

**1 SYLLABUS PRESCRIBED FOR
FOUR YEAR DEGREE COURSE IN
B.E./ B.TEXT. E./B.TECH. (CHEM.ENGG.)/
B.TECH. (CHEM. TECH.) POLYMER
(PLASTIC)**

**TECH. SEMESTER-I / II "GROUP A"
I A 1 ENGINEERING MATHEMATICS-I**

Aim :

The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subjects. The topics introduced will serve as basic tools for specialized studies in many fields of engineering and technology.

Objectives :

On completion of the course the students are expected:

- to identify algebraic problems from practical areas and obtain the solutions in certain cases
- to understand maxima and minima concept.
- to solve differential equations of certain types, including systems of differential equations that they might encounter in the same or higher semesters.
- to understand double and triple integration and enable them to handle integrals of higher orders.

SECTION-A

Unit I : Successive differentiation, Leibnitz's theorem on the n^{th} derivative of a product, Expansion of a function by using Taylor's theorem and Maclaurin's theorem, Indeterminate forms. (10)

Unit II: Partial differentiation, total differential coefficients, exact differential, Euler's theorem on homogeneous function, Transformation of independent variables. (10)

Unit III : Jacobians of explicit functions and implicit function with properties, functional dependence, Maxima and Minima of a function of two independent variables, Maxima and Minima of a function of several independent connected variables by Lagrange's method of undetermined multipliers. (10)

SECTION-B

Unit IV : Complex Numbers : Demoiver's theorem and its applications, Hyperbolic and inverse hyperbolic functions, separation of real and imaginary parts, Logarithm of complex numbers. (10)

Unit V : Ordinary differential equations of first order and first degree in various forms; (Variable separable, linear differential equation, homogeneous differential equation, exact differential equation) and reducible to above forms, methods of substitution. (10)

Unit VI : Solution of differential equation of first order and higher degree by various methods application of differential equations of first order and first degree to the problems on orthogonal trajectories and electrical engineering. (10)

TEXT BOOK :-

(1) Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics, Vol.-I, & II, Pune V.G. Prakashan, Pune.

REFERENCE BOOKS :-

- 1) Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.
- 2) Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
- 3) Ramana B.V. - Higher Engineering Mathematics, (TMH)
- 4) Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH)

I A 2 ENGINEERING PHYSICS

Aim :

To enable the students to correlate the theoretical principles of fundamentals of modern aspects in Physics with application oriented studies of engineering.

Objectives :

At the end of the course the students would be exposed to fundamental knowledge in:

- Electromagnetic phenomena and wave propagation,
- Interferometric techniques in metrology, communication
- Application of quantum physics to optical & electrical phenomena
- Application of lasers and Fiber Optics in Engineering and Technology
- Conducting, superconducting and dielectric materials
- Semi conducting and new engineering materials
- Physics of Modern engineering materials
- Application of ultrasonics, acoustics

SECTION-A

Unit I : Solid State Physics : Energy band diagrams, covalent bonds, bound & free electrons,holes, electron and hole mobilities

intrinsic and extrinsic semiconductors, fermi and impurity levels, charge neutrality equation and semiconductor conductivity, Einstein relation, p-n junction diode, Zener diode, Light Emitting Diode. (9)

Unit II: Modern Physics : Elements of wave properties of particle and particle properties of wave, LASER, spontaneous and stimulated emission of radiation, Einstein coefficient, Ruby Laser, characteristics & application of Laser. (7)

Unit III : Electric and Magnetic Fields : Motion of electron in uniform transverse electric field and transverse magnetic fields, velocity selector (energy filter), positive rays, Bainbridge mass spectrograph, Hall effect, cathode ray oscilloscope : working and its block diagram. (7)

SECTION-B

Unit IV : Interference and Diffraction : Fundamental condition of interference, thin film interference due to reflected light, Newton's ring, Fresnel and Fraunhofer diffraction, single and double slit diffraction, plane transmission grating. (7)

Unit V : Fibre Optics : Principle and construction of optical fibre, acceptance angle and acceptance cone numerical aperture, types of optical fibres and refractive index profile, attenuation in optical fibres, different mechanisms of attenuation, application of optical fibres. (8)

Unit VI : Fluid Dynamics and Acoustics : Continuity equation, Bernoulli's theorem and its applications, Viscosity, flow of liquids through a capillary tube, Stoke's formula. Production and application of Ultrasonics. Acoustics of buildings. (7)

TEXT BOOK :

1) M.N.Avadhanulu & P.G.Kshirsagar : Engineering Physics, S.Chand Pub., 2008

REFERENCE BOOKS :

- 1) R.K.Gaur & S.L.Gupta : Engineering Physics, Dhanpat Rai & Sons.
- 2) Hitendra K. Malik & A.K.Singh : Engineering Physics, Tata McGraw Hill
- 3) Beiser : Modern Physics, Tata McGraw Hill

4) Mani & Mehta : Modern Physics, Affiliated East-West Press

5) N.Subrahmanyam, Brijlal, M.N.Avadhanulu : A Text Book of Optics, S.Chand & Company Ltd.

I A 3 ENGINEERING MECHANICS

Aim :

Basic concepts of Mechanics for Static and Dynamics have to be implanted into the student.

Objectives :

At the end of this course the student should be able to understand:

- the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.
- the principle of work and energy.
- the effect of friction on equilibrium
- the laws of motion, the kinematics of motion and the interrelationship
- the dynamic equilibrium equation
- All these should be achieved both conceptually and through solved examples.

SECTION-A

UNIT I: Concept of a force, moment of a force about a point and about an axis, couple, resolution and compositions of coplanar force system, reduction of system of forces into a force and a couple equivalent force system.

Free-body diagrams, equations of equilibrium, problems of equilibrium involving co-planar force system acting on a particle, rigid body and system of rigid bodies, problems of equilibrium of non-coplanar concurrent force system. (8)

UNIT II: Analysis of simple plane trusses, method of joints, method of sections, analysis of frames involving ideally connected members.

Coulomb's law of friction, static belt friction, wedge friction. (8)

UNIT III: First moment of an area and centroid, second moment and product of area, transfer theorems, polar moment of inertia, radius of gyration, definition of principle axes and principle moment of inertia.

Work of a force, Principle of virtual work and its application. (7)

SECTION B

Unit IV: Kinematics: Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, motion curves, simple relative motion between two particles, curvilinear motion using rectangular coordinates, normal and tangential components.

Kinematics of rigid body motion in rectilinear translation: rotation about a fixed axis and plane motion. (8)

Unit V: Kinetics of rectilinear and circular motion of a particle acted upon by constant and variable force system, D'Alembert's principle, concept of dynamic equilibrium, rectilinear motion of

several interconnected particles
Kinetics of rigid body rectilinear translation, rotation about a

fixed axis of rigid body. (7)

Unit VI: Work, power and energy: work-energy equation for motion of a particle, system of particles, work energy equation for rigid bodies rectilinear translation.

Linear impulse, linear momentum, momentum equation for a particle and a system of particles, direct central impact, collision of two particles, coefficient of restitution. (7)

TEXT BOOK :

1) Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.

REFERENCE BOOKS :

1. Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore.
2. Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C., Auckland.
3. Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
4. Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

I A 4 ENGINEERING DRAWING

Aim :

To provide mechanical engineering (orthographic) drawing skills in the context of engineering design.

Objectives :

To develop in students graphic skills for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings.

SECTION-A

UNIT I: Engineering Curves

a) Conic Section

Construction of ellipse, parabola & hyperbola by various methods

b) Cycloidal curves.

Construction of cycloid, epicycloids & hypocycloid.

Tangent & normal to the curve.

c) Involute

Involute of circle, square, pentagon, hexagon.

d) Loci of points :

Locus problems on

i. four bar chain mechanism

ii. Simple slider crank mechanism

iii. Offset slider crank mechanism. (8)

UNIT II: Introduction to Projections.

1st angle, 3rd angle method of projection

a) Projection of points

b) Projection of lines

(Inclined to one plane at a time.)

c) Projection of planes.

(Inclined to both the planes) (8)

UNIT III: Orthographic projection

Conversion of simple pictorial views into orthographic views.

(7)

SECTION-B

UNIT IV: Projection of regular solids.

Projection of prism, pyramid, cone, cylinder

Projection on auxiliary planes. (7)

UNIT V: Section of solids.

Section of solids keeping solids in different position. (7)

UNIT VI: Isometric views & projection.

Construction of isometric scale.

Isometric views & projection of objects having rectangular, cylindrical surfaces & representation of sloping faces and slots.

Dimensioning of isometric views/projection. (8)

TEXT BOOK :-

1. Bhatt N.D. & Panchal V.M. – Engineering Drawing, 49th edition, Charotar Pub. House, Anand, Gujrat, 2007.

REFERENCE BOOKS :

1. Shah P.J. - Engineering Drawing, S.Chand Publication, 2008.
2. Narayana K.L., Kannaiyah P. - Engineering Drawing, Scitech Publication, 2009.
3. Dhwan R.K. - Engineering Drawing, S.Chand Publication, (5th edition, 2008)
4. Jolhe D.A. - Engineering Drawing, Tata McGraw Hill Publication, 2008.

I A 5 WORK SHOP – I

COURSE OBJECTIVES:

- To give students 'hands on experience' of craftsmanship.
- To make students familiar with different work trades.
- To develop quality & safety consciousness amongst the students.
- To develop awareness of fire safety amongst the students.
- To develop respect towards labour work amongst the students.
- To develop skill sets for creating entities from primitive engineering materials.
- To develop skill sets for establish in connections through wires and cables.
- This exercise also aims at inculcating respect for physical work and hard labour in addition to some value addition by getting exposed to interdisciplinary engineering domains.

A) PERFORMANCE:

I) SMITHY: Introduction to smithy operations like upsetting, drawing, bending, Forming; Tools- hammer, hot and cold chisels, swages, drifts, flatters, tongs, anvils and various smithy tools & equipments, their use. Forging Principle, forge welding, use of forged parts.

One job on smithy: Job involving upsetting, drawing down, flatter. Change of cross sectional area like round into rectangular or making a ring from a round bar, S – Hook, forming such as a square / hexagonal headed bolt, hook etc.

II) FITTING: Introduction to different fitting tools. Use and setting of fitting tools for marking, center punching, chipping, cutting, filing, drilling, their use, different measuring tools, Files – Material and Classification.

One job on fitting: Job involving Fitting involving marking, filing, hacksaw cutting, drilling and tapping such as a male-female type pare.above mentioned operations.

III) TAPS & DIES: introduction to Taps & Dies, Different sizes of Taps & Dies their uses, Holding instruments of taps & dies.

One job on taps & dies: Job involving, External and internal threads on plate or pipe , marking, center punching, cutting, filing, drilling.

B) DEMONSTRATION:

Minimum two physical demonstrations provided from following. In

addition to physical demonstrations **Video / LCD** presentations for rest of demonstrations may be provided.

1) SAFETY : Common hazards while working with engineering equipment and related safety measures. Colour Codes floor marking in industries, various hazard indication signs. Posters for safety. Fire Safety, fire prevention precautions, necessity of fire fighting, fire extinguishers, rules of fire fighting, risk elements in fire fighting and demonstration of use of fire extinguishers.

2) MATERIALS : Brief introduction of materials used in Industries, steels and alloys, cast iron, non-ferrous metals, timber, plastics and polymers, glass etc. and; their applications.

3) MEASURING INSTRUMENTS: Brief introduction to instruments other than used in above performing trades. like –Vernier Caliper, Micrometer, Dial indicator, thickness gauge, height gauge, Their least counts, common errors and care while using them, Use of marking gauge, 'V' block and surface plate.

4) MACHINE TOOLS AND PROCESSES: Brief introduction to metal removing, Showing basic operations like plain turning facing, step turning etc. metal shaping,
5) FOUNDRY: Moulding sand, constituents and characteristics. Pattern, definition, materials, types, core printing. Role of gate, runner, riser, core and chaplets. Causes and remedies of some common casting defects like blow holes, cavities, inclusions. Demonstration to Preparation of sand mould like pipe flange, anvil, etc.

6) PLASTIC INJECTION MOULDING: Introduction, principle, equipment & its operation, mould introduction & setting, Safety precautions and demonstration of plastic injection molding process.

7) IT & COMPUTERS: Introduction and identification of hardware components of a typical computer system. Handling and operating peripheral devices like printer, scanner, pen drives, CD-ROM, Multimedia Devices, UPS etc. Identification and study of communication elements like Single pair wires (phone lines), multipair

wires (UTP), fibre-optic cables, printer data cables, connectors- RJ-45, RJ-9, RJ-11, USB, 9-Pin and 25-Pin serial and parallel connectors; converters- serial to USB, 9-Pin to 25- Pin, Vice-Versa and others. POST (power on self test), Power related problems. Use of CD Read / Write operations etc. Installation of Operating system windows and Linux , simple diagnostic exercises.

8) CONSTRUCTION OF ELECTRICAL BOARD WIRING: House

wiring, staircase wiring for fluorescent tube light, store wiring, threephase wiring for electrical motors & Machines. Working of Electrical Batteries, demonstration of electrical cable wires, starters and MCB's.

9 10

REFERENCES :

1. B. S. Raghuvanshi, A Course in Workshop Technology, Vol – I, Dhanapat Rai and Sons.
 2. Hajara Choudhari, Elements of Workshop Technology, Vol – I, Media Promoters.
 3. Gupta and Kaushik, Workshop Technology, Vol – I, New Heights.
 4. Chapman, Workshop Technology, Vol – I, The English Language Book Society.
 5. H.S.Bawa, Workshop Technology, Vol.-I, TMH Publications, New Delhi.
 6. S.K.Hajra Choudhary, Elements Of Workshop Technology, Media Promoters & Publishers Pvt.Ltd,
 7. Workshop Technology, Vol I, II and III, Chandola S.P., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
 8. K.T.Kulkarni, Introduction to Industrial Safety, K.T.Kulkarni, Pune
- Reference Books
9. Hwaiyu Geng, Manufacturing Engineering Handbook, McGraw Hill Publishing Co.Ltd.
 10. Lawrence E.Doyle, Manufacturing Processes and Materials for Engineers, Prentice Hall Inc.

NOTE : Journal should be prepared and submitted based on information of tools and equipments used, jobs prepared by using various tools, equipments, machines in the above three trades of performance sections. It also consist of details of demonstration

(minimum two) demonstrated to students with brief description.

The term work shall be assessed based on a) the record of attendance, b) Term work done, c) the written/ practical / oral tests on the term work to decide the depth of understanding. The term work is to be assessed weekly.

PRACTICAL EXAMINATION:

Practical examination will consists of actual preparation of one job from any of the above performance sections. Duration of examination will be 3 hrs. Total marks are 25, out of which 15 marks are for job preparation and 10 marks for viva voce which should be conducted when the students are on job.

I A 6 ENGINEERING PHYSICS

PRACTICALS :

- 1) Determination of Band gap energy of semiconductor.
 - 2) To study the forward and reverse characteristics of P-N junction diode.
 - 3) To study the reverse characteristics of Zener diode.
 - 4) To study the forward characteristics of Light Emitting Diode.
 - 5) To determine the wavelength of monochromatic light by Newton's rings method .
 - 6) Determination of wavelength of spectral lines using diffraction grating.
 - 7) Determination of grating element of a diffraction grating using LASER beam.
 - 8) Study of Hall effect
 - 9) Amplitude and frequency measurement of ac signal using CRO
 - 10) Study of CRO
 - 11) Determination of unknown frequency of ac signal using Lissajou's pattern
 - 12) To determine resolving power of telescope
 - 13) Determination of Planck's constant using photocell
 - 14) To determine the coefficient of viscosity of water by capillary flow
- (Note : Minimum 08 experiments shall be conducted)

1 A 7 ENGINEERING MECHANICS

PRACTICALS:

(Four compulsory graphical solutions to the problems of statics.)

1. Law of Polygon of forces
2. Reactions at the supports of simple beam.
3. Jib crane/shear leg.

4. Determination of coefficient of friction on inclined plane.
5. Determination of Coefficient of coil friction.
6. Determination of mass moment of inertia of fly wheel
7. Determination of gravitational acceleration by compound pendulum.
8. Determination of velocity ratio, law of machine, simple screw jack, differential wheel axle, worm and worm wheel, single and double purchase crab.

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

I A 8 ENGINEERING DRAWING

PRACTICAL - Each student will submit a set of at least 8 drawing sheets based on the syllabus evenly distributed as per list attached. Practical examination will consist of orals on the topic based on the syllabus.

1. Construction of Engineering curves.
2. Loci of points on link mechanism
3. projection of straight lines
4. Projection of planes
5. Projection of regular solids
6. Section of solids
- 11 12
7. Orthographic projection (1st & 3rd angle)
8. Isometric projection/view
9. Free hand sketches of simple machine elements
 - a) Screw threads ISI profile
 - b) Types of nuts, bolts, studs, set screws, washer, locking arrangement of nuts & bolts.
 - c) Foundation bolts (Rag, Eye, Lewis foundation bolts)
