

### B.Tech I Semester Syllabus(Common for all Branches)

#### B.Tech Semester – I

Sl	Subject	Subject Code	Periods			Evaluation Scheme					Credit
			L	T	P	Sessional Exam			ESE	Sub Total	
	TA					CT	MEE				
1	Language (Communication in English)	HU 101	3	1	---	10	10	30	50	100	3
2	Engineering Chemistry I	CH 101	3	1	---	10	10	30	50	100	3
3	Engineering Physics I	P 101	3	1	---	10	10	30	50	100	3
4	Engineering Mathematics I	M 101	3	1	---	10	10	30	50	100	3
5	Engineering Mechanics	ME 101	3	1	---	10	10	30	50	100	3
6	Basic Electrical Engineering	EE 101	3	1	---	10	10	30	50	100	3
<b>Practical</b>											
7	Engg Chemistry & Physics (based on CH 101 and P 101)	CH 102 P 102	---	---	3	25+25 =50			25+25 =50	100	1 1
8	Engg Mechanics & Electrical Lab	ME 102 EE 102	---	---	3	25+25 =50			25+25 =50	100	1 1
9	Engg Graphics I (Geometrical Drawing)	ME 103	---	---	3	50			50	100	1.5
10	Workshop Practice I	ME 104	---	---	3	25			25	50	1.5
	General Proficiency	GP I	---	---					50	50	0
<b>Total</b>			<b>18</b>	<b>6</b>	<b>12</b>					<b>1000</b>	<b>25</b>

TA – Teacher’s Assessment      CT – Class Test (At least two class tests should be taken in one semester)      MEE – Mid Semester Exam      ESE – End Semester Exam

Total Marks: 1000      Total Periods: 36      Total Theoretical Marks: 600      Total Sessional Marks: 400      Total Credits: 25

## Language (Professional Communication in English)

HU-101

English communication skills- pronunciation. Vocabulary extension, basic aspects of Language Skills, modes of Writing, comprehension, composition, word order, structure of words.

The fundamentals of grammar, textual pieces for literary appreciation, non-traditional materials, newspaper articles, advertisements.

The following textual pieces from “ English for all” edited by Dr.Nilanjan Gupta, published by Mac Millan of India Ltd.

### References

1. Scientific Research for Amateurs by J.B.S. Haldance
2. Shakespeare's sister by Vigerinia Woilf.
3. When I have seen by William Shakespeare
4. Line written in Early spring by William Wordsworth
5. On the Grasshopper and Cricket by John Keats
6. Prospice by Robert Browning
7. The Adventure of the Blue Carbuncle by Arthur Conan Doyle
8. After Twenty Years by O.Henry.

## Engineering Chemistry-I

CH-101

### (a) Chemical Bonding:-

Ionic and Covalent bonds; Valence Bond Theory (V.B.T) of covalency- atomic orbitals and their overlap, hybridization of orbitals- definition, types and associated geometries, VSEPR theory, shapes of simple molecules like-  $\text{H}_2\text{O}$ ,  $\text{CO}_2$ ,  $\text{NH}_3$ ,  $\text{CH}_4$ ,  $\text{C}_2\text{H}_6$ ,  $\text{C}_2\text{H}_2$ ,  $\text{BF}_3$ ,  $\text{PCl}_5$ ,  $\text{SF}_6$  in the light of the hybridization state of the central atom and VSEPR effects; Molecular Orbital Theory (M.O.T)- concept of molecular orbital, molecular orbital energy level diagrams of homonuclear diatomic molecules- $\text{He}_2$ ,  $\text{O}_2$ ,  $\text{N}_2$  and molecular ions, determination of bond order, bond length and magnetic properties from M.O diagrams; Non-covalent interactions- van der Waals and hydrogen bonding and their effect over physical properties of different substances, metallic bonds-Electron sea model.

### (b) Fuels:-

Definition and classification of fuels; Characteristics of a good fuel, comparison between solid, liquid and gaseous fuel; Calorific value of fuels- definition, units, higher and lower calorific value, determination of the calorific value of a solid fuel by bomb calorimeter; Solid fuel- coal, origin, types, proximate and ultimate analysis of coal; Liquid fuel- petroleum, origin, refining of crude, cracking, synthetic petrol, Fischer-Tropsch and Bergius method for the synthesis of gasoline, knocking.

### (c) Water:-

Introduction; Hardness of Water- cause, types, units, disadvantages of using hard water for domestic and industrial purposes ( e.g., scale and sludge formation in boilers, caustic embitterment, boiler corrosion etc.), softening of hard water ( lime-soda, permutit and ion-exchange processes); Chemical analysis of Water- estimation of free chlorine, total alkalinity, hardness and dissolved oxygen, numerical based on determination of hardness.

### (d) Pollution and its control:-

Pollution- introduction, air pollutants, particulates, smog, photochemical smog, acid rain, green house effects, depletion of ozone layer, analysis of gaseous effluents-oxides of nitrogen, oxides of sulphur and H<sub>2</sub>S, control of air pollution- particulate emission, gaseous pollutants, water pollution-arsenic pollution and its remedies. Chemical analysis of effluent liquid streams, BOD, COD.

**(e) Electrochemistry:-**

Arrhenius theory of electrolytic dissociation, classification of electrolytes; degree of dissociation of acids, dissociation constant of weak acids, Debye-Huckel theory, concept of pH and pOH, buffer solutions, solubility product, common ion effect, conductance of solutions- specific, molar and equivalent conductance, variation of molar conductance with dilution for strong and weak electrolytes; Migration of ions- Kohlrausch's law of independent migration of ions, Ostwald's dilution law; transport number, Nernst equation for single electrode, electrochemical cells.

**(f) Polymer Chemistry:-**

Introduction, types of polymerization, classification of polymers based on chain characteristics, source, method of synthesis and molecular forces involved, mechanism of polymerization reaction: cationic, anionic and catalytic polymerization; glass transition and crystalline melting point temperatures, Factors influencing glass transition and crystalline melting point temperatures. Preparation, properties and uses of the following- Polyethylene, PVC, Polystyrene, PAN, Teflon, Nylon- 6:6, polyester ; Rubber- monomer, structure, compounding of rubber, vulcanization, synthetic rubbers- Buna-S, Buna-N, neoprene, butyl rubber and polyurethanes.

**References**

1. PC Jain and Monika Jain, Engg Chemistry, Dhanpat Rai, New Delhi
2. Dara, A text Book of Engg Chemistry, S Chand & Co

**SUB: ENGINEERING PHYSICS-I [P101]  
1<sup>st</sup> SEMESTER**

**1. Vector and Vector Differential Calculus: **6L****

Some Special types of Vectors, Orthogonal Representation of a Vector, Product of Vectors, Scalar Triple Product, Vector Triple Product, Vector Differentiation, Scalar and Vector Fields, Directional Derivatives, Vector Differential Operator, Gradient, Divergence, Curl, Line, Surface & Volume integrals and their applications, Green's theorem.

**2. Mechanics: **8L****

Mechanics: Newton's Laws of motion, Mechanics of a Particle, Limitations of Newtonian mechanics, Newton's laws of motion for a system of particles, Constraints, D'Alembert's Principle, Generalized Coordinates, Generalized velocity and momentum, Lagrangian formulation, Hamiltonian formulation.

Streamline and turbulent motion, Stokes law, terminal velocity, Poiseuille's Equation, Bernoulli's theorem, Venturimeter and other applications of Bernoulli's principle.

**3. Vibration and Waves: **8L****

Simple Harmonic Motion, superposition of two linear SHMs, Lissajous figures, Damped Vibration:-differential equation and solution, critical damping, logarithmic decrement, analogy with electrical circuit.

Progressive waves, Forced Vibration, Amplitude and Velocity Resonance, sharpness of resonance and quality factor.

**4. Time Varying Field and Maxwell's Equation: 6L**

Laws of Electromagnetic Induction, Self and Mutual induction, Concept of Displacement Current, Difference between Conduction Current and Displacement Current, Eddy Current, Maxwell's Equations, Derivation of Maxwell's Equations, Propagation of Electromagnetic Waves in Free Space, Solution of propagation of Plane Electromagnetic Wave in free space.

**5. Optics: Interference, Diffraction, Polarization 12L**

**Interference:** Coherence (temporal and spatial), Interference of Light due to division of wave front (Young's double slit and Fresnel's Bi-prism), Interference of Light due to division of amplitude (Newton's Ring), colour of thin film.

**Diffraction:** Different Types of Diffraction, Difference between Interference and Diffraction, Fraunhofer Diffraction at a Single Slit and Double slit, Plane transmission diffraction grating spectra, Comparison between Grating and Prism Spectra, Resolving Power of an optical instrument and limit of resolution.

**Polarization:** Plane of Vibration and Plane of Polarization, Classification of Polarized Light, Methods of Producing Plane polarized light, Double Refraction, Optic Axis, Nicol Prism and its use as Polarizer and Analyzer, General Method for the Production and detection of Plane, Circularly and Elliptically Polarized light, Polaroid, Optical activity.

**Suggested Books**

**Essential Reading:**

1. Mathematical Physics, B.S. Rajput
2. L.A. Pipes and L.R. Harvill, Applied Mathematics for Engineers and Physicists, McGraw-Hill, New Delhi (1970).
3. Elements of Properties of Matter, D.S. Mathur, S.Chand publication
4. Engineering Physics Vol-I & II, S. Bhattacharya Tata Mc Graw Hill
5. Introduction to Electrodynamics, D. J. Griffith, Pearson
6. A Text Book of Optics, Brijlal & Subramaniam, S.Chand Publication

**Supplementary Reading:**

7. Mathematical Methods for Physicists, G.B. Arfken
8. Optics, A. Ghatak, Tata Mc Graw Hill

**Engineering Mathematics – I  
Paper: M-101**

**1. Infinite series:** Convergence of Sequence, Bounded Sequence, Monotonic Sequence, Convergent, Divergent and Oscillatory Series, Geometric Series, Positive term series, p-series, Comparison Test, D'Alembert's Ratio tests, Raabe's Test, Gauss's Test, Cauchy's Integral Test, Cauchy's Root test, Logarithmic Test.

**2. Calculus of function of one variable:** Limit and continuity of functions, Uniform continuity and differentiability, successive differentiation, Leibnitz's theorem, Rolle's theorem, Mean Value theorems and Taylor's theorem, expansion of functions into Taylor's and Maclaurin's series, Indeterminate forms, Curvature, Asymptotes, Concavity, Convexity and point of inflexion.

**3. Function of Several Variables:** Limit, Continuity, Partial Derivatives, Chain Rule, Differentiation of Implicit functions, Exact Differentials, Euler's theorem on homogeneous function and its converse, Tangent planes and Normal planes, Maxima, Minima and Saddle points, Simple problems in extrema of functions with constraints, Method of Lagrangian Multipliers.

**4. Ordinary Differential Equation:** First order ordinary differential equation, Linear equations and Bernoulli's equation, Ordinary linear differential equation of nth order, Solution of homogeneous and non-homogeneous equations, Operator method, method of undetermined coefficients and variation of parameters, Solution of simple simultaneous ordinary differential equation. Series solution of differential equation.

**5. Laplace Transform:** Transforms of elementary functions, Inverse transforms, properties of Laplace transform, Convolutions, Transforms of periodic functions, unit step functions, shifting theorems, Solution of ODE's using transforms.

### Texts/References

1. Ordinary Differential Equation: M.D.Raisinghania.
2. Mathematical Analysis: Malik & Arora.
3. Advanced Engineering Mathematics: H.K.Dass.
4. Higher Engg. Mathematics: B.V.Ramana.
5. Advanced Engineering Mathematics: E. Kreyszig.

## **Engineering Mechanics** ME-101

### **Force system and equilibrium:**

Force moment and couple, principle of transmissibility, Varignon's theorem. Resultant of force system- concurrent and non-concurrent coplanar forces, free body diagram, equilibrium equations and their uses in solving elementary engineering problems.

### **Plane trusses:**

Analysis of plane frames (analytical and graphical methods). Method of joints, methods of sections, graphical method.

### **Friction:**

Coulumb's Laws of Friction, problems involving friction related to practical application.

### **Moment of Inertia and plane figure:**

Moment of inertia of a plane figure with respect to an axis in its plane, Moment of inertia with respect to an axis perpendicular to the plane of the figure. Parallel axis theorem, perpendicular axis theorem.

### **Polar moment of inertia:**

#### **Moment of inertia of material bodies:**

Mass moment of inertia in case of disc cone cylinder sphere slender rod.

### **Centre of gravity of rigid body:**

Centre of gravity of right circular cone, cylinder, hemisphere and composite rigid body.

**Virtual Work:**

Work of a force Principle of virtual work & its application Construction of force polygon, ray diagram, Funicular polygon, Maxwell diagrams. mass moment of inertia in case of disc, cone, cylinder, sphere slender rod.

**Reference books:**

- I Engineering Mechanics by Timoshenko and Young.
- II A Text Book of Engineering Mechanics By R.S Khurmi.
- III A Text Book of Engineering Mechanics by Dr.R.K.Bansal.

**Basic Electrical Engineering**

EE-101

Unit and Dimensions (electrical) D.C Circuits. Kirchoff's Voltage & Current Laws. Max-Well's loop current method of circuit solution, Star/delta conversion. Thevenin's Theorem, Norton's Theorems. Maximum power transfer theorem.

Electro magnetism: Ampere's Law, Magnetic field intensity, Magnetic flux density, M.M.F., magnetization curve, Hysteresis, solution of magnetic circuits, Force between current carrying conduction, inductors-energy stored in inductor. Self and mutual inductance. Co-efficient of coupling. Transient analysis of R.L. circuits with D.C. supply.

Electrostatics: Columb's Law, Electric charge. Electric flux density, electric field intensity, potential and potential gradient, capacitance of parallel plates and cylindrical plates, Capacitance with composite dielectric materials stored energy R.C. transient analysis with D.C. supply.

A.C. fundamentals: Periodic waves and sinusoidal wave. Average and R.M.S value phase displacement.

Phasor representation. Complex quantities. Impedance, Admittance. A.C. single phase series, parallel circuits, active and reactive power.VAPF.

Introduction to three phase system. Voltage, current and power relations. Three phase power measurements.

**References**

- I. Del Toro, Electrical Engineering Fundamental, PHI

**ENGG PHYSICS PRACTICAL (P102)**

1. Hand-on experiment with Vernier-Callipers, Screw Gauge and Spherometer.
2. Determination of MH and M/H of a bar magnet.
3. To determine the Young's Modulus of the material of a beam by bending of beam method.
4. To determine the value of the refractive index of a liquid.
5. Determination of unknown resistance of a given wire the help of Carey-Foster Bridge.
6. To determine the angle of prism and also angle of minimum deviation for parallel rays using Spectrometer and hence to find refractive index of the material of the prism supplied.
7. Determination of Moment of Inertia of a solid body about an axis passing through its center of gravity and perpendicular to its length.
8. Determination of surface tension of water by capillary tube.
9. Determination of Wavelength of light by Newton's ring.
10. Study of polarization of light.
11. To determine the co-efficient of viscosity by Poiseuille's Method.

**Chemistry Laboratory**

## CH -102

### LIST OF EXPERIMENTS

1. Determinations of hardness of water.
2. Determinations of percentage purity of lime stone sample.
3. Determinations of dissolved oxygen in water.
4. Determinations of sodium carbonate & sodium bicarbonate in a mixture.
5. Determinations of iron content in a sample.
6. Determinations of chloride content of water.
7. Determinations of proximate analysis of coal.
8. Determinations of flash point of an oil by penskymartein's closed cup flash point Apparatus.
9. Determinations of viscosity of oil by redwood viscometer.
10. Determination of Dissociation constant of weak acids by conductometric Titration.
11. Determinations of carbon residue of oil by Conrad son's apparatus.
12. Determination of pH of an electrolyte by potentiometer Titration.

### Engineering Mechanics Lab

ME-102

Solutions of plain truss problems by Graphical method, Drawing force polygon, Ray diagram, Funicular polygon, Maxwell Diagram

### Electrical lab

EE-102

Selected experiment based on Basic Electrical Engg. (EE-101)

#### List of Experiments

1. Calibration of Energy Meter.
2. Characteristics of fluorescent Lamp, Incandescent Lamp.
3. Determination of fusing constant of a fuse wire.
4. Determination of insulation resistance by using Megger.
5. Measurement of 1-& 3-Paired by Watt Meters.
6. Characteristic of R-L Circuit, R-C ckt, R-L-C series ckt.
7. Study of different transformer connections.

### Engineering Graphics-I

ME-103

Drawing instruments and their uses, lines, lettering and dimensioning, scales, plains and diagonal scale, curves used in engineering practice, ellipse, parabola, hyperbola, cycloid, involutes

Orthographic projection, planes of projection, four quadrant, First angle projection, reference line, Convention employed

Projection of points and lines, true length, true inclinations with reference plane, Traces of a line, End view, and illustrative problems

Projection of planes, traces, end view planes perpendicular to one inclined to other reference planes.

Projection of solids such as prisms, pyramid, cone, cylinder, cube.

#### References

- I Elementary Engg. Drawing(Plane and Solid geometry) By N.D.Bhatt
- II A text Book of Engg. Drawing By R.B.Gupta
- III A Text Book of Engg. Drawing By K.Venugopal
- IV Machine Drawing By N.D.Bhatt
- V A Text Book of Machine Drawing(In first angle projection) By R.K. Dhawan

### Workshop Practical I

ME-104

Carpentry	:	Introduction of Tools, Types of Wood, Wood processing, Different
Smithy	:	Introduction of Tools, operation of different Shapes
Fitting	:	Introduction of Tools, Use of files, Precision jobs

**References**

- I. Hazra Choudhary, Elements of Workshop Technology, Asia Publishing
- II. Raghuvansi, Workshop Technology, Dhanpat Rai
- III. Singhal, Workshop Practice, Kataria & Sons