ENGINEERING PHYSICS

SYLLABUS for the year 2009-2010

Course Code: PY1ICPHY/ PY2ICPHY Hours/Week: L-T-P: 4-0-0

Credits: 04

UNIT – I

Quantum Mechanics

Wave particle dualism, de-Broglie hypothesis, Davisson and Germer experiment. Phase velocity, group velocity. Matter waves – characteristic properties.

Heisenberg's uncertainty principle – statement and physical significance. Application of uncertainty principle (Non-existence of electron in the nucleus). Wave function. Properties and physical significance of a wave function. Probability density and Normalisation of wave function. Setting up of a one-dimensional time independent Schrödinger wave equation. Eigen functions and eigen values. Application of Schrödinger wave equation. Particle in a box. One dimensional harmonic oscillator. Eigen functions and eigen values. Problems.

10 Hours

UNIT – II

Crystal Structure

Space lattice, Bravais lattice, unit cell, primitive cell, lattice parameters, crystal systems, planes in a crystal. Miller Indices – expression for inter planar spacing. Relation between lattice constant and bulk density. Lattice constant, co-ordination number. Atomic packing factor. Relation between atomic radius and lattice constant. Problems.

X-ray Diffraction

Electromagnetic spectrum, an overview of structure determination techniques. Bragg's law, Bragg's diffractometer, Laue and powder diffraction methods of structure determination. Neutron diffraction (qualitative).

10 Hours

UNIT – III

Dielectric Properties of Materials

Introduction, dipole moment and polarization, dielectric constant. Types of polarization. Equation for internal fields in liquids and solids (one dimensional). Frequency dependence of polarizability. Piezoelectricity, applications. Problems.

Magnetic Properties of Materials

Classification of magnetic materials. Ferromagnetic materials – Weiss's domain theory.. Hysteresis in ferromagnetic materials. Explanation of hysteresis using domain theory. Soft and hard magnetic materials – characteristic features and applications. Ferrites – features and applications.

Electrical Conductivity in Metals

Quantum free electron theory, assumptions. Fermi energy, Fermi-Dirac distribution function. Expression for density of states. Merits of quantum free electron theory. Problems.

10 Hours

UNIT – IV

Lasers

Characteristic features of lasers. Interaction of radiation with matter – Einstein's coefficients. Laser action – condition for laser action – basic requisites of a laser system.

Types of laser, construction and working He-Ne laser and CO_2 laser. Applications – holography. Principle of holography. Applications of holography (any two). Measurement of atmospheric pollutants. Problems.

Optical Fibers

Principle – propagation mechanism in optical fibers. Angle of acceptance. Numerical aperture. Types of optical fibers and modes of propagation. Attenuation. Applications – optical communication. Block diagram discussion of point to point communication. Advantages. Problems.

11 Hours

UNIT – V

Elasticity

Elasticity – stress and strain. Types. Hooke's law. Stress-strain diagram. Young's Modulus (Y), bulk modulus (K) and rigidity modulus (n). Poisson's ratio (σ). Equivalence of shear to compression and extension. Equivalence of shearing stress to a compressive stress and a tensile stress. Work done per unit volume in a strain. Relation between Y, K, n and σ. Torsion of a cylinder (derivation for twisting couple/unit twist). Torsional pendulum.

Beams

Bending moment – expression for bending moment.

Cantilever- Cantilever loaded at free end. Cantilever loaded uniformly. Problems.

10 Hours

Text Books

1. Solid State Physics – Fifth edition – S.O.Pillai – New Age International.
2. Concepts of Modern Physics – Fifth edition - Arthur Beiser – Tata Mcgraw-Hill.

Reference Books

1. Textbook of Engineering Physics - Dr S.P.Basavaraju – Subhas Stores.
2. Properties of Matter – D.S. Mathur – S. Chand & Company Ltd.
3. Engineering Physics – R.K.Gour and S.L.Gupta – Dhanpat Rai Publication.
4. Elementary Solid State Physics – M. Ali Omar - Addison Wesley.
5. Solid State Physics – A.J.Dekker – McMillan India Ltd.

Scheme

1. One question is to be set from each unit.
2. Students have to answer all five questions.
3. Each question carries 20 marks with three or four subdivisions.
4. The marks for each question are 10+5+5 / 7+8+5 / 5+5+5+5.

Chairperson