ENGINEERING PHYSICS

SYLLABUS for the year 2010-2011

Course Code: PY1ICPHY/ PY2ICPHY L-T-P: 4-0-1

Credits: 05 Hours/Week: 06

UNIT – I: Theory of Vibrations

Theory of free vibrations: Periodic motion, simple harmonic motion, equation of a simple harmonic oscillator, expressions for period and frequency, energy considerations-total energy, conversion of energy from kinetic to potential, electric to magnetic, problems.

Theory of damped vibrations: Resistive forces, equation of motion-expression for decaying amplitude, two cases of damping (effect of damping on frequency and large damping force), problems.

Theory of forced vibrations and resonance: Equation of motion-expression for amplitude, mechanical impedance, expression for maximum amplitude, examples of resonance, problems.

Theory of coupled oscillation: Coupled oscillators, general equation, normal modes, special cases of coupling-loose and resonant coupling, and qualitative description of mechanical and electrical coupling, problems.

Resonant cavities: Acoustic, thermal and optical (laser) resonant cavities.

Resonant energy transfer: Introduction, brief description of NMR and ESR.

11 Hours

UNIT – II: Quantum Mechanics

Limitations of classical mechanics (Review), 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 Normalization 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.

11 Hours

UNIT – III: Crystal Structure and X-ray Diffraction

Space lattice, Bravais lattice, Unit cell, primitive cell, lattice parameters, crystal systems, planes in a crystal. Miller Indices – Expression for inter planar spacing in terms of miller indices. Relation between lattice constant and bulk density. Co-ordination number. Relation between atomic radius and lattice constant. Atomic packing factor. Problems.

Bragg's law, Bragg's diffractometer, Laue and powder diffraction methods of structure determination. Neutron and electron diffraction (qualitative). Problems.

10 Hours

UNIT – IV: Electric and Magnetic Properties of solids.

Classical free electron theory, assumptions. Definitions: drift velocity, relaxation time, mean collision time, mean free path, mobility. Expression for electrical conductivity, success and failures of classical free electron theory. Quantum free electron theory. Fermi velocity, Fermi temperature, Fermi energy, and Fermi factor. Concept of effective mass and electrical conductivity. Merits of Quantum free electron theory. Density of states-expression. Free electron concentration (through density of states). Problems.

Brief review – Classification – Ferromagnetic materials – Weiss's domain theory. B-H graph in ferromagnetic materials. Domain theory. Soft and Hard magnetic materials – characteristic features and applications. Ferrites – Features and applications

10 Hours

UNIT – V: Lasers and Optical fibers

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

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.

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.

3. Acoustics, Waves and Oscillations- S. N. Sen, New Age International.

4. Textbook of Engineering Physics – M N Avadhanulu and Kshirsagar,P.G. – S Chand

Reference Books:

1. Textbook of Engineering Physics – Dr S.P.Basavaraju.- Subhash Stores

2. Engineering Physics – R.K.Gour and S.L.Gupta – Dhanpat Rai Publication.

3. Elementary Solid State Physics – M. Ali Omar Addison Wesley.

4. Solid State Physics – A.J.Dekker – MacMillan

Chairperson