Physics-I (BPHY-001) B. Tech Semester-I

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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 Harmonic oscillations and wave motion in damped, driven media.
2. The objective of the course is also to understand the Interference, diffraction and Laser mechanisms of light and their applications.
3. The students will be given a knowledge to Electrostatics and Magnetostatics.
4. To learn about Electrostatics in a linear dielectric medium and method of images.

UNIT-I

Simple Harmonics motion & oscillator: Mechanical and electrical simple harmonic oscillators, phasor representation of simple harmonic motion, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

Non-dispersive longitudinal and transverse waves: Longitudinal waves and the wave equation for them, acoustics waves and speed of sound, standing sound waves. Transverse wave on a string, the wave equation on a string, Harmonic waves.

UNIT-II

Wave optics: Huygens principle, superposition of waves and interference of light by wave front & amplitude splitting Young's double slit experiment, Newton's rings, Diffraction: Fraunhofer diffraction from a single slit, the Rayleigh criterion for limit of resolution, Diffraction gratings and their resolving power.

Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion and pumping, Different types of lasers: gas lasers (He-Ne), solid-state lasers (ruby), semiconductor laser, properties of laser beams & applications of lasers in science, engineering and medicine.

UNIT-III

Electrostatics in vacuum: Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, method of images.

Electrostatics in a linear dielectric medium: Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; solving simple electrostatics problems in presence of dielectrics-point charge at the centre of a dielectric sphere.

UNIT-IV

Magnetostatics: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Magnetostatics in a linear magnetic medium: Magnetization and associated bound currents; auxiliary magnetic field $\vec{H}$; Boundary conditions on $\vec{B}$ and $\vec{H}$, magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials; Qualitative discussion of magnetic field in presence of magnetic materials.