

**FIRST YEAR
(Common to all branches)**

SUBJECT	L	T	P	THEORY	SESSIONAL
101. TECHNICAL ENGLISH	2	1	0	100	-
102. MATHEMATICS I	2	1	0	100	-
103. MATHEMATICS II	2	1	0	100	-
104. PHYSICS	2	1	3/2	100	50
105. CHEMISTRY	2	1	3/2	100	50
106. ENGINEERING MECHANICS	2	1	3/2	100	50
107. ENGINEERING DRAWING	1	0	5	100	100
108. BASIC ELECTRICAL ENGINEERING	2	1	3/2	100	50
WORKSHOP	0	0	3	0	100
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	15	7	14	800	400

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101. TECHNICAL ENGLISH

FIRST TERM:

1. Grammar and comprehension:
(a) Subject – verb concord (b) Tense (c) Voice (d) Synthesis (e) Common Errors (f) Vocabulary
Unseen passage will be set to test the language skills mentioned above.
2. Business correspondence:
(a) Drafting official and business letter (b) Drafting circulars and official orders/instructions and
(c) Drafting Minutes and Agenda of the meeting
3. Elementary Spoken English: Elementary theory of phonetics

SECOND TERM:

1. Sentence and Paragraph writing
2. Report writing:
(a) Importance of Reports in the Present day Industrial set-up (b) Classification of Reports (c) Writing of Reports
(i) Format, (ii) Mechanics of language
3. Technical Description of things and Processes
4. Precis writing
5. Spoken English
Advanced Phonetics
Tutorial training in: (a) Accent in Spoken English (b) Intonation in spoken English
(c) Developing fluency and accuracy in oral communication

Texts / References

1. English Exercises-ed. by Dr S N Sinha
2. A Writer's Guide for Engineers and Scientists – Rathbone Stone
3. Instruments of Communication – Meredith (Pergamom Press)

102. MATHEMATICS - I

FIRST TERM:

Solid Geometry:

Cartesian, Cylindrical polar and spherical polar coordinates, direction ratios and direction cosines, equations of planes and straight line, shortest, distance, coordinate transformations; spheres, cones, cylinders, ellipsoids, paraboloids and hyperboloids... standard equations with illustrations tangents planes and normal

Differential Calculus:

Review of limit, continuity and differentiability of functions of single variable with terminology, properties of continuous functions; geometrical illustrations, applications of differentiation to geometrical illustrations, applications of differentiation to approximate computations, successive differentiation Leibnitz rule. Rolle's theorem, Cauchy's mean value theorem, (Lagrange mean value theorem as a special case), Taylor and Maclaurin expansions, L'Hospital rule. Review of maxima and minima of functions of a single variable, concavity and convexity of a curve, points of inflexion, asymptotes and curvature.

SECOND TERM:

Limit, continuity and differentiability of function, Geometrical interpretations, differentials, derivatives of composite and implicit function, Derivatives of higher orders and their commutativity, Euler's theorem on homogeneous function, harmonic function, Taylor expansion of functions of several variables and maxima and minima of functions of several variables, Lagrange method of multipliers, Ordinary Differential Equation, First order Equation separable, exact, homogeneous, linear Bernoulli's form, second order equations with constant coefficient, Euler equation, methods of their solution. Dependence and independence of solutions. Wronskian systems of first order equations (simple type)

103. MATHEMATICS-II

FIRST TERM

Integral Calculus:

Riemann integrals upper and lower sums, definite integral as the limit of a sum, fundamental theorem integral calculus, mean value theorems, evaluation of definite integrals reduction formula, convergence of improper integrals tests of convergence, beta and gamma function elementary properties, differentiation under integral sign, differentiation of integrals with variable limits Leibnitz; rule, integrals dependent on a parameter applications Rectification, double and triple integrals Jacobians of transformations, integrals dependent on parameter application.

SECOND TERM

Vector Calculus:

Scalar and vector fields, level surfaces, directional derivative, gradient curl, divergence, laplacian, line and surface integrals, theorem of Green, Gauss and Stokes orthogonal curvilinear coordinates, Infinite series: sequence and series - their convergence and divergence tests of convergence, power series - uniform and absolute convergence: Fourier series its convergence, Dirichlet, conditions half range series.

Matrices:

Algebra of Matrices, vector space linear dependence of vectors, rank and inverse of a matrix, solution of algebraic equations consistency conditions eigen-values and eigen vectors, similarity transformations reduction to a diagonal matrix.

104 CHEMISTRY

FIRST TERM

Modern Periodic Table:

A general discussion of s.p.d. & f block elements with respect of periodicity of properties on the basis of Atomic Radii (Vander Waal's covalent, metallic & ionic), Ionization Enthalpy, Electron affinity, Electronegativity, Scales or electronegativity, polarizing power of the cation (Ionic potential), Polarizability of the anion, Metallic character, Magnetic properties and colour, Non-stoichiometry.

Factors affecting these properties, measurement and variation within a group and along a period. -5 lects

Chemical Bonding and Molecular Architect:

Conditions and energetics of the formation of ionic bond, covalent bonds (Sigma, pi, delta & tau)

Valence bond theory and resonance, Molecular orbital theory and Hybridization involving s.p.d. & f orbitals,

Metallic bond, Hydrogen bond, vanderwall's forces (kesom forces, Debye forces and London forces)

Molecular Structure Determination Of the shapes covalent molecules using Heflerich rule, Hybridization & VSEPR

-5 lects.

Kinetic theory of gases.

Derivation of gas laws from kinetic equation Temperature of a gas, Molecular velocity,

Maxwell's law of distrbution Of molecular velocities, Average velocity, Root mean square velocity

Mean free path, Deviation of real gases from the ideal gas laws, critical phenomena, Law of corresponding states,

Liquefaction Of gases and its applications

- 5 lects.

Colligative properties:

Diffusion and Osmosis Definition of Osmotic pressure, Isotonic solution, Hypertonic solution,

Reverse Osmosis and its application in the desalination of brackish water, lowering of vapour pressure,

Elevation of boiling point, Depression of Freezing point and their uses in the determination of molecular weights of non volatile solutes, Abnormal molecular weights, calculation of degree of association and Dissociation, ideal and Non-ideal solution. -5 lects.

Electrochemistry and Corrosion of metals and its prevention:

Galvanic cells, Eiectrode potentials, Nernst equation, Galvanic series, Laws of Dry corrosion (Parabolic law, Linear law and Logarithmic law), Wet corrosion (Electrochemical theory of corrosion), Types of corrosion (Drop corrosion, Crevice corrosion, Deposit corrosion, Waterline corrosion, xray current corrosion, stress corrosion, Filiform corrosion and Pitting,

Protective measures against corrosion by (I) modifiication of environment (ii) modification of the properties of the metal (iii) use of protective coatings and (iv) cathodic protection. -5 lects.

SECOND TERM

Chemical Kinetics and catalysis:

Rate expression for first order and second order reactions, Energy of Activation and a brief treatment of the theories of reaction rates (Collision Theory and Absolute Reaction Rate Theory), Catalysis and its applications in chemical industries
-4 lects.

Fundamental Reaction and High Polymers:

Inductive effect and its use. to explain the trends in acidity in organic molecules, resonance and its application in explaining the orientation of substituents in an aromatisation substitution and in the relationship between color and constitution.

A brief discussion of reactive intermediates-carbonion, carbonium ion and free radicals, S_N1 & S_N2, E1 & E2 reaction. Role of free radicals in chemical reactions and polymerization, Mechanism of polymerization, Engineering uses of polymeric materials, thermoplastic and thermosetting resins, ion exchange resins, Organic insulating and dielectric materials, Diopolymers.

- 8

lects

Ceramic Materials:

Materials used as ceramics, Requirements of a refractory, Manufacture of refractories classification and properties of refractories, selection of special refractories, Class.

-4 lects.

Fuels:

Coal-classification and analysis, Petroleum Refining, conversion of coal into gaseous fuels-producer gas and water gas, analysis of Flue gas by Orsat Apparatus, Combustion calculations, Nuclear fuels, solar power, Explosives and Rocket Fuels Hydrogen as alternative fuel.

-6 lects

Environment and its control:

Introduction, common pollutants in water, causes of water pollution, BOD & COD, methods used for making the polluted water reusable, Eutrophication, Factors that cause air pollution, common pollutants of air and their effect on the environment, commonly used anti pollution measures, A chemist's conception on the value of a tree.

-4 lects.

Text/ References:

1. Elements of Physical Chemistry by S. Glasstone, Affiliated East-West Press Pvt., Ltd., New Delhi
2. Physical. Chemistry by A.J. Mee, Heinemann Educational Books Ltd., 15-16 Queen Street London.
3. Chemistry in Engineering & Technology by J.C. Kuriacose & J. Rajaram,

Tata Mc Graw-Hill Publishing Co. Ltd, Delhi.

Chemistry Practical

1. Determination of hydroxide & Carbonate alkalinity.
2. Determination of available chlorine in bleaching powder.
3. Determination of Total hardness by EDTA
4. Determination of the equivalent weight of a polybasic organic acid.
5. Determination of the surface tension of a liquid by Stalagmometer.
6. Determination of the viscosity of a liquid by Ostwald viscometer.
7. Determination of the viscosity of an oil sample by Redwood viscometer.
8. Determination of the flash point of transformer oil by Pensky Martem's apparatus.
9. Determination of PH values of solutions by PH meter.
10. Gas analysis by Orsat apparatus.

Text References:

Practical Chemistry for Engineers by D.N. Pathak, Naveen Prakashan Mandir, Zero Road Allahabad.

105. PHYSICS

FIRST TERM

I. DIELECTRICS:

Introduction, To show that the normal components of D and the tangential components of E are continuous across the boundary between two dielectrics, the three electric vectors D, E & P . -3 lects.

II. POLARISATION:

Unpolarised light, production of plane polarised light by Polaroid technique (principle of action to be emphasised), Brewster's law, Malus's law, Double refraction, Production of circular and elliptical lights. Analysis of unpolarised and polarised lights. Photoelastic effect. Electrooptic effect, Magneto optic effect. -8 lects.

III. Maxwell's equation in integral form,

Derivation of expression for C in the case of plane Electromagnetic waves traveling in vacuum. Poynting Vector. -3 lects.

IV. MAGNETIC PROPERTIES OF MATTER:

Hysteresis, the three magnetic vectors. Magnetic circuit. - 4 lects.

V. X-RAYS:

X-ray diffraction, Bragg's laws, Kossel's effect. -3 lects

VI. QUANTUM THEORY OF LIGHT:

Photo-electric effect, Einstein's photo-electric equation, Milliken's experimental verification, Compton effect. -4 lects.

SECOND TERM

VII. THE WAVE NATURE OF MATTER:

de Broglie waves, de Broglie wave velocity, wave and group velocities, Davisson and Germer's experiment, Heisenberg's Uncertainty principle, Applications of the uncertainty -6 lects

VIII QUANTUM MECHANICS:

Classical mechanics as an approximation of Quantum mechanics, Wave function and wave equation, Schrodinger's equation: time dependent form, expectation values, Schrodinger's equation: steady state form, Particle in a box, Reflection and transmission by a barrier. -8 lects.

IX. BASICS OF A GAS LASER COHERENCE:

Temporal coherence, Michelson's interferometer for measurement of coherence length of a source, line width Spatial coherence, Measurement of spatial coherence using Young's interferometer. Lasers and Laser light, Einstein's A, B coefficients and the laser, How a He-Ne laser works -8 lects.

X. SPACIAL RELATIVITY:

Michelson Morley experiment, Postulates of special theory of relativity. -3 lects.

BOOKS RECOMMENDED:

1. PHYSICS, Part 2, THIRD EDITION EXTENDED,-TEXT BOOK.
David Halliday and Robert Resnick, John Wiley & Sons.
2. Concepts of Modern physics by Arthur Beiser,
Fourth Edition, McGraw-Hill (International Editions) Book company.

REFERENCE BOOK:

3. OPTICS, Ajoy Ghatak, Tata Mc Graw- Hill Publishing Co. New Delhi.

106. ENGINEERING MECHANICS

FIRST TERM

1. INTRODUCTION:

Idealisation of Mechanics, concept of Rigid Body. External Forces (Body forces & surface forces). Laws of Mechanics. -2 lects.

2. VECTOR METHODS:

Equality and Equivalence of vectors. Free and Bound vectors. Principle of Transmissibility of forces
Moment of a force about a point and about a line. Couple and moment of a couple. Couple moment as a free vector.
Addition and subtraction of couples -4 lects.

3. VARIOUS SYSTEMS OF FORCES:

Statically Equivalent Force systems. Simplest Equivalent of a system of forces. -3 lects.

4. EQUILIBRIUM:

Force analysis, Free Body Diagram, Equations of equilibrium and their applications to various system of forces.
Plane Trusses. -9 lects.

5. FRICTION:

Friction on dry surfaces. Static, kinetic and rolling friction. Applications to inclined planes, wedge and blocks and belts & pulleys. -6 lects.

SECOND TERM

1. KINEMATICS AND KINETICS OF A PARTICLE..

Rectilinear and curvilinear translations. Normal and tangential components of acceleration. Projectile. Motion on a smooth vertical curve.

-6 Lects.

2. IMPULSE AND MOMENTUM:

Linear Impulse and linear momentum. Central- Impact of elastic, semi-elastic & plastic bodies.

- 4 lects.

3. KINEMATICS AND KINETICS OF RIGID BODIES

Angular velocity and angular acceleration. Effective Forces on a rigid body.

D'Alembert's Principle- Application to Highways and Railway tracks. Instantaneous centre of zero velocity.

Compound pendulum. Centre of Percussion. Rotation of Rigid bodies. Rolling motion. Plane motion of rigid bodies.

Simple application- Four bar mechanism.

-12 lects

4. WORK, ENERGY AND POWER:

Work done by forces and couples, Potential, Elastic and kinetic energy, work energy Conservation of energy.

Concept of power and efficiency.

LABORATORY WORK:

About eight experiments based on the theory covered under the subject.

Books Recommended:

1. Engineering Mechanics I.M. Shames
2. Vector Mechanics- (Statics and Dynamics) F.B. Beer & E.R. Johnston
3. Engineering Mechanics- S. Timisheno & T. Yong
4. Engineering Mechanics- Statics Vol-I & Dynamics Vol-II by V.S. Mokashi. (Tata McGraw-Hill)
5. Engg. Mechanics-Statics & Dynamics by Dr. A.K. Tayal. Umesh Publication, Delhi.

107. ENGINEERING DRAWING

Learning drafting codes as per ISO and IS preparation and use of scales, Technical lettering	-one plate.
Projection of points and straight lines.	-one plate.
Projection of simple solids, cylinders, cones, parallelopiped & pyramids in orthographic and isometric projections.	-3 plates
Section of simple solids.	- one plate
Simple cases of interpenetration of solids and development of plane and curved surfaces.	-3 plates
Introduction, construction of nomograms, Histograms, and frequency distribution, determination of mean, median, mode Perspective projection- Principles of perspective projection by orthographic method and vanishing point (one and two vanishing point perspective projection of simple solids.	

108. BASIC ELECTRICAL ENGG.

D.C. Circuits:

Units and dimension, Ohm's law, Kirchhoff's laws, mesh current and nodal voltage methods, Delta star and stardelta conversion, superposition theorem, Thevenings and Norton's theorems, Maximum power transfer theorem.

Electromagnetics:

Ampere's circuit law, Blot Savart law. Magnetic field due to conductors, Coils and Salenoids B.H. characteristic of Ferro Magnetic Materials, Faraday's law, self and mutual inductances. Single phase and poly phase A.C.

Circuit: A.C. generation, waveform, average value, r.m.s value, form factor and peak factor, R-L, R-C, R-L-C series circuits, power factor, active and reactive power, parallel and series parallel circuits. Two phase and three phase e.m.f generation, delta and star connections line and phase quantities, power measurement by two wattmeter method.

Transformers:

Construction, Principle of operation, e.m.f. equation, voltage regulation, Auto-Transformers, three phase transformers.

D.C. Machines:

Construction, E.M.F. equation, methods of excitation. Speed torque characteristics of d.c. motors (shunt, series and compound), starters, speed control.

Induction Motor:

Construction and principles of operation, Torque speed characteristics; starters for cage and wound rotor type induction motors, speed control of induction motors

TEXT BOOKS:

1. Basic Electrical Engg. Del Toro
2. Electrical Technology - H. Cotton
3. Basic Electronic Engg - Hughes.