques, multiphase reactors, multiphase reactions, hetrogeneous catalytic reactions, isothermal, non isothermal, adiabatic, non adiabatic, fluidised catalytic reactor, slurry reactor, characterisation of catalysis, chemical kinetics & rate equation for homogeneous and hetrogeneous reactions, chemical reaction kinetics for reactions with heat and mass transfer simulteneously, non ideal flow, fixed bed reactor - adiabatic, non isothermal, non adiabatic fixed bed, comparision of fixed, moving & fluid beds, optimization - formulation of reactor problems, use of linear programming, differential calculus, non linear programming in reactor optimization, instrumentation & control devices in chemical reactor.

BOOKS :

1) Chemical Reaction Engg. : Levenspiel O., John Wiley.
2) Chemical & Catalytic Reaction Engg. : James J. Carberry, McGraw Hill.
3) Chemical Engg. Kinetics : Smith J.M., McGraw Hill.
4) Chemical Reactor Design & Analysis : Bischott K.B. & Forment G.F.
5) Optimization of Process : Edgar T.F., Himmelbloan D.M., McGraw Hill.
6) Elements of Chemical Reaction Engg. : Scot Fogler H.C., Prentice Hall.

2 MST 5 ADVANCED DOWNSTREAM TECHNOLOGY FOR CHEMICAL RECOVERY AND WASTE UTILIZATION-LAB.

PRACTICALS : based on above syllabus.

2 MST 6 INDUSTRIAL BIOTECHNOLOGY

PRACTICALS : based on above syllabus.

2 MST 7 SEMINAR-II

A collection of literature on a topic related to recent developments in process technology, etc., critical apprisal of literature collected, preparation of report and presentation of Seminar.

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THIRD SEMESTER

3 MST 1 SEMINAR-III

Preparation of detail report based on collection of data, experimental work, published reviews, etc. on a topic related to Project / Dissertation and presentation as Seminar.

3 MST 2 PROJECT / DISSERTATION

Literature survey on Project / Dissertation topic, planning of work, finalising materials and methodology, etc.

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FOURTH SEMESTER

4 MST 1 PROJECT / DISSERTATION

Review of Project / Dissertation data generated, experimentation, conclusion drawn, recommendations given, preparation of report, calculation, designing, etc.

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SYLLABUS PRESCRIBED FOR TWO YEAR P.G. COURSE IN MASTER OF TECHNOLOGY (FULL TIME) (CHEMICAL ENGINEERING)

FIRST SEMESTER

1CE 1 TRANSPORT PHENOMENA

Viscosity and Mechanisms of Momentum Transport, Shell momentum balances and velocity distribution in Laminar flow., Equation of continuity, Mechanical energy, and equation of motion, velocity distribution in Turbulent flow, Polymeric liquids, Non Newtonian Viscosity and Models, Molecular theory of Polymeric Liquids. Boundary layer flow and hydrodynamic boundary layer.

Thermal conductivity and the mechanism of Energy transport, Shell energy balance and temperature distributions in laminar and turbulent flow, convective transport of energy, Thermal boundary layer theory, Heat transfer coefficients for different situations.

Diffusivity and the mechanisms of Mass Transport. Mass transport by convection, concentration distributions in laminar and turbulent flow. concentration boundary layer, Mass transfer with chemical reaction.

Simultaneous heat, mass and momentum transfer, analogy, dimensional analysis, Scale up.

Recent Developments in the fields and future challanges.

Books and References :

1. Transport Phenomena, R.B.Bird, W.E. Stewart and E.W. Lightfoot. John Wiley, 2nd Ed
2. Fundamentals of Momentum, Heat and Mass Transfer, J.R. Wilty, et. Al. John Wiley, 4th Ed.
3. Transport Processes and Separation process Principles, Christie J. Geankopolis 4th Ed. Prantice Hall.

1 CE 2 ADVANCED BIOCHEMICAL ENGINEERING

Kinetics of Microbial Growth And Product Formation

Phases of cell growth in batch cultures; simple unstructured kinetic models for microbial growth; growth associated product formation kinetics; Monod and Leudeking-Piret models; etc.,

Introduction to structured models for growth and product formation.

Stoichiometry of cell growth and product formation-elemental balances, available electron balances, degrees of reduction; yield coefficients of biomass and product formation; maintenance coefficients; oxygen consumption and heat evolution in aerobic cultures.

Techniques in Fermentation :-

Sterilization

Sterilization methods; Thermal death kinetics; Design criterion; Batch and continuous Heat- Sterilization of liquid media; Membrane Filter Sterilization of liquid media and Air.

(Death kinetics and design criteria to be elaborated)

Transport Phenomena In Bioreactors

Mass Transfer in heterogeneous biochemical reaction systems; oxygen transfer in submerged fermentation processes; oxygen uptake transfer coefficients (k1.a); relation OUR and OTR, role of aeration and agitation in oxygen transfer. Heat transfer processes in biological systems.

Process Design and Construction Of Bioreactors

Materials of construction, vessel geometry, Bearing assemblies, motor drives; Aseptic Seals; Flow measuring Devices, valves; Agitator and Sparger Design ; sensors and its ancillaries. Operational modes of reactors-Batch, continuous, Fed batch, repetitive batch, recycles and continuous cultivation; novel bioreactors; stirred tank, air lift & loop reactors, packed-bed and hollow-Fiber membrane Bio-reactors; reactors for waste-treatment processes; scale up criteria for bioreactors.

Books and References:

1. Bailey J.E and Ollis, D.F.Biochemical Engineering fundamentals, McGraw Hill(1986).
2. James M.Lee, Biochemical Engineering, Prentice Hall, Englewood Cliffs, New Jersey
3. Michael L. Shuler and Fikret Kargi**,** Bioprocess Engineering: Basic Concepts, Second Edition, Prentice Hall.
4. S. Aiba et al, Biochemical Engineering, Academic Press, London, 1965.

1 CE 3 PROCESS CONTROL

Dynamic modeling of complex processes by applying fundamental laws, Empirical modeling

Graphical methods for first order plus dead time and second order (over & under) damped Processes. Computer based process parameter estimation techniques.

Introduction to non linear , open loop unstable, dead time, integrating processes and their control.

Advanced control strategies, controller design for cascade control, feed forward control and interfacial Control.

Adaptive control, MRAC and STR, control configuration, Analysis and Applications

Model based control: Internal model control, Dynamic matrix control, model predictive control.

Multivariable control, Transfer function Matrix, Stability and interaction analysis.

Digital control : Hardware & Software requirement, Introduction of DDC, DCS, supervisory (optimizing) and hierarchical, z-and modified z-transformation and their inverse. Controller design and implementation.

Case studies.

Recent Developments in the fields and future challanges.

Books & References :

1. George Stephanopoules, "Chemical Process Control, An Introduction to Theory and Practical", Prentice Hall, New Delhi, 1998
2. Smith C A and Corripio A B "Principles and Practice of Automotive Process Control", John Wiley, New York, 1976.
3. Coughnowr D R, "Process System Analysis and Control" 2nd edn., McGraw Hill, New York, 1991.
4. Luyben" Process Modelling, Simulation and Control for Chemical Engineers", 2nd edn, McGraw Hill, 1990.

1 CE 4 MATHEMATICAL MODELING AND OPTIMIZATION

Introduction to process engineering and optimization, formulation of various process optimization problems and their classification, basic concept of optimization, convex and concave function, necessary and sufficient conditions for stationary points, optimization of one dimensional problems

Unconstrained multi variable optimization, direct search methods, indirect first and second order methods, linear Programming and its application : Simplex and Big M & two phase methods.Constrained multi level optimization, necessary and sufficient conditions for optimum, quadratic programming, Dynamic programming, integer and mixed integer programming.

Neural Network : Fundamentals, basic propagation network, use of neural networking in industries, fundamentals of genetic algorithm, genetic modeling.

Books & References:

1. T.F.Edgar and D.M Himmelblau "Optimization of Chemical Processes" McGraw Hill Edition.
2. Rao S.S "Engineering Optimization" New Age
3. Sharma J.K. "Operations Research"
4. Rajasekaran R, & Vijayalakshmi G.A. " Neural Network, Fussy Systems and Genetic Algorithm.

1 CE 5 ELECTIVE-I (Any one of the following topics)

1) ADVANCED CHEMICAL ANALYSIS

Introduction to Spectroscopical Methods Of Analysis

Molecular Spectroscopy, Atomic Spectroscopy, Polarimetry And Refractometry, Electrometric Methods Of Analysis, XRD Analysis

Thermal Methods, Chromatographic Methods

QUANTITATIVE SPECTROSCOPY: Beer-Lambert's Law, Limitations, Deviations (Real, Chemical, Instrumental). Nesslerimetry, Duboscq colourimetry, Estimation of inorganic ions such as Fe, Ni and estimation of Nitrite using Beer-Lambert's Law. Various electronic transitions in organic and inorganic compounds effected by UV, Visible and infra red radiations, Various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Woodward-Fischer rules for the calculation of absorption maxima (dienes and carbonyl compounds), Effects of auxochromes and effects of conjugation on the absorption maxima, Instrumentation for UV, VISIBLE and IR spectroscopies (Source, Optical parts and Detectors), Multicomponent analysis,

Classification of chromatographic methods, Column, Thin layer, Paper, Gas, High Performance Liquid Chromatographical methods (Principle, mode of separation and Technique). Separation of organic compounds by column and Thin layer, mixure of Cu, Co and Ni by Paper, separation of amino acids by paper, estimation of organic compounds by GC and HPLC.

Books & References:

1. Parikh V.M., " Absorption Spectroscopy of Organic Molecules ", Addison - Wesley Publishing Company, 1974.
2. Willard, H.H., Merritt. I.I., Dean J.A., and Settle, F.A., " Instrumental Methods of Analysis", Sixth edition, CBS publishers, 1986.
3. Skoog D.A. and West D.M., " Fundamentals of Analytical Chemistry", Saunders-College Publishing, 1982.
4. Banwell, G.C., " Fundamentals of Molecular Spectroscopy", TMH, 1992.

1 CE 5 ELECTIVE-I

2) MATERAL SCIENCE

Packings in crystals, ceramic structure, silicate materials, refractory material, structure sensitive materials, polymeric materials, structure, rheology, mechanical properties, instruments used for determination of structure, detects, advances in polymeric materials, metals like carbon, steel, alloy steel, effect of cooling & heating on structure of metal structure, strengthening mechanism, rubber and composite materials.

Stress characteristics, reinforced material, plastics in packaging, containers for pharmaceutical, beverage, food, oil, detergent, etc. industries,

BOPP film in food packaging, laminated, heat seable, flame proof polyester fibers, flame retardant polyolefin fibers, polymer alloys and their applications, nylon, pc, pvc, polysulphur etc., alloys, materials of construction for handling specific chemicals, Lining of equipment, inspection & testing, corrosion, fatigue, protection & testing, nanomaterials.

Books & References:

1) Process Design of Equipments, Vol. I & II : Dawande S.D., Central Techno Pub., Nagpur.
2) Hydrocarbon Processing- Journal
3) Corrosion Engineering : Fontana M.G., McGraw Hill.
4) Chemical Engg. - World Journal.
5) Chemical Age of India.

1 CE 5 ELECTIVE-I

3) PULP & PAPER TECHNOLOGY

Raw materials for making pulp & Paper. Different pulping processes, pulp washing, recovery of spent chemicals, pulp bleaching, stock preparation: beating, refining, internal sizing filling & loading, coloring, wet end additives.

Fourdrinier and cylinder mold paper making machines, sheet formation, Pressing, sheet drying, external sizing, winding, Hand made paper production.

Environmental aspect of Pulp & Paper Industry.

Recent Development of subject.

Books & References:

1. Pulp & Paper, Chemistry & Chemical Technology Casey, J.P.Wiley Interscience, New York
2. Pulp & Paper Manufacture , MacDonald R.G, McGraw Hill
3. Pulping Processes, Rydhlom S.A Interscience, New York
4. Pulp & Paper, Science and Technology, Libby, C.E McGraw Hill
5. Handbook of Pulp & Paper Technology, Britt, K.W. Reinhold Publishing Corporation, NY.

1CE 6 TRANSPORT PHENOMENA-LAB.

Practical based on above syllabus.

1 CE 7 ADVANCED BIOCHEMICAL ENGINEERING

Practical based on above syllabus.

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SECOND SEMESTER

2 CE 1 CHEMICAL REACTION ENGINEERING

Basic concept of design of reactors, types, optimisation techniques, multiphase reactors, multiphase reactions, hetrogeneous catalytic reactions,

isothermal, non isothermal, adiabatic, non adiabatic, fluidised catalytic reactor, slurry reactor, characterisation of catalysis, chemical kinetics & rate equation for homogeneous and hetrogeneous reactions, chemical reaction kinetics for reactions with heat and mass transfer simulteneously, non ideal flow, fixed bed reactor - adiabatic, non isothermal, non adiabatic fixed bed, comparision of fixed, moving & fluid beds, optimization - formulation of reactor problems, use of linear programming, differential calculus, non linear programming in reactor optimization, instrumentation & control devices in chemical reactor.

Books & References:

1) Chemical Reaction Engg. : Levenspiel O., John Wiley.
2) Chemical & Catalytic Reaction Engg. : James J. Carberry, McGraw Hill.
3) Chemical Engg. Kinetics : Smith J.M., McGraw Hill.
4) Chemical Reactor Design & Analysis : Bischott K.B. & Forment G.F.
5) Optimization of Process : Edgar T.F., Himmelbloan D.M., McGraw Hill.
6) Elements of Chemical Reaction Engg. : Scot Fogler H.C., Prentice Hall.

2CE2 ADVANCED SEPARATION PROCESS

Membrane transport and separation mechanism, basic transport Equations solute transport parameters, surface force-pore model, prediction of membrane performance, physico-chemical criteria of membrane process, material science of RO/UF membranes, aqueous & non aqueous solution systems, module design and analysis, membrane process design and systems, membrane process in water, waste water, biotechnology process, food industries etc., membrane bio reactor, pervaporation techniques in alcohol concentration, gas separation application, permeation under pressure through membrane, membrane fouling and compaction, liquid membranes, pollution control by membrane process RO treatment of non-aqueous solutions in liquid phase.

Books and References:

1. RO/UF Principles and Applications; S.Sourirajan, R. Matsscera, Canada
2. UF Applications Hand book; Munir Cheryon
3. Membrane Separation Process : Stratumann, Germany
4. Handbook of Separation Process Technology: Koros W.J, Rousseau R.W., Wiley, New York.

2 CE 3 PROCESS DESIGN AND PLANT UTILITIES

Process Design and development. General design considerations, Hierarchy of chemical process design.

Nature of process synthesis and analysis. Developing a conceptual design and flow sheet synthesis.

Synthesis of reaction-separation systems, Distillation sequencing, Energy targets, heat integration of

Reactors, distillation columns, evaporators and driers. Process change for improved heat integration.

Heat and mass exchange networks and network design. CHEM CAD/CAM ASPHEN Essential utilities of chemical process plants such as Water sources, steam, compressors & vacuum pumps, refrigeration systems, inert gases etc.

Recent Developments in the fields and future challanges.

Books & References:

1. Jack Broughton; Process Utility Systems; Institution of Chem. Engineers U.K.
2. Reid, Prausnitz poling; The Properties of Gases & Liquids, IV ed. McGraw Hill International ed.
3. S.C.Arora & S.Domkumdwar; A Course in Refrigeration and Air Conditioning; Dhanpat Rai & Co.(P) ltd.

2CE4 ENERGY TECHNOLOGY AND CONSERVATION

Sources of energy, different forms and conversion , solid, liquid and gaseous fuels, composition Analysis, heating values, combustion of fuels, furnaces and furnace streams, material and energy Balance, consumption and heat transfer efficiency, furnace design, oxidation of sulfur and sulfur compounds, alternate sources of energy, energy auditing, case studies, principle of renewable energy, technical and social implications.

Solar radiation, measurement and estimation, solar heating devices, solar water heaters, sheltered and unsheltered heaters, systems with separate storage, selective surfaces, solar ponds, solar concentrators and other devices, Bio fuels: classification, combustion and pyrolysis, production of alcohol and bio gas. Bio diesel, fundamentals, transesterification of vegetable oils for bio diesel production, characterization of bio diesel, economics, current trends, future prospects.

Hydrogen energy,: system and analysis, hydrogen infrastructure, safety, codes and standards.

Hydrogen production: Electrolysis, thermochemical, hydrogen from fossil fuels, biomass a renewable sources of energy. Hydrogen storage, carbon storage materials, metal and chemical hydrides, cryogenic hydrogen storage, hydrogen fuel cells.

Recent Developments in the fields and future challanges.

Books & References:

1. Fuels & Fuel Technology : Francis W; Peter M.C Pergmon Press
2. Fuel Combustion Energy Technology : S.N.Saha, Dhanpat Rai Pub. Co. New Delhi
3. Conventional Energy Technology : S.B.Pandya, Tata McGraw Hill

4. Practical Techniques of Saving Energy in Chemical Industries : Sitting M, Noyes Data Corp. USA.
5. Brame J. S. S. and King J. G. Edward Arnold, " Fuel, Solid, Liquid and Gases"
6. Sukhatme S.P., "Solar Energy"

2CE5 ELECTIVE-II (Any one of the following)

1) ENVIRONMENTAL ENGINEERING & WASTE MANAGEMENT

Ecology and environment, sources of air waster, solid wastes, Air pollution, Micrometeorology and dispersion of pollutants in environment, Fate of pollutants, Air pollution control techniques, centrifugal collectors,electrostatics, precipitator, bag filter, wet scrubbers, Design & efficiencies, Combustion generated pollution, vehicle emission control, case studies, Water pollution, water quality modeling of streams, Characterization of effluents, effluent standards, treatment methods, Primary, secondary and tertiary methods, solid waste collection, treatment and disposals, waste recovery systems.

Books & References:

1. Environmental Impact Assessment L.Canter, McGraw Hill
2. Fundamentals of Ecology, E.P.Odum, V.B.Sounders & CO
3. Physici-Chemical Process for water quality control, Wiley International
4. Water & Water Pollution Handbook, L.L.Gaccio, Marcel Dekkar, New York.

2CE5 ELECTIVE-II

2) NANOTECHNOLOGY

Introduction to Nanotechnology – History of nano-revolution, nano scale materials and their applications, Carbon nano tubes, organic and inorganic nano structures.

Future of the nanotechnology.

Materials used in Nanotechnology – An overview of the physical (mechanical, electrical) and chemical properties of different classes of solid materials such as metals, semiconductors, insulators and polymers.

Examples of size effects of properties observed in thin films, colloids and nanocrystals.

Conventional Fabrication Techniques – Topdown and bottom up process, techniques used in conventional microfabrication including thin film deposition (e.g. CVD, PVD(, lithography, chemical etching and electrodeposition.

Analytical Techniques – Analytical techniques such as Scanning Electron Microscopy (SEM), Electron and X-ray Diffraction, Ellipsometry,

Photoelectron, Optical and Ion spectroscopy and Probe Microscopy. Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM)

Applications – Examples of applications in Micro and Nano technology including, Micro fluidics, Micro Electron Mechanical Systems (MEMS) membrane technology, and catyalyst and coatings

Books & References :

1. M. Wilson, K. K. G. Smith, M. Simmons and B, Raguse; Nanotechnology, Chapman & Hall/CRC press 2002
2. M. Meyyappan; Carbon Nanotubes, Science and application; CRC Press, 2005
3. Alexei Nabok; Organic and Inorganic Nanostructures; Publisher Artech House, London, 2005
4. H. Watarai, N. Teramae and T Sawada; Interfacial Nanochemistry; Kluwer Academic/Plenum Press, 2005

2CE5 ELECTIVE-II

3) CHEMOINFORMATICS

Definition; in-vivo, in-vitro, in-silico synthesis of molecules

Representation of molecules in computers; WLN, SMILES, InChi etc.; Graph theory; Property Calculations; QSAR, QSPR

Molecular surfaces; data mining, data modeling; 2D and 3D structural databases; Database search tools (ANN, GA, Fuzzy etc.)

Virtual reactions, reaction prediction; bond energies; reaction databases; drug design; CML

Introduction to packages such as ACDLABS, Chemsk8, Chemaxon, JME, Molchem

Books & References:

1. J. Gasteiger, T. Engel, "Cheminformatics," Wiley-VCH, Weinheim, Germany, 2003 A. Leach, V. Gillet, "An Introduction to Cheminformatics," Springer, 2003.
2. J. Bajorath, "Chemoinformatics: Concepts, Methods, and Tools for Drug Discovery (Methods in Molecular Biology)," Humana Press, 2004
3. Gasteiger, Johann J., ed. Handbook of Chemoinformatics: From Data to Knowledge. 4 v. Wiley-VCH, 2003.

2 CE 6 CHEMICAL REACTION ENGINEERING-LAB.

Practical based on above syllabus.

2 CE 7 ADVANCED SEPARATION PROCESS

Practical based on above syllabus.

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THIRD SEMESTER

3CE1 DISSERTATION / SEMINAR : Preparation of detailed report based on collection of data, experimental work, published review, etc, on a topic related to the Project / Dissertation and presentation as seminar.

Literature survey on Project / Dissertation topic, planning of work, finalising materials and methodology, etc.

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FOURTH SEMESTER

4CE1 DISSERTATION / SEMINAR : Review of Project / Dissertation data generated, experimentation, conclusion drawn, recommendations given, preparation of report, calculation, designing, etc.

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SYLLABUS PRESCRIBED FOR

TWO YEAR P.G. DEGREE COURSE IN

MASTER OF ENGINEERING (FULL TIME)
COMPUTER SCIENCE & ENGINEERING

FIRST SEMESTER

1RMEF1/1RME1 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 piplelining. 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).

1RMEF2/1RME2 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: Travarsing 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).

1RMEF3 /1RME3 OPERATING SYSTEM DESIGN

Unit-I: Introduction to OS Internals. Overview of OS and Kernel, Linux and classic UNIX kernels. Kernel Source tree. Process management in Linux: Process descriptor and task structure, process creation, implementation of threads, process termination, process scheduling.

Unit-II: Process Scheduling in Linux: The Linux Scheduling Algorithm, Preemption and Context Switching, Real-Time, Scheduler-Related System Calls, System Calls: Handler, Implementation and Context. Interrupts and Interrupt Handlers.

Unit-III: Kernel Synchronization in Linux: Critical Regions and Race Conditions, Locking, Deadlocks, Contention and Scalability. Kernel Synchronization Methods: Spin Locks, Semaphores, Completion Variables. Preemption Disabling.

Unit-IV: Time Management in Linux: Kernel Notion of Time, Hardware Clocks and Timers, The Timer Interrupt Handler, Delaying Execution. Memory Management in Linux: pages, zones, kmalloc, vmalloc, slab layer allocator, statically allocating on the stack, high memory mapping. Per-CPU Allocations.

Unit-V: The Virtual File System in Linux: common file system interface, file abstraction layer, UNIX file system, VFS, dentry object, Super block object, file object, data structure associated with file systems and with a process. The Block I/O Layer and I/O Scheduler in Linux.

Unit-VI: The Process Address Space, the Memory Descriptor, Memory Areas, Page Tables. The Page Cache and Page Write back: Page Cache, Radix Tree, Buffer Cache. Linux Kernel Modules: Building, installing, Loading and managing. Portability in Linux.

Text Book:

Robert Love, "Linux Kernel Development" Pearson Education, (2/e).

Reference Books:

i. Daniel Bovet, "Understanding the Linux Kernel" O'Reilly Publications 2/e.

ii. Rubini and J. Corbet . "Linux Device Drivers." O'Reilly and Associates, 2001.

iii. Mosberger & Eranian. "IA-64 Linux Kernel: Design & Implementation" PHI.

iv. McKusick & Neil . "The FreeBSD Operating System" Addison-Wesley, 2004.

1RMEF4/3RME1 EXPERT SYSTEM DESIGN

Unit I: Introduction to Expert Systems, An Overview of Artificial Intelligence, Knowledge Representation: Principles and techniques, STRIPS planner, Subgoaling in MYCIN, Evaluating and comparing expert Systems.

Unit II: Rule Based Systems: Canonical systems, Production systems for problem solving, Conflict resolution. Associative Nets and Frame Systems: Graphs, trees and networks, The rise of associative networks, Representing typical objects and situations. Object-oriented analysis and design for expert systems.

Unit III: Representing Uncertainty: Sources of uncertainty, Expert systems and probability theory, Vagueness and possibility, The uncertain state of uncertainty. Knowledge Acquisition: Theoretical analyses of knowledge acquisition, Expert system shells, Knowledge acquisition methods, Knowledge-based knowledge acquisition.

Unit IV: Heuristic Classification (I): Classifications of expert system tasks, Classification problem solving, Classification versus construction. Heuristic Classification (II): Mapping tools to tasks, Heuristic classification in MUD and MORE, Making strategy more explicit.

Unit V: Hierarchical Hypothesize and Test: Managing complexity, Structured objects in CENTAUR, Model-based reasoning in INTERNIST, TDE as knowledge engineering workbench. Constructive Problem Solving (I): Motivation and overview, A case study: R1/XCON, Elicitation, evaluation and extensibility.

Unit VI: Tools for Building Expert Systems: Overview of expert systems tools, Expert System Shells, High-level programming languages, potential implementation problems, More maxims on expert system development. Truth Maintenance Systems: Keeping track of dependencies, Revising propositional theories, Nonmonotonic justifications, Maintaining multiple contexts.

Text Book:

Peter Jackson, "Introduction to Expert systems", Pearson Education, 3rd Edition, 2003.

Reference Books:

1. J. L. Ermine, "Expert Systems: Theory and Practice", Prentice Hall, 2003.

2. Hayes Roth, "Handbook of Expert System Design" (Addison-Wesley).

3. D. W. Patterson, "Artificial Intelligence & Expert Systems" (PHI).
4. Donal A. Waterman, "A Guide to Expert systems", Pearson Education, 2001.
5. E. Turban, "Expert Systems and Applied Artificial Intelligence", Macmillan, 2004.

1RMEF5/3RME2 DATABASE PROCESSING

Unit I: Introduction to Database Processing, File Processing Systems, Definition of Database. The Entity-Relationship (E-R) Model: Element of the E-R Model, E-R Diagrams, Examples, Database as Models of Models. The Semantic Object Model: Semantic Objects, Creating Data Models with Semantic Objects, Types of Objects, Comparison of the Semantic Object and the E-R Model.

Unit II: The Relational Model and Normalization: The Relational Model, normalization, First through Fifth Normal Forms, Domain Key Normal Forms, The Synthesis of Relations, Multi-Value Dependencies, Iteration, Optimization.

Unit III: Database Design using Entity-Relationship Models: Transformation of Entity Relationship Models into Relational Database Designs, Example Design. Trees, Networks. Database Design with Semantic Object Models: Transformation of Semantic Objects into Relational Database Design, Sample Objects.

Unit IV: Defining Relational Data, Relational Data manipulation, Relational Algebra. SQL: Querying a Single Table, Querying Multiple Tables, Exist and Not Exists, Changing Data. Database Application Design: Creating, Reading, Updating and Deleting View Instances, Form Design, Report Design, Enforcing Constraints, Security and Control, Application Logic.

Unit V: Managing Multi-User Databases: Database Administration, Concurrency Control, Database Security, and Database Recovery. Managing Database with Oracle: Creating an Oracle Database, Application Logic, Data Dictionary, Concurrency Control, Oracle Security, Backup and Recovery.

Unit VI: Networks, Multi-Tier Architecture, and XML: Network Environments, Multi-Tier Architecture, XML-Extensible Markup Language. ODBC, OLE DB, ADO. The Web Server Data Environment, Open Database Connectivity (ODBC) Standard, JDBC, JSP with reference to databases.

Text Book:

David M. Kroenke: Database Processing- Fundamentals, Design and Implementation, 8th Edition (PHI).

Reference Books:

1. C.J. Date: Database Processing, (Addison Wesley).
2. R. Ramakrishnan: Database Management Systems, (McGraw Hill).
3. R Elmasri and S B. Navathe: Fundamentals of Database Systems, 2nd Edition.(Wiley)
4. Korth and Silberschatz " Database Processing Concepts" (McGraw Hill).

1RMEF6/3RME3 EXPERT SYSTEM DESIGN-LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

1RMEF7/3RME4 DATABASE PROCESSING-LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

SECOND SEMESTER

2RMEF1/2RME1 COMPUTER COMMUNICATION NETWORKS

Unit I: The need for speed and quality of service. Advanced TCP/IP and ATM Networks. The need for a protocol architecture. The TCP/IP protocol architecture. The OSI model. Internetworking, TCP, UDP, Ipv6.

Unit II: Pacekt-switching networks. Frame relay networks. ATM protocol architecture. ATM logical connections. ATM cells. ATM service categories. ATM Adaptation Layer (AAL). The emergence of high-speed LANs. Ethernet. Fibre channel. Wireless LANs.

Unit III: Overview of probability and Stochastic processes. Probability. Random variables. Stochastic processes. Queuing analysis. Why queuing analysis. Queuing models. Single-server queus. Multiserver queues. Queues with priorities. Networks of queues. Other queuing models. Estimating model parameters. Self-similarity. Self-similar data traffic. Examples of self-similar data traffic. Performance implications of self-similarity.

Unit IV: Congestion control in data networks and internets. Effects of congestion. Congestion and control. Traffic management. Congestion control in Packet-Switching networks. Frame relay congestion control. The need for flow and error control. Link control mechanisms. ARQ performance. TCP flow control. TCP congestion control performance of TCP over ATM.

Unit V: Overview of graph theory and least-cost paths. Elementary concepts of graph theory. Shortest path length determination. Internet routing principles. Distance-Vector protocol. RIP. Link-State protocol. OSPF. Path-Vector protocols. BGP and IDRP. Multicasting.

Unit VI: Integrated Services Architecture (ISA). Queuing discipline. Random early detection. Differentiatedservices. Real-Time traffic. Resource Reservation : RSVP. Multiprotocol label switching. Real-Time Transport Protocol (RTP).

Text Books:

Willam Stallings - High Speed Networks and Internets - Performance and Quality of Service, 2nd Ed., (Pearson Education).

Reference Books:

1. Andrew S. Tanenbaum - Computer Networks, 4th Ed., Pearson Education.
2. James F. Kurose, Keith W. Ross - Computer Networking: A Top-Down Approach Featuring the Internet.
3. William Stallings - Data and Computer Communications, 7th Ed., Pearson Education.
4. Andrew S. Tanenbaum - Computer Networks, 4th Ed., Pearson Education.

2RMEF2/2RME2 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.

Unit III: 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.

2RMEF3/4RME1 REAL-TIME SYSTEMS

Unit-I: Typical Real-time applications, Hard versus Soft Real-time systems: Jobs and Processors, Release Times, Deadlines and Timing Constraints, Hard and Soft Timing Constraints, Hard Real-time systems, Soft Real-time systems. A Reference Model of Real-time system: Processors and Resources, Temporal Parameters of Real-time Workload, Periodic Task Model, Precedence Constraints and Data Dependency, Other types of Dependencies, Functional Parameters, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy.

Unit II: Commonly used approaches to Real-time Scheduling: Clock driven Approach, Weighted Round-Robin Approach, Priority Driven Approach, Dynamic versus Static Systems, Effective Release Times and Deadlines, Optimality of the EDF and LST Algorithms, Non optimality of the EDF and LST Algorithms, Challenging in Validating Timing Constraints in Priority-Driven Systems, Off-Line versus On-Line Scheduling.

Unit III: Clock-Driven Scheduling: Notation and Assumptions, Static, Timer Driven Scheduler, General Structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of Aperiodic Jobs, Scheduling Sporadic Jobs, Practical Consideration and Generalizations, Algorithms for Constructing Static Schedules, Pros and Cons of Clock-Driven Scheduling.

Unit IV: Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed-Priority versus Dynamic-Priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability Test for Fixed-Priority Tasks with Short Response Times, Schedulability Test for Fixed-Priority

Tasks with Arbitrary Response Times, Sufficient Schedulability Conditions for the RM and DM Algorithms.

Unit V: Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumption and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth, and Weighted Fair Queuing Servers, Scheduling of Sporadic Jobs, Real-time Performance for Jobs with Soft Timing Constraints.

Unit VI: Resources and Resource Access Control: Effects of Resource Contention and Resource Access Control, Nonpreemptive Critical Sections, Basic Priority-Inheritance Protocol, Basic Priority-Ceiling Protocol, Stack-Based Priority-Ceiling (Ceiling-Priority) Protocol, Use of Priority-Ceiling Protocol in Dynamic-Priority Systems, Preemption-Ceiling Protocol, Controlling Accesses to Multiple-Unit Resources.

Text Book:

Jane W.S. Liu: Real-Time Systems, (Pearson Education).

Reference Books:

1. R Buhr and D Bailey "Introduction to Real-Time Systems" (Addison Wesley).
2. C. M. Krishna and K. G. Shin: Real-Time Systems, (McGraw-Hill), 1997.
3. Phillip A. Laplante: "Real-Time Systems Design and Analysis" (Wiley India).
4. K.V.K. Prasad "Embedded Real –Time Systems" (Wiley- India/ Dreamtech).

2RMEF4/4RME2 ELECTIVE

(1) 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).

2RMEF4/4RME2 ELECTIVE

(2) NETWORK SECURITY

UNIT-I **Introduction:** Security, Attacks, Computer criminals, Method of Defense

Cryptography: Substitution ciphers, Transpositions, Symmetric and asymmetric systems, cryptanalysis ,data encryption standard (DES) AES Encryption algorithms Public Key Cryptography, RSA Algorithms , Uses of Encryptions.

UNIT-II **Program Security**: Secure programs, Non-malicious program errors, Computer Viruses and Other malicious code, Targeted malicious code, controls against program threats.

UNIT-III **Operating System** Security: Protected Objects and methods of protection, Memory address protection, Control of access to general objects, File protection Mechanism, User Authentication**:**
Authentication basics, Password, Biometrics,

UNIT-IV Trusted Operating System, Security Policies, models of Security, Trusted Operating System, Design, Design elements , security features of ordinary and Trusted Operating System, Kernalised design , separation , virtualizations , Layered design , typical OS Flows assurance method , Open Source Evolutions

UNIT-V **Database Security**: Security requirements for Database , Reliability and integrity, sensitive data, interface, multilevel database, Proposals for multilevel security : separations , design of Multilevel secure databases , Trusted Front-end Practical issues

UNIT-VI **Networks Security**: Threats in networks, Network security controls, Firewalls Intrusion detection systems, Secure E-mail.
Administrating Security: Planning, Risk Analysis, Organization security policies, Physical security

Text Book:

C.P. Pfleeger and S.L.Pfleeger, "Security in Computing", Pearson Education (LPE)

Reference Books:

1. Stallings, "Cryptography and Network Security:" Pearson Education (LPE)
2. Matt Bishop, "Computer Security: Art and Science", Pearson Education
3. Kaufman, Perlman, Speciner, "Network Security" PHI.
4. Eric Malwald, "Network Security: A Beginner's Guide", TMH

2RMEF4/4RME2 ELECTIVE

(3) COMPUTER VISION & IMAGE PROCESSING

Unit-I: Introduction to image processing, computer vision. Digitized images: basic concepts, image digitization, sampling, and quantization, digital image properties. Data structures for image analysis: traditional data structures and hierarchical data structures.

Unit-II: Image pre-processing: pixel brightness transformation, geometrical transformation, local pre-processing, image smoothing, edge detection, scaling, parametric edge models, multi-spectral images, adaptive neighborhood pre-processing, image restoration.

Unit-III: Image Segmentation: Thresholding, threshold detection methods, optimal thresholding, Edge-based segmentation, edge image thresholding, edge relaxation, border tracing and detection, Hough transforms, region-based segmentation and matching.

Unit-IV: Shape: Region identification, contour-based shape representation and description, region-based shape representation and description, shape classes. Object recognition: knowledge representation, statistical pattern recognition, syntactic pattern recognition.

Unit-V: Image Understanding: parallel, serial processing and hierarchical control, bottom-up, model-based and combined control strategies, point distribution models, contextual image classification, scene labeling & constraint propagation, semantic region growing.

Unit-VI: Linear discrete image transforms: Fourier, Hadamard, Discrete Cosine and Wavelets. Applications of these transforms. Image data compression: predictive methods, vector quantization, Hierarchical, progressive compression. JPEG & MPEG image compression.

Text Book:

Sonka M, Hlavac H, Boyle R, "Image Processing, Analysis, and Machine Vision", (2/e) Brooks/Cole Thomson Learning.

Reference Books:

1. Gonzalez and Woods, "Digital Image Processing" (2/e) Pearson Education.
2. Forsyth, "Computer Vision" Pearson Education.
3. Chanda and Majumdar, "Digital Image Processing and Analysis" PHI.
4. Horn B K P, "Robot Vision" MIT Press, Cambridge, MA.

2RMEF5/4 RME 3 TECHNICA PAPER WRITING

2RMEF6/2RME3 SEMINAR

2RMEF7/2RME4 ADVANCED COMPILING TECHNIQUES-LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

2RMEF8/4 RME 4 REAL TIME SYSTEMS- LAB.

At least eight experiments must be performed which will include at least one experiments on each Unit.

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THIRD SEMESTER

3RMEF1 SEMINAR AND DISSERTATION

FOURTH SEMESTER

4RMEF1 SEMINAR AND DISSERTATION

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SYLLABUS
PRESCRIBED FOR
TWO YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING (FULL TIME)
INFORMATION TECHNOLOGY
SEMESTER PATTERN
SEMESTER : FIRST

1NMEF1 OPERATING SYSTEM CONFIGURATION

Unit-I: Introduction to OS Internals. Overview of OS and Kernel, Linux and classic UNIX kernels. Kernel Source tree. Process management in Linux: Process descriptor and task structure, process creation, implementation of threads, process termination, process scheduling.

Unit-II Process Scheduling in Linux: The Linux Scheduling Algorithm, Preemption and Context Switching, Real-Time, Scheduler-Related System Calls, System Calls: Handler, Implementation and Context. Interrupts and Interrupt Handlers.

Unit-III Kernel Synchronization in Linux: Critical Regions and Race Conditions, Locking, Deadlocks, Contention and Scalability. Kernel Synchronization Methods: Spin Locks, Semaphores, Completion Variables. Preemption Disabling.

Unit-IV: Time Management in Linux: Kernel Notion of Time, Hardware Clocks and Timers, The Timer Interrupt Handler, Delaying Execution. Memory Management in Linux: pages, zones, kmalloc, vmalloc, slab layer allocator, statically allocating on the stack, high memory mapping. Per-CPU Allocations.

Unit-V: The Virtual File System in Linux: common file system interface, file abstraction layer, UNIX file system, VFS, dentry object, Super block object, file object, data structure associated with file systems and with a process. The Block I/O Layer and I/O Scheduler in Linux.

Unit-VI: The Process Address Space, the Memory Descriptor, Memory Areas, Page Tables. The Page Cache and Page Write back: Page Cache, Radix Tree, Buffer Cache. Linux Kernel Modules: Building, installing, Loading and managing. Portability in Linux.

Text book :

Robert Love, “Linux Kernel Development” Pearson Education, 2/e.

Reference Books:

i. Daniel Bovet, “Understanding the Linux Kernel” O’Reilly Publications 2/e.

ii. Rubini and J. Corbet . Linux Device Drivers. O'Reilly and Associates, 2001.

iii. D. Mosberger and S. Eranian. IA-64 Linux Kernel: Design & Implementation. Prentice Hall, 2002.

iv. M. McKusick and G. Neville-Neil . The Design and Implementation of the FreeBSD Operating System. Addison-Wesley, 2004.

1NMEF2 DATABASE SYSTEM DESIGN

Unit I: Introduction to Database Processing, File Processing Systems, Definition of Database. The Entity-Relationship(E-R) Model: Element of the E-R Model, E-R Diagrams, Examples, Database as Models of Models. The Semantic Object Model: Semantic Objects, Creating Data Models with Semantic Objects, Types of Objects, Comparison of the Semantic Object and the E-R Model.

Unit II: The Relational Model and Normalization: The Relational Model, normalization, First through Fifth Normal Forms, Domain Key Normal Forms, The Synthesis of Relations, Multi-Value Dependencies, Iteration, Optimization.

Unit III: Database Design using Entity-Relationship Models: Transformation of Entity Relationship Models into Relational Database Designs, Example Design. Trees, Networks. Database Design with Semantic Object Models: Transformation of Semantic Objects into Relational Database Design, Sample Objects.

Unit IV: Foundation of Relational Implementation: Defining Relational Data, Relational Data manipulation, Relational Algebra. SQL: Querying a Single Table, Querying Multiple Tables, Exist and Not Exists, Changing Data. Database Application Design: Creating, Reading, Updating and Deleting View Instances, Form Design, Report Design, Enforcing Constraints, Security and Control, Application Logic.

Unit V: Managing Multi-User Databases: Database Administration, Concurrency Control, Database Security, and Database Recovery. Managing Database with Oracle: Creating an Oracle Database, Application Logic, Data Dictionary, Concurrency Control, Oracle Security, Oracle Backup and Recovery.

Unit VI: Networks, Multi-Tier Architecture, and XML: Network Environments, Multi-Tier Architecture, Markup Languages HTML and DHTML, XML-Extensible Markup Language. ODBC, OLE DB, ADO and ASP: The Web Server Data Environment, Open Database Connectivity (ODBC) Standard, JDBC, Java Server Pages, MySQL.

Text Book:

David M. Kroenke: Database Processing- Fundamentals, Design and Implementation, 8th Edition (PHI).

References:

1. C.J. Date: Database Processing, (Addison Wesley).

2. R. Ramakrishnan: Database Management Systems, (McGraw Hill).

3. Ramez Elmasri and Shamkant B. Navathe: Fundamentals of Database Systems, 2nd Edition.

1 NMEF 3 NET - CENTRIC COMPUTING

Unit I : Overview of Computer Communications and Networking, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability, and Security, Network Standards, Network Applications and Application Protocols, Computer Communications and Networking Models, Communication Service Methods and Data Transmission Modes, Analog and Digital Communications, Speed and Capacity of a Communications Channel, Multiplexing and Switching, Network Architecture and the OSI Reference Model.

Unit II : Physical Layer Concepts, Copper Media, Fiber-Optic Media, Wireless Communications, Satellite Communications, structured cabling Systems, Data Link Layer Concepts, LLC Sublayer, MAC Sublayer, Data Prioritization and Quality of Service.

Unit III : Internetworking Concepts, The Network Layer and Routing Concepts, Routing Protocols, RIP, OSPF, Router and Switches, VPNs, Internet Administration, TCP/IP, TCP/IP Transport and Network Layer Protocols, IP Addresses, IPv6, TCP/IP Application Level Protocol.

Unit IV : Ethernet and 802.3 Networks, 10-MBPS Ethernet/802.3 LANS, Switched Ethernet, Full-Duplex Ethernet, and Virtual LANs, Fast Ethernet, Gigabit Ethernet, Token Ring, Frame Formats, Priority and Reservation, Monitor Stations, Second-Generation token Ring, Token Ring versus Token Bus.

Unit V : Fiber Distributed Data Interface, Physical Layer Specifications, Frame Formats and Medium Access Specifications, Configuration and Design Issues, Integrated services Digital Network, Components, Channel types, BRI, PRI, ISDN Protocols, Frame Relay Circuits, Data link Layer Issues & Information.

Unit VI : Switched Multimegabit Data Services, Technical Overview, SIP, SMDS Addressing, SMDS versus Other LAN-to-LAN Technologies, ATM, Concepts and Operation, ATM interface Standards, ATM Cells, Virtual Connections, And Addressing,

AAL, ATM and Convergence Technology, ATM versus Other Technologies and Services, Dialup Networking, DSL Services.

TEXT BOOK :

Michael A. Gallo, William M. Hancock : Computer Communications and Networking Technologies. Cengage Learning

REFERENCE BOOKS :

1) Stallings W., "High Speed Networks and Internets : Performance and Quality of Service", Prentice Hall, 2002.
2) Kershenbaum A., "Telecommunications Network Design Algorithms", Tata McGraw Hill.
3) Douglas E. Comer, "Computer Networks and Internet", Pearson Edu. Asia.
4) Andrew Tanenbaum, "Computer Network", PHI.

1 NMEF 4 REAL TIME EMBEDDED SYSTEM DESIGN

UNIT I Architecture of Embedded System, Hardware Architecture, Software Architecture, RTOS , Architecture of Kernel ,Features/ Characteristics of RTOS,. Task Scheduling, Signals, Events, Queues, Mail Boxes, Semaphores, Creation of Threads and Inter Thread Communication, Memory Management

UNIT II Detailed study of PIC18 Family Microcontroller Architecture, Pin Description, File Structure, Status Register, PIC data formats, Directives, RISC Architecture in PIC, SFR, PIC18 Hardware Connections, PIC 18 Timers, PIC 18 Serial Port, PIC 18 Interrupts. Features of ATMEL, ARM, AVR Microcontrollers.

UNIT III PIC 18 Instruction set, Programming using C / Assembly: Data types, time delays, I/O Programming, Data Conversion, Timer/ Counter, Serial Port, Interrupt programming, ADC,DAC, Sensor Interfacing.

UNIT IV Clock-Driven Scheduling: Notation and Assumptions, Static, Timer Driven Scheduler, General structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of periodic Jobs, Scheduling Sporadic Jobs, Practical Consideration and Generalizations, Algorithms for Constructing Static Schedules, Pros and Cons of Clock-Driven Scheduling.

UNIT V Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed-Priority versus Dynamic-Priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability Test for Fixed-Priority Tasks with Short Response Times, Schedulability Test for Fixed-Priority Tasks with Arbitrary Response Times, Sufficient Schedulability Conditions for the RM and DM Algorithms.

UNIT VI Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumption and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth, and Weighted Fair Queuing Servers, Scheduling of Sporadic Jobs, Real-time Performance for Jobs with Soft Timing Constraints.

TEXT BOOKS:

1. Dr. K.V. K. K. Prasad "Embedded / Real Time System : Concepts, Design, & Programming -Black Book" Dreamtech Press Publication
2. Mohammad Ali Mazidi, Rolin D. Mckinly,Danny Causey: PIC Microcontroller and Embedded system using Assembly and C for PIC18, Pearson Education
3. Jane W.S. Liu : Real Time System, Pearson Education

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill
2. John B. Beatman, Design with PIC Micrantroller, Prentice Hall
3. Barry B. Brey, Appling PIC18 Micrantroller, Architecture, Programming and Interfacing using C and Assembly, Prentice Hall.
4. Phillip A. Laplante: Real-Time Systems Design and Analysis, (Wiley InterScience)

1NMEF5 Elective-I

i) Software Engineering Methodologies

Unit I: Software Process Models : Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Process Assessment, CMMI, Impact of Processes and Outcomes, Process Selection and applicability.

Unit II: Requirements Engineering : Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization.

Unit III: UML Concepts : Programming In Small Versus Programming In Large, UML 2.0 History/ New Features MDA/ MOF/ XMI/ CORBA, Introduction to UML Metamodel, Extensibility Mechanisms and its usage, Introduction to OCL, Specification techniques of diagrams in UML.

Unit IV: Behavioral Model : Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases Data Dictionary : Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Dynamic Behavior : Sequence diagrams, object lifelines and message types, Activity Diagrams : Decisions and Merges, Synchronization.

Unit V: Design Engineering : Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles : Main program with sub program style, Abstract data type style, Repository, Layered. Architectural Design: Software Architecture, Data Design and Architectural Design.

Unit VI: Object Oriented Design : Design of Objects, Design and Factoring, Design of Software Objects, Features and Methods, Cohesion of Objects , Coupling between Objects , Coupling and Visibility, Inheritance, Establishing The Object Model, Refining classes and associations, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control, Modeling associations and collections, Achieving reusability, Reuse through delegation, Identifying and using service packages.

REFERENCE BOOKS:

1. Ian Sommerville, "Software Engineering", 7th Edition, Addison-Wesley, 2004
2. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison-Wesley,.
3. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design. ", 2nd Edition, Addison-Wesley,
4. Tom Pender, "UML Bible", John Wiley & Sons,.
5. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", Pearson Education,

1NMEF5 Elective-I

ii) INTELLIGENT SYSTEM

Unit I : Artificial Intelligence : Intelligence, Artificial intelligence, intelligent systems. Knowledge representation : Reasoning, issue and acquisition : propositional calculus, predicate calculus, Rule-based knowledge representation, Truth Maintenance system.

Unit II: Expert Systems : introduction, expert systems, stages in the development of expert system, expert system tools, difficulties in developing expert systems, applications of expert systems.

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 decision-making applications

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, evolutionary programming, genetic-algorithm-based machine learning classifier system.

Unit VI : Swarm Intelligent Systems : introduction, 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 : Probabilistic Transition rule,PheromoneUpdating ,Types of ant colony models. particle Swarm intelligent systems .

TEXT BOOK :

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 - A Knowledge-Based Approach", Springer, London.

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iii) Legal and Professional Ethics

Unit-I Technical communication: Oral presentations Technical writing, System documentation, Technical requirements Team Work Culture: Collaboration, Group dynamics, Leadership styles, Personality types, Collaboration tools.

Unit-II Social informatics, Social impact of IT on society, Online communities & social implications, Philosophical context,

Diversity issues, Gender-related issues, Cultural issues, Accessibility issues, Globalization issues, Economic issues in computing, Digital divide.

Unit-III Foundations of intellectual property, Ownership of information, Plagiarism, Software piracy, Fair use, Digital Millennium Copyright Act (DMCA), Copyrights, patents, trademarks and trade secrets, NDAs, International differences.

Unit-IV Legal Issues: Compliance to Cyber laws, Hackers/crackers, Computer crime, Viruses, System use policies & monitoring, Risks and liabilities of computer-based systems, Accountability, responsibility, liability.

Unit-V Organizational context: Business processes, IT environment, Organizational culture, Professionalism, Relationships with professional societies., Codes of professional conduct, such as IEEE, ACM, BCS, ITAA, AITP. Ethics and history of ethics, Whistle-blowing, Workplace issues (harassment, discrimination), Identify theft, Ethical hacking,

Unit-VI Implications of: History of computer hardware, software, History of the Internet History of Telecommunications, The IT profession, IT education. Privacy and civil liberties.

BOOKS RECOMMENDED:

1. Meenakshi Raman, Sangeeta Sharma,"Technical Communication – English Skills for Engineers" Oxford Higher Education
2. George Reynolds, "Ethics in Information Technology", Thomson Course Technology, 2003
3. Sara Baase,"A Gift of Fire: Social, Legal and Ethical Issues for Computing and the Internet ", PHI publications
4. Richard A.Spinello, " Case Studies in Information Technology Ethics", Second Edition, PHI

1NMEF6 LAB-I
(Based On 1NMEF1 & 1NMEF2)

1NMEF7 LAB-II
(Based On 1NMEF3 & 1NMEF4)

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SECOND SEMESTER

2NMEF1 INTEGRATIVE PROGRAMMING

Unit I : Object Oriented Programming : Methodology, features, design patterns and frameworks, Java classes and objects: constructors, finalizers, garbage collector, cloning objects, nested classes and interfaces, inner classes, Java I/O : Byte-oriented streams, File I/O, Character streams, Object serialization.

Unit II : Multithreaded Programming : Threads and life cycle of a thread, Creating and running the threads. Thread class and Runnable interface. Service threads, JVM and task scheduling, thread synchronization, synchronizing methods of inner classes. Thread communication, Grouping the threads.

Unit III : Databases Programming : Model-View-Persistence design pattern, Mapping between Java objects and Data elements, JDBC and drives for RDBMS, SQL to Java type mapping, Java and Javax SQL APIs and their uses in database programming, Transaction coding, Connection pooling.

Unit IV : XML : Introduction, XML structure, XML DTD creation and Schema creation, well formed and valid XML documents, XML parsers like SAX & DOM, Parsing XML documents with DOM, JDOM and SAX parsers, XML transformation using XSLT and X Path.

Unit V : Network Programming : Java approach for URLs, Sockets – TCP/IP and Datagram sockets, Programming using sockets, Remote method invocation (RMI) : server and client development for RMI, RMI registry, JNDI service and its packages, Security : Cryptography, Secure Socket Layer, Security policy definition, Java AAS.

Unit VI : Web application development : Technology of the web, Servlet and Servlet API, building web application. Java Server Pages, JSP tags and API, JSP processing, Java coding in JSP, Web application frameworks. Robust web application development.

TEXT BOOK:

Wigglesworth J & McMillan P : Java Programming : Advanced Topics, 3/e, Thomson Course Technology.

REFERENCES:

1. Schildt H and Naughton P : Java : The Complete Reference, Osborne, McGraw Hill
2. Dustin R Callaway : Inside Servlet, Pearson Education, LPE
3. Larne Pekowasky : Java Server Pages, Pearson Education, LPE
4. Dietel & Dietel : WWW : How to Program, Pearson Education, LPE.

2NMEF2 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.

References

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)

2NMEF3 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.

2NMEF 4 SYSTEM SECURITY

UNIT-I **Introduction:** Security, Attacks, Computer criminals, Method of Defense

Cryptography: Substitution ciphers, Transpositions , Symmetric and asymmetric systems , cryptanalysis ,data encryption standard (DES) AES Encryption algorithms Public Key Cryptography, RSA Algorithms , Uses of Encryptions.

UNIT-II **Program Security**: Secure programs, Non-malicious program errors, Computer Viruses and Other malicious code, Targeted malicious code, controls against program threats.

UNIT-III **Operating System** Security: Protected Objects and methods of protection, Memory address protection, Control of access to general objects, File protection Mechanism, User Authentication**:**

Authentication basics, Password, Biometrics,

UNIT-IV Trusted Operating System, Security Policies, models of Security, Trusted Operating System, Design, Design elements , security features of ordinary and Trusted Operating System, Kernalised design , separation , virtualizations , Layered design , typical OS Flows assurance method , Open Source Evolutions

UNIT-V **Database Security**: Security requirements for Database , Reliability and integrity, sensitive data, interface, multilevel database, Proposals for multilevel security : separations , design of Multilevel secure databases , Trusted Front-end Practical issues

UNIT-VI **Networks Security**: Threats in networks, Network security controls, Firewalls Intrusion detection systems, Secure E-mail.

Administrating Security : Planning , Risk Analysis , Organization security policies , Physical security.

Text Book:

C.P. Pfleeger and S.L.Pfleeger, "Security in Computing", Pearson Education (LPE)

References :

1. Stallings, "Cryptography and Network Security:" Pearson Education (LPE)
2. Matt Bishop, "Computer Security: Art and Science", Pearson Education
3. Kaufman, Perlman, Speciner, "Network Security" PHI.
4. Eric Malwald, "Network Security: A Beginner's Guide", TMH

2NMEF5 Elective-II

(1) SOFTWARE TESTING

Unit I : Introduction of testing : Goals for testing, phases in a tester's mental lilfe, test design, testing versus debugging, designer versus tester, model for testing : project overvirew, environment, the program, bugs test, testing & levels, the role of models.

Unit II : Software testing process : verification & validation, testing team & development team, characteristics of test engineers, level of testing, testing approaches, test plan, manual testing & its limitations / drawbacks.

Unit III : Flow graphs and path testing : path testing basics, predicates, path predicates and achievable paths, path senstizing, implementation and application of path testing, transaction - flow testing techniques.

Unit IV : Testing of object oriented systems : peimer on object oriented software, differences in OO testing, software test automation : what to automate, steps of automation, design and architecture for automation, process model for automation, selecting a test tool.

Unit V : Software testing tools overview : WinRunner, testing and application using WinRunner, test script language, data driven testing, silk test, load runner, test director.

Unit VI : Source code testing utilities in UNIX/LINUX environment : GNU tools, timing of programs, profiler, code optimization, productivity tools, portability testing tool, testing application using QTP.

TEXT BOOKS :

1) Boris Beizer : Software Testing Techniques, Dreamtech Press, 2nd edition.

2) Srinivasan Desikan, Gopalaswamy Ramesh : Software Testing Principle and Practices, Pearson Education.

3) Dr. K.V.K.K. Prasad : Software Testing Tools, Dreamtech Press, 2006 edition.

2 NMEF 5 ELECTIVE-II

(2) WIRELESS COMMUNICATION AND NETWORKS

Unit I : Introduction to Wireless Telecommunication Systems and Networks, evolution of modern telecommunications infrastructure, OSI model, FDMA, TDMA, CDMA, Future Wireless Networks, Future Wireless Networks, 1 G to 4 G cellular systems, Wireless Standards Organizations.

Unit II : Cellular network hardware components, cellular network databases; SS7 signaling, cellular cluster, backhaul networks, mobility management, concepts of power management and network security, GSM network and System architecture, DECT architecture.

Unit III : CDPD, GPRS and EDGE data networks, network layout, packet data transfer, GPRS protocol reference model, data rates, evolution of GSM and NA-TDMA to 3 G..

Unit IV : Wireless modulation techniques and hardware : spread spectrum modulation, ultra
wideband radio technology, BSC and RBS hardware, digital modulation techniques : OFDM, subscriber devices.

Unit V : Wireless LANs / IEEE 802.1x : evolution, architecture, Wi-Fi system, WLAN FHSS and DSSS physical layer, wireless LAN hardware and system deployment strategies.

Unit VI : PANs and WLANs, IEEE 802.15.1 standard, Bluetooth protocol stack, Bluetooth link controller, Broadband wireless MANs/ IEEE 802.16x, IEEE 802.16 physical layer, WiMax System, Broadband satellite applications, emerging wireless technologies, wireless sensor networks.

TEXT BOOK :

1. Gary Mullett, Wireless Telecommunications Systems and Networks, Thomson Delmar Learning, 2006.

REFERENCE BOOKS :

1. Jochen Schiller, Mobile Communications.
2. William Stallings, Wireless Communications and Networks.
3. T.S.Rappaport, Wireless Communications.

2 NMEF 5 ELECTIVE-II

(3) DATA WARE HOUSING & DATA MINING

Unit I : Need for Data Warehousing : Operational Vs. Decisional support system, data warehouse users, benefits of data warehousing : tangible benefits, intangible benefits. Features of a data warehouse. Subject oriented data. Integrated data, data cleansing, data transformation, non volatile data, time varient data, data granularity, benefits of data granularity, data granularity - pros and cons, dual levels of data granularity, the information flow mechanism.

Unit II : Metadata. Role of metadata, classification of metadata, metadata management. Direct access mode, indirect access mode. Data warehouse architecture, the two tier architecture, three tier architecture, four tier architecture, data warehouse and data marts, reasons for creating data marts, pushing and pulling data, data warehouse schema, the star schema, the snowflake schema, characteristics of a dimension table, characteristics of a fact table.

Unit III : Keys in the data warehouse schema : primary keys, surrogate keys, foreign keys. Data clustering, OLAP in the data warehouse, OLAP functions, multi dimensional analysis, OLAP and multidimensional analysis, OLAP design considerations, OLAP models, data warehouse design stage, security issues in a data warehouse.

Data Mining

Unit IV : Introduction : fundamentals of data mining, data mining functionalities, classification of data mining systems, major issues in data mining, mining frequent patterns, associations and correlations, classification and prediction, cluster analysis, outlier analysis, evolution analysis.

Unit V : Market basket analysis, frequent itemsets, closed itemsets and association rules, frequent pattern mapping, the Apriori Algorithm, generating association rules from frequent itemsets, mining multilevel association rules, mining multidimensional association rules, constrained based association rules.

Unit VI : Classification and prediction : preparing data for classification and prediction, comparing classification and prediction methods, decision tree induction, Baye's theorem, rule based classification using IF-THEN rules, classification by backpropagation, rule extraction from decision tree.

TEXT BOOKS :

1) Reema Thareja : Data Warehousing, Oxford Unviersity Press.
2) Paulraj Ponniah : Data Warehousing Fundamentals, John Wiley.
3) Vikram Pudi and P. Radha Krishna, Oxford University Press.

REFERENCE BOOKS :

1) M.H.Dunham : Data Mining Introductory and Advanced Topics, Pearson Education, 2.
2) Han, Kamber : Data Mining Concepts and Techniques, Morgan Kaufmann, Pieter Adriaans, Dolf Zantinge.

2 NMEF 6 **Lab.-III**
(based on 2NMEF1)

2 NMEF 7 **Lab.-IV**
(based on 2NMEF2 & 2NMEF4)

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THIRD SEMESTER

3NMEF1 **Seminar and Dissertation**

FOURTH SEMESTER

4NMEF1 **Seminar and Dissertation**
As per given in the Scheme

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SYLLABUS
PRESCRIBED FOR
TWO YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING (FULL TIME)
ELECTRONICS & TELECOMMUNICATION ENGG.

SEMESTER : FIRST

1 ENTC1 ADVANCED OPTICAL COMMUNICATION

Unit – I: Introduction to guided optical communication. Optical Fibers, types of fibers & optical Cables, Study of losses during transmission through viz. Attenuation by Absorption & Scattering, Consideration of losses in designing of High Speed / High bandwidth optical communication systems, Selection of fiber for such systems.

Unit – II: Optical Sources: Types of LEDs used in optical communication, their construction & operating principle, Types of Lasers. Principle of working of Lasers, solid state & injection Lasers, Optical amplifiers, EDFA, Soliton Systems & design of system required in LAN & WAN type of applications. Calculations of Power budgets and feasibility of system design for above optical sources.

Unit – III: Optical Detectors: Introduction & study of type of detectors characteristics. Spectral spread and availability of detectors for 980 nm, 1.3 ìm & 1.55 ìm _ systems. Calculation of detector sensitivity and design considerations of suitable receivers for LAN, WAN applications Multiplexing Components & Techniques : Concepts of WDM, DWDM system design parameters, Optical multiplex / Demultiplex design considerations- Angular dispersive devices, Dielectric thin film filter type devices,

Unit – IV: Hybrid & planer wave guide devices, Active WDM devices, Wavelength non selective devices, System application. Long Haul High Band Width Tx System : Designing systems for long haul high band width consideration-Outage, Bit error rate, Cross connect, Low & high speed interphases, Multiplex / Demultiplex consideration, Regenerator spacing, Degeneration & Allowances, Application consideration.

Reference Books:

1. Optical Communication Systems by John Gowar (PHI)
2. Optical Fiber Communication by Gerd Keiser (MGH) .
3. Optical Fiber Communication Principles & Practice by John M. Senior (PHI pub. 1996.)

Recommended Journals:

1. IEEE Proceeding In Optics.
2. Journal of Optical Society of America.
3. AT&T, Alcatel Optics Journals.
4. Hand book of Optics Vol I & II (MGH.)
5. Optics & Opto Electrics, vol I & II, Nigihawan & Gupta, (Narsoa publication.)
6. Advance In Light Wave Nypters Research Journals of AT & T ,Vol. 66
7. IIT Rourkee Compiled Seminar Proceeding of Fiber Optics in 1994.

1 ENTC2 RANDOM PROCESSES

Unit – I: Concepts of Probability: Conditional probability and Baye's theorem, Independence of events, Bernoulli trails,Random variables: Cumulative distribution, Joint probability density function, Statistical properties, Jointly distributed Gaussian random variables, Conditional probability density, properties of sum of random variables, Central limit theorem, Estimate of population means, expected value and variance and covariance, Computer generation of random variables.

Unit – II: Multiple Random Variables: joint cumulative distribution function, Joint probability density function statistical properties, Jointly distributed Gaussian random variables, Conditional probability density, properties of sum of random variables, Central limit theorem, Estimate of population means, Expected value and variance and covariance, Computer generation of random variables.

Unit – III: Markov Chains: Chapman Kolmogorov equation, Classification of states, Limiting probabilities, Stability of Markov system, Reducible chains, Markov chains with continuous state space. Queuing Theory: Introduction, Cost equation, steady state probabilities, Models of single server exponential queuing system with no limit and with finite buffer capacity (M/M/I, M/M/N). Queuing system with bulk service, Network of queues with open system and closed system. The M/G/I system and application of work to M/G/I.

Unit – IV: Random Processes: Properties, Auto correlation and cross correlation function, Estimate of auto correlation function, Spectral Density: Definition, Properties, white noise, Estimation of auto-correlation function using frequency domain technique, Estimate of spectral density, cross spectral density and its estimation, coherence.

Reference Books:

1. Introduction to probability Models,(Third edition) - Sheldon M. Ross.
2. Probability and Random Processes for Electrical Engg.-Alberto Lean-Garcia (Pearson Education.)
3. Stochastic Processes – J. Medhi , (New Age International.)
4. Probability random variables & Stochastic process- Athanasios Papoulis (MGH)
5. Introduction to Probability and Random Processes. By Jorge I. Aunin, V. Chandrashekar.
6. Probability & Statistics- Murrary R. Spiegel – (MGH.)

1 ENTC3 DIGITAL COMMUNICATION TECHNIQUES

Unit – I: Baseband and Bandpass Digital Transmission: Baseband modulation, Correlative coding, Detection of binary signals in Gaussian Noise, ISI, Eye pattern and equalization, Bandpass modulation techniques, coherent and noncoherent detection of signals in Gaussian noise, error performance for binary and M-ary signals.

Unit – II: Error Control Coding: Linear block codes, error detecting and correcting capability, cyclic codes, convolution codes, properties of convolution codes, Viterbi decoding algorithm, Turbo code concepts, Trellis codes.

Unit – III: Synchronization, Multiplexing and Multiple Access: Carrier and Symbol synchronization, Frequency Division Multiplexing/Multiple Access, Time Division Multiplexing/ Multiple Access, performance comparison of FDMA & TDMA, Code Division Multiple Access, capacity of multiple access methods, Access algorithms: ALOHA, Slotted ALOHA, Reservation ALOHA, Carrier sense systems and protocols.

Unit – IV: Spread Spectrum Techniques: Model of spread spectrum digital communication system, direct sequence spread spectrum system, frequency hopped spread spectrum system, generation of PN sequences, synchronization of spread spectrum systems.

Reference Books:

1. J. G. Proakis, "Digital Communications", Fourth Edition, McGraw Hill Inc.
2. Bernard Sklar, "Digital Communications: Fundamentals and Applications", Second Edition, Pearson Education Asia (LPE)
3. Simon Haykin, "Digital Communications", John Wiley and Sons
4. K Sam Shanmugam, "Digital Communications", John Wiley and Sons

1 ENTC4 DIGITAL SIGNAL PROCESSING AND APPLICATIONS

Unit – I: Representation of deterministic signals, orthogonal representation of signals. Dimensionality of signals spaces, construction of orthogonal basis functions. Time bandwidth relationship: RMS duration and bandwidth, uncertainty relations.

Unit – II: Introduction: Review of Discrete time signals and systems, Different transforms, use of DFT in linear filtering, filtering of long data sequences, Algorithm for convolution and DFT.

Unit – III: LS and LMS, spectral estimation, adaptive filters DSP Algorithm, Multirate Digital Signal Processing and its applications.

Unit – IV: Issues involved in DSP processor design, Architecture and applications of TMS 320 C6XX, Multiprocessing with DSP processors, Applications of DSP to speech & radar signal processing.

Reference Books:

1) Advanced Digital Signal Processing, Proakis, McMillan
2) Discrete time Signal Processing, A.V. Oppenheim and Schafer, PHI, 1989
3) Digital Signal Processing – Principles, Algorithms and Applications, John G. Proakis, PHI, 1997
4) Digital Signal Processing, S.K. Mitra, TMH (2nd Edition)
5) Texas Instruments Application reports
6) Adaptive Filter Theory, Simon Haylein Jhon Wiley
7) Theory and Applications of Digital Signal Processing by Rabiner & Gold, Prentice –Hall

1 ENTC4 Elective-I

1. REAL TIME EMBEDDED SYSTEM

Unit – I: Fundamentals of Real-Time Theory : Real-time, embedded multitasking systems challenges, Best effort, Hard real-time, Soft real-time, Best Effort scheduling (Round- Robin Time slice Scheme - Review), Introduction to Fixed priority preemptive

Scheduling, Introduction to Dynamic priority scheduling, Utility Curves, Real-Time Services: Service Release Timeline, The CPU, I/O, Memory Resource Space (Characterizing RT Applications), Introduction to Timing diagrams (interference), Introduction to Hard real-time safe resource utilization bounds, The hard real-time requirements and performance

Unit – II: Rate Monotonic Policy and Feasibility Overview: Rate Monotonic Assumptions and Constraints, More on Fixed priority preemptive scheduling, Hard real-time safe resource utilization bounds, EDF and LLF Overview, Introduction to Feasibility Tests, Deadline Monotonic Policy and Feasibility Overview, HW and HW+FW Implementations of RT Services, SW Implementations of RT Services Synchronization and Resource Issues : Problems with Blocking (resources other than CPU, e.g. I/O), Break up into more threads (better scheduling control), Interrupt driven/O - e.g. Programmable FIFOs, Model Blocking Time, Priority inversion (general concept), Unbounded priority inversion problem (mutex C.S.), Priority inheritance, Priority ceiling.

Unit – III: Scalable Embedded Systems Architectures: Intro to PCI Architecture and I/O Architectures, PCI Plug and Play Concept, Embedded System PCI Form Factors and Standards, Device Drivers and Characterization of Embedded I/O : I/O interfaces, Digital, Analog (ADC, DAC interfaces), Microprocessor interface types (word or block), Register-based control, status, data, Higher rate FIFO I/O, Block-oriented 1st/3rd party DMA tx/rx between I/O interfaces and memory, Bus burst transfers and block transfers, system memory map for MMIO devices - DRAM/SDRAM/DDR, BOOTROM, Flash, External interface types, CPU local bus IO/MMIO E.g. PCI 2.x, GPIO, DRAM, Flash, Point-topoint or switched devices E.g. RS-232, RS-422, PCI-Express, Network multi-access devices E.g. Ethernet Device interfaces-introduction to drivers: Top half (driver entry point interface to tasks), bottom half (interface to devices), ring buffers, blocking/non-blocking, ioctl, ISRs and signals/semaphores, scheduled I/O (handle buffering and processing in task).

Unit – IV: Power PC Architecture: PowerPC 8xx architecture review, Power PC 8xx and 82xx Architecture Power Point Overviews, Xscale Architecture: Xscale Architecture Docs, x86 Architecture:, IA32 Architecture Docs,Estimating/Measuring Performance Based on CPU Architecture: Measuring / Controlling CPU Efficiency, Trace Ports (e.g. IBM PowerPC 4xx series, Strong Arm), Built-in PMU (Performance Monitoring Units) (e.g. Intel Pentium, Xscale), External Methods, Logic Analyzer Memory Traces (Cache Misses, DMA, Un-cached access), Memory Port Markers (Writes to Un-cached Memory), Profiling Code by Function or Block, Software in Circuit Methods (e.g. CodeTest Trace SW In-Circuit, gprof), Hardware Supported

Profiling (e.g. Intel Vtune, CodeTest HW In-Circuit), Cycle-based profiling, Event-based profiling, Cache Coherency, Harvard I-Cache, D-cache Architecture, Cache Invalidate, Flush, Lock, Pre-fetch, Measuring/Controlling I/O Efficiency, Bus Analyzers - e.g. PCI Event Traces, Logic Analyzer with Support Package.

Reference Books:

1. Real-Time Embedded Systems and Components: Sam Siewert, ISBN 1584504684 Books, Barnes & Noble
2. PCI System Architecture (Paperback) Mindshare Inc Tom Shanleyr, Don Anderson

1 ENTC4 Elective-I

2. DIGITAL DATA COMPRESSION

Unit – I: Introduction to Data Compression: Data compression, Loss less compression, Lossy Compression, Performance Measures, Coding, Modeling, Grading Compression
Algorithms, Minimum Redundancy Coding: The Shannon-Fano algorithm, The Huffman Algorithm, Adaptive coding: Adaptive Huffman Coding, Updating The Huffman trace, Decoding, The overflow problem, Rescaling Bonus, Arithmetic Coding: Difficulties, Practical Matters, a complication, Decoding.

Unit – II: Statistical Modeling: Higher order modeling, finite context modeling, adaptive modeling, Escape code as a fall back, Improvements. Highest order modeling, updating the model, Escape probabilities, score boarding, data structures, modes flushing and implementation. Static v/s Adaptive Compression: Adaptive Methods, Sliding window compression: The algorithm and encoding problem. Speech compression: Digital audio concepts, fundamentals, sampling variables,

Unit – III: PC- Based sound, Lossless compression of sound, problem and result, Lossy compression, silence compression, companding and other techniques. Lossy Graphics Compression: Statistical and Dictionary compression methods, Lossy Compression, Differential modulation, JPEG-overview, JPEG-Enhancement, Loss less
JPEG, JPEG Compression, The discrete cosine transform, Implementing The DCT, Matrix Multiplication, Improvements, output of the DCT, quantization methods, selection of quantization of coding: zigzag sequence, entropy encoding and about color.

Unit – IV: Speech Compression: MPEG, MP3.Video compression: Pixel details, Motion estimation, quantization and bit packing, MPEG-2. Fractal Image compression: History, Iterated function system (IFS), Basic IFS, Image compression with IFS and with partitioned IFS. Fractal Image decoding, Resolution independence. Introduction to Wavelet based compression Techniques.

Reference Books:

1) The Data Compression- Mark Nelson, Jean-Ioup Gailly, 2nd edition, (M&T pub.)
2) Data Compression: The complete Reference-David Saloman, D., 3rded, (Springer Publication.)
3) Introduction to Data Compression-Khalid Sayood, 2nd ed. (Academic press ltd.)
4) Introduction to Information Theory and Data Compression- Darrel Hankerson, 2nd ed, (Chapman and Hall/CRC publications.)
5) Handbook of Image and video Processing-Al Bovik(Academic press ltd. Publication.)
6) Compression Algorithms for Real Programmers- Peter Wayner (Academic press ltd.)

1 ENTC4 Elective-I

3. ARTIFICIAL INTELLIGENCE

Unit – I: Fuzzy set Theory, Introduction to Fuzzy sets, Fuzzy relation, Membership functions, fuzzification, defuzzification, fuzzy logic, fuzzy rule based system fuzzy inference system.

Unit – II: Fuzzy Decision Making, Fuzzy modeling, Adaptive neuro fuzzy inference system, cognitive neurofuzzy modelling, Neuro fuzzy control, Application of neuro fuzzy control.

Unit – III: Fundamental of Artificial Neural Network: Artificial Neuron model. Learning process, Single layer and multilayer feed forward network, training by back propagation, Hop-field model basic concept of bidirectional associative memory, self organization map, and optimization model.

Unit – IV: Recurrent Networks, Hamming Net and MAXNET, Feature mapping, counter propagation networks, cluster discovery Network (ART), Applications of Neural Network Characters Recognition Network, Neural Network control Application, Network for Robot kinematics, Hand written Numeral recognition.

Reference Books:

1) "Neural Networks in Computer Intelligence", Limin Fu , McGraw Hill Inc., 1994.
2) "Neural Network Fundamentals", N. K. Bose, P. Lling , McGraw Hill.
3) "Artificial Neural Networks", Zurada
4) " Fuzzy Logic with Engg. Applications", Timothy J. Ross ,McGraw Hill.
5) "Neuro Fuzzy and Soft computing", Jang, Sun, Mezutani
6) "Fuzzy Engineering", Bart Kasko, PHI
7) "Neural Networks", S. Hykin ,Pearson Education.

1 ENTC4 Elective-I

4. CRYPTOGRAPHY & NETWORK SECURITY

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 the Data Encryption Standard: Simplied DES, Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes of Operation, Contemporary symmetric Ciphers: Triple DES, Blowfish, RC5, Characteristics of Advanced Symmetric Block Ciphers, Confidentially using symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.

Unit – II: Public Key Cryptography and RSA: Principles of Public Key cryptosystems, The RSA Algorithm, Key Management, other Public Key Cryptosystems key Management, Diffle- Hellman Key exchange. Message Authentication and hash functions: Authentication Requirements, Authentication Function, Message Authentication Codes, Hash Functions, Security of Hash Functions and MACs.

Unit – III: Hash Algorithms: MD5 Message Digest Algorithm, Secure Hash Algorithm, Authentification Applications: Kerberos, X. 509 Authentication Service.

Unit – IV: 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. Willam Stallings, Cryptography and Network Security, Third Edition, Pearson Education
2. Cbarlie Kaufman, Radia Perlman, Mike Speciner, Network Security, Provate Communication in a public world, Second Edition, Pearson Education Asia, 2002.
3. Atul Kahate, Cryptography and Network Security, Tata McGrawhill, 2003.

1ENTC6 Lab – I (based on 1ENTC1 & 1ENTC3)

1ENTC7 Lab – I (based on 1ENTC4)

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SEMESTER : SECOND

2 ENTC1 ADAPTIVE SIGNAL PROCESSING

Unit – I: **General Introduction**

Adaptive systems-Definition and characteristics, areas of applications, general properties, Open and closed loop adaptation, applications of closed loop adaptation. The adaptive liner combiner-General description, input signal and weight vectors, desired Response and error, the performance function, gradient and minimum mean square error. Example of performance surface, alternative expression of the gradient, decorrelation of Error and input components.

Unit – II: **Theory of adaptation with stationary signals.**

Properties of the quadratic performance surface-Normal form of the input correlation Matrix, eigen values and eigen vectors of the input correlation matrix, an example with two weights, geometrical significance of eigen vectors and eigen values. Searching the performance surface-Methods of searching the performance surface, basic ideas of gradient search methods, a simple gradient search algorithm and its solution, stability and rate of convergence, Gradient estimation and its effects on adaptation – Gradient component estimation by derivative measurement, the performance penalty, derivative measurement and performance penalties with multiple weights, variance of the gradient estimate.

Unit – III: **Stochastic processes and models: Partial Characterization of a Discrete-Time Stochastic**

Process, Mean Ergodic Therom, Correlation Matrix, Correlation Matrix of Sine Wave Plus Noise, Stochastic Models, World Decomposition, Asymptotic Stationary of an

Autoregressive Process, Yule-Walker Equations, Computer Experiment: Autoregressive Process of Order Two, Selecting the Model Order, Complex Gaussian Process, Power Spectral Density, Properties of Power Spectral Density, Transmission of a Stationary Process Through a Liner Filter, Cramer Spectral Representation for a Stationary Process, Power Spectrum Estimation, Other Statistical Characteristics of a Stochastic Process, Polyspectra, Spectral-Correlation Density.

Unit – IV: Wiener filters: Linear Optimum Filtering, Statement of the problem, Principle of Orthogonally, Minimum Mean-Square Error Adaptive algorithms and structures: The LMS algorithms, The z-transform in ASP, Other adaptive algorithms and structures, RLS adaptive filters: Some Preliminaries, The Matrix Inversion Lemma, The Exponentially Weighted Recursive Least-Squares Algorithm, Selection of The Regularizing Parameter, Update Recursion for the sum of weighted Error Squares, Example, Single-weight Adaptie noise canceller, convergence analysis of the RLS Algorithm, Computer Experiment on Adaptive Equalization, Robustness of RLS filter

Text Books:

1. Adaptive Filter Theory- S. Haykin, (Pearson edition 4th Edition)
2. Adaptive Signal Processing, - B. Windrow, S.D. Sterns, (Pearson Education).

Reference Books:

1. Digital Signal Processing, S. K. Mitra, TMH
2. Digital Signal Processing: Principles, Algorithms & Applications, John G Prokis, D. G. Manolakis, PHI

2 ENTC2 WIRELESS COMMUNICATION

Unit – I: Review: 2G, 3G wireless networks, WLL, Cellular Concept Mobile Radio Propagation: Large Scale Path Loss: Introduction to Radio Wave propagation, Free Space propagation model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection, Ground Reflection (Two-Ray) Model, Diffraction, Scattering, Practical Link Budget Design Using Path Loss Models, Outdoor Propagation Models, Indoor Propagation Models, Signal Penetration into Buildings, Ray Tracing And Site Specific Modeling, Problem.

Unit – II: Mobile Radio Propagation- Small-Scale Fading and Multipath : Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of small-

Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels, Theory of Multipath shape factor for small- Scale Fading wireless Channels, Summary, Problem.

Unit – III: Multi Access Technique for wireless communication: Introduction, Frequency Division multiple Access (FDMA), Time Division Multiple Access (TDMA) Spread Spectrum Multiple Access, Space Division Multiple Access (SDMA) Packet Radio, Capacity of cellular Systems, Problems. Wireless Networking: Introduction to wireless Networks, Difference between Wireless and Fixed Telephone Networks, Development of Wireless Networks, Fixed Network Transmission Hierarchy, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel Signaling (CCS), Integrated services Digital networks (ISDN), Signaling System No. 7 (SS7), An Example of SS7-Global Cellular Network

Unit – IV: Interoperability, Personal Communication services / Networks (PCS/PCNs), protocols for Network Access, Network Databases, Universal Mobile Telecommunication System (UMTS), Summary, Wireless Systems & Standards: AMPS and ETACS, United States Digital Cellular (IS-54 ad IS-136) Global System for Mobile (GSM) CDMA digital Cellular Standard (IS-95), CT2 standard for cordless Telephones, Digital European Cordless Telephones (DECT) PACS- Personal Access Communication Systems, Pacific Digital Cellular (PDC), Personal Handy phone System (PHS), US PCS and ISM Bands, US wireless Cable Television, Summary Of Standards throughout the world, problems. IEEE 802.11

Reference Books

1. Wireless Communications Principals & Practice- Theodore S. Rappaport, (P.E.)
2. Wireless & Mobile Network Architecture- Yi-Bing Lin, Imrich Chiamtac (John Wiley)
3. Fundamental of Wireless Communication- David Tse, Pramod Viswanath (Cambridge)

2 ENTC3 ADVANCE COMPUTER NETWORKS AND PROGRAMMING

Unit – I : Review of computer networking concepts, Topology, LAN, WAN, MAN, Internet, OSI/ISO, TCP/IP reference models, Point to point protocols. ARQ: Retransmission strategies. Functional elements : Multiplexing, Switching , Networks Management & traffic controls. Delay models in Data

Networks Switching techniques: Performance measures & architectural issues.

Unit – II : Internetworking, TCP/IP Internet architecture, IPV4, IPV6, IP addressing & related issues, IP address resolution techniques (ARP). IP datagram & forwarding, routing algorithms.

Unit – III : Multiple access techniques, ALOHA, CSMA, CSMA/CD, CSMA/CA, CDMA, OFDM, Delay throughput characteristics, WLAN-Protocols, multiple access, Ad-hoc networks, Bluetooth Specifications, WAP.

Unit – IV : Network security issues, Ciphers, DES, Public key cryptography, RAS algorithm, Digital Watermarking, Attacks and Counter Measures, Service Authentication Proforma.

Reference Books:

1) "Data Networks" Dimitri Bertisekas & Robert Gallager, PHI
2) "Local Area Networks", Gerd E Kieser – Mc-Graw-Hill
3) "Computer Networks and Internetworking"D.E.Comer, Pearson Education
4) "Cryptography and Network Security: Principles and Practice",William Stallings, Pearson Education
5) "GSM, CDMA and 3G Systems" , Steele,, Wiely Students Edition
6) "Communication Networking" An analytical approach" Anurag kumar, D. Manjunath & Joy Kuri– Morgn – Kaufmann publishers

2 ENTC4 RF & MICROWAVE CIRCUIT DESIGN

Unit – I: Review of EM Theory : Maxwell's equations, Plane waves in dielectric & conducting media, Energy & Power, Transmission lines, Solid state devices, Monolithic Microwave Integrated Circuits & Technology : History of Monolithic Microwave Integrated Circuits, Monolithic circuit components planner, Transmission Lines, Lumped and Distributed, Passive Elements, GaAs MESFET, Other active devices.Metal Semi-conductor Functions, and their characterization, Physical characteristics, modeling of GaAs MESFET & HEMT.

Unit – II: Material and fabrication techniques of GaAs MESFET. Properties of GsAs. Electron Beam and X-ray lithography, Plasma assisted deposition, Molecular beam epitaxy & MOCVD, Ion milling, S-Parameter measurements and their use in GaAs MESFET, S-Parameter measurements : General concept, measurements, utilization of S-Parameters in circuit design, Amplifiers (Narrow band/Broad band), Oscillators, Mixers, Active & Passive Phase shifters, Monolithic Microwave Integrated circuit Process, Optical Control of MMIC's.

Unit – III: RF And Microwave Circuit Design: Single & multi port network, Basic definitions, interconnecting networks, network properties, & applications, scattering parameters. RF filter design, filter configurations, special filter realizations, filter implementation, coupled filter, Active components: Semiconductor basics, RF diodes, bipolar junction transistor, RF field effect transistors, High electron mobility transistors.

Unit – IV: Active RF components modeling : Diodes models, transistor models, measurement of active devices, scattering parametric device characterization. Matching & biasing network: Impedance matching using discrete components, micro strip line matching networks, amplifier class of operation, biasing networks. RF transistor amplifier design, amplifier power relations, stability considerations, constant gain, noise figure circles, constant VSWR circles, broadband, high power & multistage amplifiers, Oscillators & Mixer: basic oscillator model, High Frequency oscillator configuration, basic characteristics of mixers.

Reference Books:

1. RF circuit design, theory & applications- Reinhold Ludwig, Pavel Bretchko, (Pearson Education – LPE)
2. Microwave Engineering-David M. Pozar (John Wiley & Sons)
3. Microwave Amplifier Design- Samuel Y. Liao, (PHI)
4. Microwave Engineering- Sisodiya and Raghuvanshi, (PHI)
5. Microwave Devices & Circuit Design"-Gupta & Shrivastava(PHI)

2 ENTC5 Elective-II

1. MOBILE COMPUTING

Unit – I: Wireless network technology : Global System for Mobile Communication (GSM) , Wireless media access control protocols; Wireless LAN, TDMA, PRMA, CDMA, etc 2. Routing in wireless networks: Unicast routing protocol, Dynamic source routing, DSR optimization, route caching, Relative distance micro discovery routing, On-demand distance vector routing, power aware routing, Hybrid protocols (5)

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 computing: security technique s and algorithms, security protocol, public key infrastructure, trust, security model, security frame work, Wireless devises with symbian OS: Symbian OS architecture, control and compound Control, active objects, Localization, security on the symbian OS.

Reference Books:

1. Mobile Computing, edited by T. Imielinski and H.F. Korth, Kluwer Academic
2. Mobile computing by Asok Talukdar, Roopa Yawagal, TMH

2 ENTC5 Elective-II

2. 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)

2 ENTC5 Elective-II

3. OPTICAL NETWORKS

Unit – I: Sonet & SDH : Brief history of Sonet & SDH, Multiplexing hierarchy, Multiplexing structure – Functional components, Problem detection, Virtual tributaries & containers, Concatenation. Architecture of OTN: Digital wrapper, control planes, Control signaling, Multiplexing hierarchies, Current digital hierarchy, revised hierarchies, Optical & Digital Transport hierarchies, Functionality stacks, Encapsulation & Decapsulation, GFP.

Unit – II: WDM, DWDM Topologies : Relationship with SONET / SDH, EDF, WDM Amplifiers, Multiplexers, WADM I/P & O/P ports, spanloss & chromatic, dispersion, Tunable DWDM lasers, Network Topologies & Protection schemes : Non-negotiable requirements of robust networks, Line & Path protection switching, Type of Topologies, Optical Channel Concatenation, Meshed topologies, PON's, Optical Ethernets, Wide area Backbones, Metro optical networking.

Unit – III: MPLS & Optical networks : Label switching, FEC, Scalability & granuility : labels & wavelength, MPLS nodes, Distribution & Binding methods, MPLS support of virtual private networks, Traffic Engineering, MPLS, Relationships of OXC, MPLS operation, MPLS & optical Traffic Engineering, Similarities. Control & Dataplanes interworking, Architecture of IP & MPLS based optical transport Networks : IP, MPLS & Optical control planes- Interworking, The three control planes, Framework for IP Vs. Optical networks, Generalized MPLS use in optical networks, Bidirectional LSP's in optical network, Next horizon of GMPLS, ODVK General communication channels, Traffic parameters

Unit – IV: Link Management protocol (LMP): What is managed, Data Bearing links, Basic function of LMP, LMP messages, LMP message header, TLW's control channel management, LPC, LCV, Fault management, Extending LMP operations to optical

links Optical Routers Management : Switching in optical internets: State of art in optical switching, clarification of Key terms, Evolution of switching technologies, Speeds of electronics & photonics, Optical routers, Control element, switching technologies MEMS, OSP, Setting up protection paths between nodes H, G & J, Expanding the Role of nodes G & I, Node failure, Coupling, decoupling, node to node wavelengths, Approach to problem of LSP & OSP interworking, Thermo-optic switches, Bubble switch. Optical compilers: Building blocks, Serial Binary adder with carry delay, Fiber delay line memory loop, Bit serial, optical counter design, Lumped delay design, Distributed delay design, Time multiplex multiprocessor, Time slot interchange with 2 log 2 (N-1) switch, Hatch design support system.

Reference Books:

1. Optical Networks– Third generation transport system -Uyless Black (Prentice Hall)
2. Opto Electronic computing system – Jordan

2 ENTC5 Elective-II

4. SPEECH & AUDIO PROCESSING

Unit – I: Digital models for the speech signal: Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals. Time domain models for speech processing: 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. Digital representations of the speech waveform: Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.

Unit – II: Short time Fourier analysis: 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 speech processing: Homomorphic systems for convolution, Complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.

Unit – III: Linear predictive coding of speech: 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, Speech Enhancement: Spectral subtraction & filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation. Speech Synthesis: Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis.

Unit – IV: Automatic Speech Recognition: Introduction, Speech recognition vs. Speaker recognition, Signal processing and analysis methods, Pattern comparison techniques, Hidden Markov Models, Artificial Neural Networks, Audio Processing: Auditory perception and psychoacoustics - Masking, frequency and loudness perception, spatial perception, Digital Audio, Audio Coding - High quality, lowbit- rate audio coding standards, MPEG, AC-3, Multichannel audio - Stereo, 3D binaural and Multichannel surround sound.

Text Books:

1. L. R. Rabiner and R. W. Schafer, “Digital Processing of Speech Signals,” Pearson Education (Asia) Pte. Ltd., 2004.
2. D. O’Shaughnessy, “Speech Communications: Human and Machine,” Universities Press, 2001.
3. L. R. Rabiner and B. Juang, “Fundamentals of Speech Recognition,” Pearson Education (Asia) Pte. Ltd., 2004.
4. Z. Li and M.S. Drew, “Fundamentals of Multimedia,” Pearson Education (Asia) Pvt. Ltd., 2004.

Reference Book:

1. C Becchetti & L P Ricotti, “Speech Recognition Theory & C++ Implementation” John Wiley & Sons
2. D. O’Shaughnessy, “Speech Communication Human & Machine”, Universities Press.
3. B. Gold & N. Morga+n “Speech & Audio Signal Processing”, John Wiley & Sons

2ENTC6 Lab – I (based on 2ENTC2 & 2ENTC3)

2ENTC7 Lab – I (based on 2ENTC1 & 2ENTC4)

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THIRD SEMESTER

3 ENTC1 Seminar & Dissertation

FOURTH SEMESTER

4 ENTC1 Seminar & Dissertation

As per given scheme

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SYLLABUS
PRESCRIBED FOR
TWO YEAR P.G. DEGREE COURSE IN
MASTER OF ENGINEERING (FULL TIME)
COMPUTER ENGINEERING
SEMESTER PATTERN
SEMESTER : FIRST

1KMEF1/ 1RMEF1/1RME1
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 piplelining. 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 workstations.

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 Organization and Architecture", (PHI).
3. Hwang K., "Advanced Computer Architecture", (McGraw Hill).
4. Hamacher V.C, "Computer Organization", (McGraw Hill).

1KMEF2/ 1RMEF2/1RME2 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 & Conquer : 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: Travarsing 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 and Sahni, "Fundamentals of Algorithms", (Galgotia).
2. Aho, Ullman, "Analysis & Design of Computer Algorithms", (Addison-Wesley).
3. Donald E. Knuth, "The Art of Computer Programming", Vols. I, II & III, (Addison-Wesley).

1KMEF3/1RMEF3/ 1RME3
OPERATING SYSTEM DESIGN

Unit-I: Introduction to OS Internals. Overview of OS and Kernel, Linux and classic UNIX kernels. Kernel Source tree. Process management in Linux: Process descriptor and task structure, process creation, implementation of threads, process termination, process scheduling.

Unit-II: Process Scheduling in Linux: The Linux Scheduling Algorithm, Preemption and Context Switching, Real-Time, Scheduler-Related System Calls, System Calls: Handler, Implementation and Context. Interrupts and Interrupt Handlers.

Unit-III: Kernel Synchronization in Linux: Critical Regions and Race Conditions, Locking, Deadlocks, Contention and Scalability. Kernel Synchronization Methods: Spin Locks, Semaphores, Completion Variables. Preemption Disabling.

Unit-IV: Time Management in Linux: Kernel Notion of Time, Hardware Clocks and Timers, The Timer Interrupt Handler, Delaying Execution. Memory Management in Linux: pages, zones, kmalloc, vmalloc, slab layer allocator, statically allocating on the stack, high memory mapping. Per-CPU Allocations.

Unit-V: The Virtual File System in Linux: common file system interface, file abstraction layer, UNIX file system, VFS, dentry object, Super block object, file object, data structure associated with file systems and with a process. The Block I/O Layer and I/O Scheduler in Linux.

Unit-VI: The Process Address Space, the Memory Descriptor, Memory Areas, Page Tables. The Page Cache and Page Write back: Page Cache, Radix Tree, Buffer Cache. Linux Kernel Modules: Building, installing, Loading and managing. Portability in Linux.

Text Book:

Robert Love, "Linux Kernel Development" Pearson Education, (2/e).

Reference Books:

i. Daniel Bovet, "Understanding the Linux Kernel" O'Reilly Publications 2/e.

ii. Rubini and J. Corbet . "Linux Device Drivers." O'Reilly and Associates, 2001.

iii. Mosberger & Eranian. "IA-64 Linux Kernel: Design & Implementation" PHI.

iv. McKusick & Neil . "The FreeBSD Operating System" Addison-Wesley, 2004.

1KMEF4 OBJECT ORIENTED SYSTEMS

Unit I UML structure; UML building blocks; UML common mechanisms; Architecture. Unified Process (UP): UP axioms; UP structure; UP phases. Requirements workflow. Software requirements – Meta model; Requirements workflow detail; Defining requirements; Finding requirements. Use case modeling; Use case specification; Requirements tracing; Advanced use case modeling; Actor generalization; Use case generalization.

Unit II The analysis workflow; Analysis artifacts – Meta model; Analysis workflow detail; Analysis model - rules of thumb. Objects and classes; UML object notation UML class notation; Scope; Object construction and destruction. Analysis classes, Relationships; link; association; dependency; Inheritance and polymorphism. Generalization; Class inheritance; Polymorphism; Advanced generalization.

Unit III Analysis packages; Packages and namespaces, Nested packages; Package dependencies; Package generalization; Architectural analysis. Use case realization – elements; Interactions; Lifelines; Messages; Interaction diagrams; Sequence diagrams; combined fragments and operators; Communication diagrams. Advanced use case realization; Interaction occurrences; Continuations.

Unit IV Activity diagrams; Activity semantics; Activity partitions; Action nodes; Control nodes; Object nodes; Pins. Connectors; Interruptible activity regions; Exception handling; Expansion nodes; Sending signals and accepting events; Streaming; Advanced object flow features; Multicast and multireceive; Parameter sets; Interaction overview diagrams.

Unit V The design workflow; Design artifacts metamodel; Design workflow detail; Architectural design. Design classes; Anatomy of a design class; Inheritance; Templates; Nested classes. Refining analysis relationships; Design relationships; Aggregation semantics; Composition semantics; One-to-one, Many-to-one and One-to-many associations; Collections; Reified relationships; Interfaces: Provided and required interfaces; Interface realization vs. inheritance; Ports. Component-based development; Component stereotypes; Subsystems; Designing with interfaces.

Unit VI Use case realization-design; Modeling concurrency; Subsystem interactions; Timing diagrams; State machine

diagrams; States; Transitions; Events. Advanced state machines; Composite states; Submachine states; Submachine communication. The implementation workflow; Implementation artifacts – meta model; Artifacts. Deployment; Architectural implementation; The deployment diagram; Nodes; Artifacts; Deployment.

Text Book:

Jim Arlow, Ila Neustadt "UML 2 and the Unified Process: Practical Object-Oriented Analysis and Design" (2/e), Pearson Education.

Reference Books:

1. Booch, Rumbaugh, Jacobson, "The UML Users Manual", Pearson Education.
2. James Rumbaugh, Jacobson, Booch, "UML Reference Manual', Pearson Education.
3. Jacobson et al., 'The Unified Software Development Process', Pearson Education.
4. Bennett, McRobb, Farmer, "Object-Oriented Systems Analysis and Design Using UML" (TMH)

1KMEF5 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).

1 KMEF6

Algorithmics-Lab: Based on 1KMEF2 Algorithmics.

1 KMEF 7

Operating System Design Lab: Based on 1KMEF3 Operating System Design.

SEMESTER : SECOND

2KMEF1 NETWORK SYSTEMS DESIGN

Unit I: Network analysis, architecture and design process overview. System and service descriptions, services and performance characteristics. Network supportability. Requirements Analysis: user-, application-, device-, network- and performance requirements.

Unit II: Requirement Analysis: process; gathering and listing requirements, service metrics development, behavior characterization, RMA -, delay-, capacity-, supplemental performance requirements development. Requirement mapping. Specifications development.

Unit III: Flow analysis: Basics, flow identification and development, Flow models, flow prioritization, flow specifications. Network

architecture: component architectures, reference architecture, architectural models, systems and network architectures.

Unit IV: Addressing and routing architecture: Fundamentals, Addressing mechanisms, Routing mechanisms, Addressing strategies, Routing strategies. Architectural considerations for addressing and routing.

Unit V: Network Management Architecture: Objectives and basics, Defining Network Management, Network Management Mechanisms, Architectural considerations for network management architecture.

Unit VI: Performance Architecture: Objectives and basics, Performance Mechanisms, Architectural considerations for Performance mechanisms. Network layout, Design traceability and Design metrics.

Text Books:

James D. McCabe, "Network Analysis, Architecture, and Design" (2/e) Morgan Kaufmann 2003.

Reference Books:

1. Andrew S. Tenanbaum "Computer Networks", 4th Ed., Pearson Education.
2. James F. Kurose, Keith W. Ross "Computer Networking: A Top-Down Approach" TMH.
3. William Stallings "Data and Computer Communications" 7th Ed., Pearson Education.
4. Priscilla Oppenheimer "Top-Down Network Design" Second Edition, Cisco Press, 200

2KMEF2/2 RMEF2/2 RME2
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.

Unit III: 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.

2KMEF3 EMBEDDED SYSTEM DESIGN

UNIT I Architecture of Embedded System, Hardware Architecture, Software Architecture, RTOS, Architecture of Kernel ,Features/ Characteristics of RTOS,. Task Scheduling, Signals, Events, Queues, Mail Boxes, Semaphores, Creation of Threads and Inter Thread Communication, Memory Management

UNIT II Detailed study of PIC18 Family Microcontroller Architecture, Pin Description, File Structure, Status Register, PIC data formats, Directives, RISC Architecture in PIC, SFR, PIC18

Hardware Connections, PIC 18 Timers, PIC 18 Serial Port, PIC 18 Interrupts. Features of ATMEL, ARM, AVR Microcontrollers.

UNIT III PIC 18 Instruction set, Programming using C / Assembly: Data types, time delays, I/O Programming, Data Conversion, Timer/ Counter, Serial Port, Interrupt programming, ADC,DAC, Sensor Interfacing.

UNIT IV Clock-Driven Scheduling: Notation and Assumptions, Static, Timer Driven Scheduler, General structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of periodic Jobs, Scheduling Sporadic Jobs, Practical Consideration and Generalizations, Algorithms for Constructing Static Schedules, Pros and Cons of Clock-Driven Scheduling.

UNIT V Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed-Priority versus Dynamic-Priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability Test for Fixed-Priority Tasks with Short Response Times, Schedulability Test for Fixed-Priority Tasks with Arbitrary Response Times, Sufficient Schedulability Conditions for the RM and DM Algorithms.

UNIT VI Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumption and Approaches, Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth, and Weighted Fair Queuing Servers, Scheduling of Sporadic Jobs, Real-time Performance for Jobs with Soft Timing Constraints.

TEXT BOOKS:

1. Dr. K.V. K. K. Prasad "Embedded / Real Time System : Concepts, Design, & Programming" Dreamtech Press Publication
2. Mohammad Ali Mazidi, Rolin D. Mckinly, Danny Causey: "PIC Microcontroller and Embedded system using Assembly and C for PIC18" Pearson Education
3. Jane W.S. Liu : Real Time System, Pearson Education

REFERENCE BOOKS:

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw-Hill
2. John B. Beatman, Design with PIC Microntroller, Prentice Hall
3. Barry B. Brey, Applying PIC18 Microntroller, Architecture, Programming and Interfacing using C and Assembly, Prentice Hall.
4. Phillip A. Laplante: Real-Time Systems Design and Analysis, (Wiley InterScience)

2KMEF4 **ELECTIVE**

(1) HUMAN COMPUTER INTERFACES

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.

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.

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.

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.

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.

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.

Text Book

Ben Shneiderman "Designing the User Interface" (Pearson Education)

Reference Books:

1. R. Beale, A.J. Dix, J. E. Finlay, G. D. Abowd "Human Computer Interaction" (Prentice-Hall).
2. Joann Hackos, Janice Redish, "User and Task Analysis for Interface Design"(Wiley).
3. Jeff Raskin, "The Humane Computer Interface" (Pearson Education).
4. Jesse James Garrett, "The Elements of User Experience" (New Riders)

2KMEF4 ELECTIVE

(2) SYSTEMS SECURITY

UNIT-I Introduction: Security, Attacks, Computer criminals, Method of Defense. Cryptography: Substitution ciphers, Transpositions, Symmetric and asymmetric systems, cryptanalysis, data encryption standard, AES Encryption algorithms Public Key Cryptography, RSA Algorithms, Uses of Encryptions.

UNIT-II Program Security: Secure programs, Non-malicious program errors, Computer Viruses and Other malicious code, Targeted malicious code, controls against program threats.

UNIT-III Operating System Security: Protected Objects and methods of protection, Memory address protection, Control of access to general objects, File protection Mechanism, User Authentication**:** Authentication basics, Password, Biometrics.

UNIT-IV Trusted Operating System, Security Policies, models of Security, Trusted Operating System, Design, Design elements , security features of ordinary and Trusted Operating System, Kernalised design , separation , virtualizations , Layered design , typical OS Flows assurance method , Open Source Evolutions.

UNIT-V Database Security: Security requirements for Database, Reliability and integrity, sensitive data, interface, multilevel database, Proposals for multilevel security: separations, design of multilevel secure databases, Trusted Front-end Practical issues.

UNIT-VI Networks Security: Threats in networks, Network security controls, Firewalls, Intrusion detection systems, Secure E-mail. Administrating Security: Planning, Risk Analysis, Organization, security policies, Physical security.

Text Book:

C.P. Pfleeger and S. L. Pfleeger, "Security in Computing", Pearson Education (LPE)

Reference Books:

1. Stallings, "Cryptography and Network Security:" Pearson Education (LPE)
2. Matt Bishop, "Computer Security: Art and Science", Pearson Education
3. Kaufman, Perlman, Speciner, "Network Security" PHI.
4. Eric Malwald, "Network Security: A Beginner's Guide", TMH

2KMEF4 ELECTIVE

(3) IMAGE PROCESSING & COMPUTER VISION

Unit-I: Introduction to image processing, computer vision. Digitized images: basic concepts, image digitization, sampling, and quantization, digital image properties. Data structures for image analysis: traditional data structures and hierarchical data structures.

Unit-II: Image pre-processing: pixel brightness transformation, geometrical transformation, local pre-processing, image smoothing, edge detection, scaling, parametric edge models, multi-spectral images, adaptive neighborhood pre-processing, image restoration.

Unit-III: Image Segmentation: Thresholding, threshold detection methods, optimal thresholding, Edge-based segmentation, edge image thresholding, edge relaxation, border tracing and detection, Hough transforms, region-based segmentation and matching.

Unit-IV: Shape: Region identification, contour-based shape representation and description, region-based shape representation and description, shape classes. Object recognition: knowledge representation, statistical pattern recognition, syntactic pattern recognition.

Unit-V: Image Understanding: parallel, serial processing and hierarchical control, bottom-up, model-based and combined control strategies, point distribution models, contextual image classification, scene labeling & constraint propagation, semantic region growing.

Unit-VI: Linear discrete image transforms: Fourier, Hadamard, Discrete Cosine and Wavelets. Applications of these transforms. Image data compression: predictive methods, vector quantization, Hierarchical, progressive compression. JPEG & MPEG image compression.

Text Book:

Sonka M, Hlavac H, Boyle R "Image Processing, Analysis, and Machine Vision", (2/e) Brooks/Cole Thomson Learning.

Reference Books:

1. Gonzalez and Woods, “Digital Image Processing” (2/e) Pearson Education.
2. Forsyth, “Computer Vision” Pearson Education.
3. Chanda and Majumdar, “Digital Image Processing and Analysis” PHI.
4. Horn B K P, “Robot Vision” MIT Press, Cambridge, MA.

2KMEF5 Technical Paper Writing: Practice of technical paper writing as per IEEEE or ACM standards.

2KMEF6 Seminar: Based on recent trends in Computer Engineering taken form the Journals like IEEE transactions or ACM transactions.

2 KMEF7 Advanced Compiling Techniques Lab: Based on 2KMEF2 Advanced Compiling Techniques

2KMEF8 Embedded Systems Design Lab: Based on 2KMEF3 Embedded Systems Design.

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THIRD SEMESTER

3KMEF1 SEMINAR AND DISSERTATION

FOURTH SEMESTER

4KMEF1 SEMINAR AND DISSERTATIONI

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APPENDIX-A

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)

(STRUCTURAL ENGINEERING)

CREDIT GRADE SYSTEM

FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	1SFSE1	Introduction to Earthquake Engineering	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1SFSE2	Theory of Plates and Shells	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1SFSE3	Computer Methods of Structural Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1SFSE4	Structural Dynamics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1SFSE5	Earthquake Resistant Design of Reinforced Concrete Structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1SFSE6	Earthquake Resistant Design of Reinforced Concrete Structures - Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1SFSE7	Computer Aided Analysis & Design of Structures – Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	23				500					100	
														TOTAL			600

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2SFSE1	Finite Element Method	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2SFSE2	Advanced Design of Steel Structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2SFSE3	Repairs & Retrofitting of Structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4.	2SFSE4	Design of Prestressed Concrete structures	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5.	2SFSE5	Elective*	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6.	2SFSE6	Adv. Design of Steel Structures - Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7.	2SFSE7	Design of Prestressed Concrete Structures - Laboratory	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL			600

Elective-II : 1) Substructures and Foundation Design (2) Earthquake Resistant Design of Bridges and Dams (3) Theory of Elasticity and Stability (4) Design of Environmental Structures

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3SFSE1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	

TOTAL : 100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4SFSE1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			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 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)
MECHANICAL ENGINEERING (CAD/CAM)
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	1MCC1	Computer Aided Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1MCC2	Computer Aided Manufacturing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1MCC3	Computer Assisted Production Management	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1MCC4	Mechatronics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1MCC5	Elective-I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1MCC6	Computer Aided Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1MCC7	Computer Aided Manufacturing-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

Elective - I : 1) Concurrent Engineering 2) Engineering Experimental Techniques 3) Management Information Systems 4) Optimization Techniques 5) Design of Manufacturing Assembly and Environment

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme Hours/Week Lecture	Tutorial	P/O	Total Hours/ Week	Credits	Examination Scheme Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal Marks	Total	Min. Passing
1	2MCC1	Finite Element Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2MCC2	Simulation Theory &Applications	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2MCC3	Robotics & Robot Applications	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2MCC4	Industrial Product Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2MCC5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2MCC6	Finite Element Analysis-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2MCC7	Simulation Theory & Applications V-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

Elective-II : 1) Flexible Manufacturing System 2) Virtual Manufacturing 3) Industrial Automation 4) Rapid Prototyping and Tooling

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3MCCS	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4MCCP	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			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 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL-TIME)
DIGITAL ELECTRONICS
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Practical Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1UMEF1	Digital Electronics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1UMEF2	Advanced Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1UMEF3	Elective-I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1UMEF4	Digital Communication Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1UMEF5	Embeded System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1UMEF6	Digital Communication Techniques-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1UMEF7	Embeded System Design-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL			600

Elective - I : 1) Modern Electronic Design Techniques 2) RF System Design 3) Computer Communication Network

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Practical Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	2UMEF1	Digital Image Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2UMEF2	CMOS VLSI Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2UMEF3	Parallel Computing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2UMEF4	Artificial Intelligent Systems	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2UMEF5	Elective-II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2UMEF6	Digital Image Processing-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2UMEF7	CMOS VLSI Design-Lab.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL			600

Elective - II : 1) Bio-Informatics 2) Micro Electro Mechanical System 3) High Speed Digital System Design

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3UMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL : 100	

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4UMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			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.

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Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL TIME)
ELECTRICAL ENGINEERING (ELECTRICAL POWER SYSTEM)
CREDIT GRADE SYSTEM
FIRST SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme: Hours/Week: Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Examination Scheme: Theory: Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks: Theory Paper	Subject	Practical: Max.Marks: External	Internal	Total	Min. Passing Marks
1	1SEPS1	Power System Optimization	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1SEPS2	Generation Planning & Load Dispatch	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1SEPS3	Microcomputer and Microcontroller	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1SEPS4	Power System Dynamics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1SEPS5	Digital Signal Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1SEPS6	Power System Lab.-I	0	0	4	4	2	-	-	-	-	-	-	50	50	100	50
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

SECOND SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme: Hours/Week: Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Examination Scheme: Theory: Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks: Theory Paper	Subject	Practical: Max.Marks: External	Internal	Total	Min. Passing Marks
1	2SEPS1	Advanced Power System Protection	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2SEPS2	High Voltage Transmission	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2SEPS3	Power System Modeling & Control	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2SEPS4	Computer Methods in Power System Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2SEPS5	FACTS & Power Quality	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2SEPS6	Power System Lab.-II	0	0	4	4	2	-	-	-	-	-	-	50	50	100	50
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/O	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3SEPS1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4SEPS1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			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 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF TECHNOLOGY (FULL TIME)
CHEMICAL TECHNOLOGY (MEMBRANE & SEPARATION TECHNOLOGY)
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	1 MST 1	Advances in Absorption & Adsorption Separation Technology	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1 MST 2	Membrane Separation Process	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1 MST 3	Chemical Engineering Analysis	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1 MST 4	Advanced Energy Technologies	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1 MST 5	Advances in Absorption & Adsorption Separation Technology-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
6	1 MST 6	Membrane Separation Process-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1 MST 7	Seminar-I	-	-	2	2	5	-	-	-	-	-	-	50	50	100	50
			16	0	6	22	23	-	-	-	400					200	
																TOTAL	600

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2 MST 1	Advanced Downstream Technology for Chemical Recovery & Waste Utilization	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2 MST 2	Industrial Biotechnology	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2 MST 3	Elective	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2 MST 4	Advance Reactor Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2 MST 5	Advanced Downstream Technology for Chemical Recovery & Waste Utilization -LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
6	2 MST 6	Industrial Biotechnology-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2 MST 7	Seminar-II	-	-	2	2	5	-	-	-	-	-	-	50	50	100	50
			16	0	6	22	23	-	-	-	500					100	
																TOTAL	600

Elective : 1) Advance Material Technology 2) Advance Surface Coating Technology 3) Speciality Plastics 4) Insulation Coating

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3 MST 1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4 MST 1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			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 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF TECHNOLOGY (FULL TIME)
(CHEMICAL ENGINEERING)
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	1 CE 1	Transport Phenomena	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1 CE 2	Advanced Biochemical Engineering	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1 CE 3	Process Control	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1 CE 4	Mathematical Modelling & Optimization	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1 CE 5	Elective - I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1 CE 6	Transport Phenomena-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1 CE 7	Advanced Biochemical Engineering-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

Elective-I : 1) Advanced Chemical Analysis 2) Material Science 3) Pulp & Paper Technology 4) Chemical Process Intensification

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2 CE 1	Chemical Reaction Engineering	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2 CE 2	Advanced Separation Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2 CE 3	Process Design & Plant Utilities	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2 CE 4	Energy Technology & Conservation	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2 CE 5	Elective - II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2 CE 6	Chemical Reaction Engineering-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2 CE 7	Advanced Separation Techniques-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

Elective-II :1) Environmental Engineering & Waste Management 2) Nanotechnology 3) Chemoinformatics 4) Computational Fluid Dynamics

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/O	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3 CE 1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	50

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/O	Total	Credits	External Marks	Internal Marks	Total
1	4 CE 1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			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.

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Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL-TIME)
COMPUTER SCIENCE & ENGINEERING
CREDIT GRADE SYSTEM
FIRST SEMESTER

Sr. No.	Subject Code	Subject	Teaching Scheme					Examination Scheme								
			Hours/Week					Theory					Practical			
			Lecture	Tutorial	P/D	Total Hours/ Week	Credits	Theory Duration of Paper (Hr.)	Max. Marks Theory Paper	Max. Marks College Assess-ment	Total	Min.Passing Marks Theory Paper	Min.Passing Marks Subject	Max.Marks External	Max.Marks Internal	Total	Min. Passing Marks
1	1RMEF1/ 1RME1	Advanced Computer Architecture	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1RMEF2/ 1RME2	Algorithmics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1RMEF3/ 1RME3	Operating System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1RMEF4/ 3RME1	Expert System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1RMEF5/ 3RME2	Database Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1RMEF6/ 3RME3	Expert System Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1RMEF7/ 3RME4	Database Processing-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL			600

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2RMEF1/ 2RME1	Computer Communication Networks	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2RMEF2/ 2RME2	Advanced Compiling Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2RMEF3/ 4RME1	Real Time Systems	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2RMEF4/ 4RME2	Elective	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2RMEF5/ 4RME3	Technical Paper Writing	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
6	2RMEF6/ 2RME3	Seminar	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
7	2RMEF7/ 2RME4	Advanced Compiling Techniques-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
8	2RMEF8/ 4RME4	Real Time Systems-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			16	2	4	22	20				400					200	
														TOTAL			600

Elective : 1) MOBILE COMPUTING 2) NETWORK SECURITY 3) COMPUTER VISION AND IMAGE PROCESSING

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3RMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15	100		
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4RMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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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

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Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

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TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL-TIME)
INFORMATION TECHNOLOGY
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	1NMEF1	Operating System Configuration	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1NMEF2	Database System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1NMEF3	Net Centric Computing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1NMEF4	Real Time Embeded System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1NMEF5	Elective - I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1NMEF6	LAB-I (Based On 1NMEF1 & 1NMEF2)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1NMEF7	LAB-II (Based On 1NMEF3 & 1NMEF4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

ELECTIVE-I : 1) SOFTWARE ENGINEERING METHODOLOGIES 2) INTELLIGENT SYSTEMS 3) LEGAL AND PROFESSIONAL ETHICS

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2NMEF1	Integrative Programming	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2NMEF2	Digital Medial Development	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2NMEF3	Information Technology Management	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2NMEF4	System Security	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2NMEF5	Elective - II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2NMEF6	LAB-III (Based On 2NMEF1)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2NMEF7	LAB-IV (Based On 2NMEF2 & 2NMEF4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

ELECTIVE - II : 1) SOFTWARE TESTING 2) WIRELESS NETWORKS AND COMMUNICATION 3) DATA WAREHOUSING AND DATA MINING

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks	
1	3NMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50	
			-	-	6	6	15		100		
										TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4NMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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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

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Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

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TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL-TIME)
ELECTRONICS AND TELECOMMUNICATION ENGINEERING
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	1ENTC1	Advanced Optical Communication	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1ENTC2	Random Processes	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1ENTC3	Digital Communication Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1ENTC4	Digital Signal Processing and Applications	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1ENTC5	Elective - I	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1ENTC6	Lab – I (based on 1ENTC1 & 1ENTC3)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1ENTC7	Lab – I (based on 1ENTC4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

Elective - I : 1) Modern Electronic Design Techniques 2) RF System Design 3) Computer Communication Network

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2ENTC1	Adaptive Signal Processing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2ENTC2	Wireless Communication	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2ENTC3	Advance Computer Networks and Programming	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2ENTC4	RF & Microwave Circuit Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2ENTC5	Elective - II	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	2ENTC6	Lab – I (based on 2ENTC2 & 2ENTC3)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	2ENTC7	Lab – I (based on 2ENTC1 & 2ENTC4)	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22	-	-	-	500					100	
														TOTAL			600

Elective - II : 1) Bio-Informatics 2) Micro Electro Mechanical System 3) High Speed Digital System Design

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3ENTC1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total
1	4ENTC1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300
		TOTAL	-	-	12	12	30			300
									GRAND TOTAL	1600

Semester III

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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

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Notes : 1. Student should fill the examination form in the begining of 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student

DIRECTION

No. 31/2010 Date : 24 /6/2010

Subject : Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full-Time) / तंत्रशास्त्र पारंगत (Master of Technology) (Full Time) (Semester Pattern .... Credit Grade System)

Whereas the schemes of teaching & examinations of Master of Engineering (Full-Time) / Master of Technology (Full Time) courses has been accepted by the Academic Council vide Item No. 49 in its meeting held on 28-05-2010 as per the Credit Grade System for its implementation from the Academic Session 2010-2011,

AND

Whereas admissions to the First Year of Master of Engineering (Fullt-Time) / Master of Technology (Full Time) courses are to be made in the Academic Session 2010-2011,

AND

Whereas the matter for admission of the students at the examinations is required to be regulated by an Ordinance,

AND

Whereas the schemes of teaching & examinations of I and II Semesters of Master of Engineering (Full-Time) / Master of Technology (Full Time) courses are to be implemented from the academic session 2010-2011,

AND

Whereas the schemes of teaching & examinations 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 syllabus for I and II Semesters of Master of Engineering (Full-Time) / Master of Technology (Full Time) courses are to be sent for printing.

Now, therefore, I, Dr.Ku.Kamal Singh, 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 may be called "Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full-Time) / तंत्रशास्त्र पारंगत (Master of Technology) (Full Time) (Semester Pattern ....Credit Grade System) Direction, 2010.

2. This Direction shall come into force w.e.f. the session :-

i) 2010-2011 for First Year, and

ii) 2011-2012 for Second Year

3. Following shall be the Examinations leading to the Degree of Master of Engineering (Full Time)/ Master of Technology (Full Time) courses :-

i) M.E./M.Tech. Semester-I Examination

ii) M.E./M.Tech. Semester-II Examination

iii) M.E./M.Tech. Semester-III Examination

iv) M.E./M.Tech. Semester-IV Examination

4. Examinations of IIIrd & IVth semesters shall be held at the end of IVth semester seperately.

5. An applicant for admission to the Degree of Master of Engineering (Full Time) / Master of Technology (Full-Time) courses 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 respective course :-

TABLE

M.E./M.Tech.		B.E./B.Tech. of this University or any other statutory University
1.		2.
a)	M.E. Civil (Structural Engg.)	Civil /Construction Engg., Water Management
b)	M.E. Mechanical (CAD/CAM)	Mechanical/Automobile/Production/Industrial Engineering
c)	M.E. Digital Electronics	Electronics & Telecommunication, Electronics Engg., Industrial Electronics, Instrumentation & Information Tech.
d)	M.E. Electrical (E.P.S.)	Electrical / Electrical Power System / Electronics & Power
e)	M.Tech. Chemical Technology (Membrane & Separation Technology)	Chemical Engineering/Chemical Technology
f)	M.Tech. (Chemical Engineering)	Chemical Engg./Chemical Tech., Petrochemical Engg./Tech., Plastics & Polymer Engg./Tech., Pulp & Paper Tech.
g)	M.E. Computer Science & Engineering	Computer Technology, Computer Engineering, Electronics Engg.,(Computer Science & Electronics & Telecommunication, Information Technology Engineering)
h)	M.E. (Information Technology)	Information Technology, Computer Science & Engineering, Computer Technology, Computer Engineering, Electronics & Telecommunication, Electronics Engineering

i)	M.E. (Electronics & Telecommunication)	Electronics & Telecommunication, Electronics Engg., Industrial Electronics & Instrumentation

6. The Degree of Master of Engineering (Full-Time) / Master of Technology (Full-Time) shall be awarded to an examinee who in accordance qualifies in any one of the following subjects :-

   1) M.E. Civil (Structural Engineering)
   2) M.E. Mechanical (CAD/CAM)
   3) M.E. Digital Electronics
   4) M.E. Electrical (Electrical Power System)
   5) M.Tech. Chemical Technology (Membrane & Separation Technology)
   6) M.Tech. Chemical Engineering
   7) M.E. Computer Science & Engineering
   8) M.E. Information Technology
   9) M.E. Electronics & Telecommunication Engineering

7. (i) University shall hold Main Examinations of Semester-I of above mentioned Full Time Degree Courses in Winter every year and Supplementary Examinations in Summer every year at the end of the Second Semester

   (ii) University shall hold Main Examinations of Semesters-II, III & IV in Summer every year and Supplementary Examinations in Winter every year.

   (iii) The period of Academic session shall be such as may be notified in Academic Calender of the concerned academic session.

   (iv) Examinations shall be held at such places and on such dates as may be notified by Board of Examinations.

8. For the purposes of Instructions and Examinations, students shall study sequentially.

9. Subject to his/her compliance with the provisions of Ordinance relating to Examinations in General, the applicant for admission to an examination at the end of the course of study of a particular semester shall be eligible to appear at it, if;

   (i) He/She has satisfied the conditions mentioned in the following table and the provisions thereunder.

TABLE-I

Sr. No.	Name of Exam.	The student should have completed the term satisfactorily of	The student should have passed the subjects of examination of
1.	M.E./M.Tech. Semester-I	Semester-I	----
2.	M.E./M.Tech. Semester-II	Semester-II	----
3.	M.E./M.Tech. Semester-III	Semester-III	2/3 heads of passing of Semester- I & II taken together
4.	M.E./M.Tech. Semester-IV	Semester-IV	-----

(Explanation :- The Theory or Practical part of the subject shall be treated as separate head of Passing.)

   (ii) He/She shall not be allowed to submit the dissertation till he/she has passed in all subjects of I & II Semester.

10. The schemes of teaching & examinations shall be as provided under "Appendices A, B, C, D, E, F, G, H and I" appended with this Direction.

11. The fees for each M.E. (Full Time) / M.Tech. (Full Time) Examinations (Theory & Practical) shall be as prescribed by University from time to time.

12. The computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) of an examinee shall be as given below :-

    The marks will be given in all examinations which will include college assessment marks and the total marks for each Theory / Practical shall be converted into Grades as per Table II.

    SGPA shall be calculated based on Grade Points corresponding to Grade as given in Table II and the Credits allotted to respective Theory / Practical shown in the scheme for respective semester.

    SGPA shall be computed for I, II and IV Semester (**III & IV Semester together**) and CGPA shall be computed in IV semester based on SGPAs of I, II and IV Semester. :-

$$\text{SGPA} = \frac{C_1 \times G_1 + C_2 \times G_2 + \ldots\ldots + C_n \times G_n}{C_1 + C_2 + \ldots\ldots + C_n}$$

Where C_1 = Credit of individual Theory / Practial

G_1 = Corresponding Grade Point obtained in the respective Theory / Practical

$$\text{CGPA } X(Cr)_{IV} = \frac{(SGPA)_I X (Cr)_I + (SGPA)_{II} X (Cr)_{II} + (SGPA)_{IV}}{(Cr)_I + (Cr)_{II} + (Cr)_{IV}}$$

Where $(SGPA)_{I, II, IV}$ = SGPA of I, II & IV Semester

$(Cr)_{I, II, IV}$ = Total Credits for I, II & IV Semester

TABLE II

THEORY & PRACTICALS

Grade	Percentage of Marks	Grade Points
AA	85 ≤ Marks < 100	10
AB	75 ≤ Marks < 85	9
BB	70 ≤ Marks < 75	8
BC	65 ≤ Marks < 70	7
CC	60 ≤ Marks < 65	6
CD	55 ≤ Marks < 60	5
DD	50 ≤ Marks < 55	4
FF	00 ≤ Marks < 50	0
ZZ	Absent in Examination	--

13. (i) The scope of the subject shall be as indicated in the syllabus.

(ii) The medium of instructions and examination shall be English.

14. Provisions of Ordinance No.18 of 2001 in respect of an Ordinance to provide grace marks for passing in a Head of passing and improvement of Division (Higher Class) and getting distinction in the subject and condonation of deficiency of marks in a subject in all the faculties prescribed by the Statute No.18, Ordinance, 2001 shall apply to each examination under this Direction.

15. An examinee, who does not pass or who fails to present himself/ herself for the examination, shall be eligible for readmission to the said examination on payment of fresh fees, and such other fees as may be prescribed by the University.

16. As soon as possible after the examination, the Board of Examinations shall publish a result of the examinees. The result of all examinations shall be classified as above and branchwise merit list shall be notified as provided under Original Ordinance No.6.

17. Notwithstanding anything to the contrary, no one shall be admitted to an examination, if he/she has already passed the said examination or an equivalent examination of any Statutory University.

18. (i) Examinees who have passed in all the subjects prescribed for all the examinations of the particular branch shall be eligible for award of the Degree of Master of Engineering/Master of Technology in that branch including specilization.

(ii) The Degree Certificate in the prescribed form shall be signed by the Vice-Chancellor.

Sd/-
Dr. Kamal Singh
Vice-Chancellor

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DIRECTION

No.57/2010 Date : 30/9/ 2010

Subject : Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full-Time) (Computer Engineering) (Semester Pattern .... Credit Grade System)

Whereas Direction No. 30 of 2010 in respect of Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full Time) /तंत्रशास्त्र पारंगत (Master of Technology) (Full Time) (Semester Pattern .... Credit Grade System) is in existence in the University,

AND

Whereas the Master of Engineering (Full Time) (Computer Engineering) course has been started at Collge of Engineering & Technology, Amravati from the session 2010-2011,

AND

Whereas the Board of Studies in Computer Science & Engineering in its meeting held on 23-8-2010 vide Item No. 56, resolved to recommend the schemes of teaching & examinations and syllabi of Master of Engineering (Full Time) (Computer Engineering) course for its implementation from the session 2010-2011,

AND

Whereas Hon'ble Vice-Chancellor has been accepted the above scheme & syllabi u/s 14 (7) of M.U. Act, 1994 on behalf of faculty of Engineering & Technology on 25-8-2010,

AND

Whereas the Academic Council in its meeting held on 27-08-2010 vide Item No. 90 has been accepted the above scheme and syllabi,

AND

Whereas the matter regarding making of Ordinance and Regulation is likely to take some time,

AND

Whereas two year Master of Engineering (Full Time) (Computer Engineering) course is to be implemented from the academic session 2010-2011,

AND

Whereas syllabi for the above course is to be sent for printing.

Now, therefore, I, Dr.Ku.Kamal Singh, 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 "Examinations leading to the Degree of अभियांत्रिकी पारंगत (Master of Engineering) (Full Time) (Computer Engineering) (Semester Pattern .... Credit Grade System), Direction, 2010"

2) This Direction shall come into force from the date of its issuance.
3) Schemes of teaching & examinations for I to IV Semesters of Master of Engineering (Full Time) (Computer Engineering) (Semester Pattern .... Credit Grade System) course shall be as per "Appendix-A" appended with this Direction.
4) The Degree of Master of Engineering (Full Time)shall be awarded to an examinee who accordance qualifies himself / herself in the following subject :-
   i) M.E. (Computer Engineering)

Dr. Kamal Singh
Vice-Chancellor

TWO YEAR POST GRADUATE DEGREE COURSE IN MASTER OF ENGINEERING (FULL-TIME)
COMPUTER ENGINEERING
CREDIT GRADE SYSTEM
FIRST SEMESTER

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 Assess-ment	Total	Min. Passing Marks: Theory Paper	Subject	Practical: Max. Marks: External	Internal	Total	Min. Passing Marks
1	1RME1/ 1RMEF1/ 1KMEF1	Advanced Computer Architecture	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	1KMEF2/ 1RMEF2/ 1RME2	Algorithmics	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	1RME3/ 1RMEF3/ 1KMEF3	Operating System Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	1KMEF4	Object-Oriented Systems	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	1RMEF5/ 3RME2	Mobile Computing	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
6	1KMEF6	Algorithmics -LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
7	1KMEF7	Operating System Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			20	0	4	24	22				500					100	
														TOTAL			600

SECOND SEMESTER

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 Assess-ment	Total	Min.Passing Marks Theory Paper	Subject	Practical Max.Marks External	Internal	Total	Min. Passing Marks
1	2KMEF1	Network Systems Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
2	2RMEF2/ 2RME2/ 2KMEF2	Advanced Compiling Techniques	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
3	2KMEF3	Embeded Systems Design	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
4	2KMEF4	Elective	4	0	0	4	4	3	80	20	100	40	50	-	-	-	-
5	2KMEF5	Technical Paper Writing	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
6	2KMEF6	Seminar	0	1	0	1	1	-	-	-	-	-	-	-	50	50	25
7	2KMEF7 2RME4	Advanced Compiling Techniques-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
8	2KMEF7	Embeded Systems Design-LAB.	0	0	2	2	1	-	-	-	-	-	-	25	25	50	25
			16	2	4	22	20				400					200	
														TOTAL			600

Elective : 1) Human Computer Interfaces 2) Systems Security 3) Image Processing & Computer Vision

THIRD SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	Internal Marks	Total	Min.Passing Marks
1	3KMEF1	SEMINAR AND DISSERTATION	-	-	6	6	15	100	100	50
			-	-	6	6	15		100	
									TOTAL	100

FOURTH SEMESTER

Sr.	Subject	Subject	Lecture	Tutorial	P/D	Total	Credits	External Marks	Internal Marks	Total	Min.Passing Marks
1	4KMEF1	SEMINAR AND DISSERTATION	-	-	12	12	30	200	100	300	150
		TOTAL	-	-	12	12	30			300	
										TOTAL	100
										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 3rd semester jointly for 3rd & 4th semester.

2. Single marksheet for 3rd & 4th semester together will be given to the student.