

## PH 101: Engineering Physics (3-1-2: 5)

**Electromagnetism:** Gauss's law and its applications, Divergence and Curl of Electrostatic fields, Electrostatic Potential, Laplace's equation. Lorentz force, Biot-Savart and Ampere's laws and their applications, Divergence and Curl of Magnetostatic fields, Force and torque on a magnetic dipole. Motional EMF, Faraday's law, Lenz's law, Maxwell's equations, Wave solution of Maxwell Equations.

**Wave Optics:** Interference- Introduction to waves, Coherence (Spatial and Temporal), Principle of Superposition, Young's double slit experiment, Interference due to thin parallel films, wedge shaped film, Newton's rings. Diffraction- Fresnel and Fraunhofer diffracting, Fraunhofer diffraction due to double slits. Diffraction grating and its usages; Polarization- Introduction, Malus' law, Polarization by reflection and Brewster's law.

**Special Theory of Relativity:** Postulates of Special Theory of Relativity; Galilean transformation; Lorentz transformation; Simultaneity; Length Contraction; Time dilation; Relativistic addition of velocities; Energy-momentum relationships.

**Quantum Mechanics:** Historical remarks, Two-slit experiment; De Broglie's hypothesis; Uncertainty Principle, wave function and wave packets, phase and group velocities; Schrödinger Equation; Probabilities and Normalization, Expectation values; Eigenvalues and eigenfunctions, Applications in one dimension: Particle in a box, Harmonic oscillator.

**Lasers:** Laser Operation, Absorption, Spontaneous Emission and Stimulated Emission, Producing Population Inversion, Two-, Three- and Four-Level Laser Systems, Laser Characteristics- Types of Lasers - Solid-State Lasers - Gas Lasers - Semiconductor Lasers- Laser Applications

### Textbooks

1. R. A. Serway and J. W. Jewett, "Physics for Scientists and Engineers with Modern Physics", CENGAGE Learning Custom Publishing.
2. D. J. Griffiths, "Introduction to Electrodynamics", Prentice-Hall of India.
3. K. Ghatak, "Optics", Tata McGraw-Hill.
4. R. Resnick, "Introduction to Special Relativity", John Wiley, Singapore.
5. Anil K. Maini, "Lasers and Optoelectronics: Fundamentals, Devices and Applications", John Wiley and Sons Ltd.

### References

1. D. Kleppner, and R. J. Kolenkow, "An Introduction to Mechanics", Tata McGraw-Hill.
2. R. Eisberg, and R. Resnick, "Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles", John-Wiley.