20th BOS meeting held on 06 July 2020

Physics-II (BPHY-003) B. Tech Semester-II

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3	1	0

Continuous evaluation	40
End semester exam	60
Total Marks	100
Credits	4.0

Course Objective:

1. The course covers various concepts on Electromagnetic waves and their propagation in various media.
2. The objective of the course is also to understand role and application of Classical mechanics in science & technology
3. The students will be given a knowledge to Quantum mechanics , wave nature of particles, Schrodinger wave equations
4. To learn about free electron theory of metals and behaviour of electrons in solids.

UNIT-I

Electromagnetic waves: Continuity equation for current densities; displace current and magnetic field arising from time-dependent electric field, Maxwell's equation in vacuum and non-conducting medium, The electromagnetic wave equations, Plane electromagnetic waves in vacuum, their transverse nature and polarization.

Electromagnetic theory: Flow of energy and Poynting vector with examples; Energy in an electromagnetic field (Poynting theorem), Momentum carried by electromagnetic waves and resultant pressure, Reflection and transmission of electromagnetic waves from a non-conducting medium vacuum interface for normal incidence.

UNIT-II

Introduction to classical mechanics: Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Non-inertial frames of reference, Centripetal and Coriolis accelerations, Applications: Weather systems, Foucault pendulum.

Central forces: Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler's laws and its applications.

UNIT-III

Wave nature of particles & Schrodinger equation: Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

Applications of Schrodinger equation: Solution of stationary-state Schrodinger equation for one dimensional problems– particle in 1-D box, linear harmonic oscillator.

UNIT-IV

Free electron theory of metals: Classical Free electron theory and its limitations Quantum theory of free electrons, Fermi level, Density of states, Fermi-Dirac distribution function, Thermionic emission, Richardson's equation.

Band theory of solids: Origin of Energy bands, classification of solids into metals, semiconductors and insulators, Bloch's theorem for particles in a periodic potential, Kronig-Penney model (qualitative), *E-K* diagrams, Brillouin zones, Concept of effective mass and holes, Hall effect and its applications.