

## PHY 101

### ENGINEERING PHYSICS (COMMON TO ALL BRANCHES REGULAR & PTDC COURSES)

Instruction 3 Periods per week  
University Examination 75 Marks

Duration of University Examination 3 Hours  
Sessional 25 Marks

#### UNIT -I

Oscillations: Simple Harmonic Oscillations -Torsional pendulum. Damped Oscillations, Logarithmic decrement, relaxation time, Q- factor, forced oscillations and resonance. Ultrasonics: Production and detection of ultrasonics, Determination of velocity of ultrasonics in liquids. Applications of ultrasonics. Special Theory of Relativity: Postulates of special theory of relativity, Galician & Lorentz transformation equations, Length contraction, Time dilation, addition of velocities, variation of mass with velocity, Einstein's mass energy relation.

#### UNIT -II

Physical optics Interference: Young's experiment, Interference in thin films -Newton's rings (Reflected light). Diffraction: Introduction, Fraunhofer diffraction at a single slit, double slit and diffraction grating. Polarisation : Introduction, double refraction -Nicol's prism - Quarter wave and Half wave plates, Optical activity -Lorent's half shade polarimeter. Lasers: Basic principals -Einstein coefficient, Ruby Laser, He-Ne Laser, semiconductor laser, Uses of lasers. Data Principles of Holography: Recording and Reconstruction of Holograms - Applications. Fibre Optics: Introduction to optical fibres.' Numerical aperture - Propagation of light through an optical fibre -Pulse dispersion. Fiber drawing process (double crucible method)

#### UNIT-III

Elements of Statistical mechanics: Introduction, Maxwell Boltzman, Bose ~ Einstein and Fermi- Dirac distribution functions, Partition Function and its relation with thermodynamic parameters" Statistical interpretation of heat & work. Photon gas Derivation of Plank's law of black body radiation, electron gas in a metal at TO A, concept of Fermi energy. Crystallography and Imperfections: Space lattice, Unit Cell, Crystal systems -Bravais lattices -packing fraction -(Sc, Bcc, Fcc) Lattice planes and Miller indices -Bragg's law -Experimental determination of lattice constant by powder diffraction Method -Crystal imperfections - Classification of crystal imperfections, Equilibrium concentration of Schottky & Frenkel defects..

#### UNIT -IV:

Wave Mechanics & Electron theory of Metals: Introduction classical theory of free electrons in metals, Ohm's law, failures of classical theory, Quantum theory:deBroglie's

hypothesis, Heisenberg's uncertainty principle, Schroedinger's wave equation (Time independent) infinite square well potential (One dimensional & 3 -dimensional), account of electronic specific heat (qualitative). Band theory of solids -Salient features of Kronig -Penny Model (qualitative) -classification of Solids -conductors, Semiconductors and Insulators in the basis of band theory, Hall effect. Semiconductor Devices: light emitting diode- photo diode -solar cell -thermistor (structure, working and uses)

UNIT –V:

Superconductivity: Superconductivity -General properties of superconductors Elements of BCS theory, Types of superconductors - Applications of superconductors. Magnetic Materials: Introduction, ferromagnetism, Weiss theory, Hysteresis curve, domain theory. Soft and hard magnetic materials, ferrites, and their -Applications (Gyrator & circulator). Dielectric Materials: Types of polarisation, Frequency and Temperature dependence of polarization, determination of dielectric constant-shear bridge method; Ferroelectricity with special reference to  $\text{BaTiO}_3$ - Applications.

Books (Latest edition) :

- 1) Engineering physics -R.K. Gaur and Gupta, Dhanpath Rai Publications.
- 2) Material Science -M.Arumugam, Anuradha agencies.
- 3) Solid State Physics -S.O.Pillai, New Age Publications.
- 4) Statistical thermodynamics -Agarwal & Eisner.