

DEPARTMENT OF PHYSICS
NATIONAL INSTITUTE OF TECHNOLOGY
HAZRATBAL, SRINAGAR, KASHMIR – 190 006 (J&K)

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|--|---|------------|------------------------------------|---|---|-------|
| Subject: Engineering Physics Code: PHL100 | Common Syllabus for B.Tech. 1 st and 2 nd Semester of All Engineering Branches | | Total Course Credits: 04 | | | |
| Mid-Term | Class Assessment | Final-Term | Contact Hours | | | |
| | | | L | T | P | Total |
| [30 Marks] | [10 Marks] | [60 Marks] | 3 | 1 | 0 | 4 |

Unit-I: VECTOR CALCULUS AND ELECTRODYNAMICS (8 Hours)

Gradient, Divergence, curl and their physical significance. Laplacian in rectangular, cylindrical and spherical coordinates, vector integration, line, surface and volume integrals of vector fields, Gauss-divergence theorem, Stoke's theorem and Green Theorem of vectors. Maxwell equations, electromagnetic wave in free space and its solution in one dimension, energy and momentum of electromagnetic wave, Poynting vector, Problems.

UNIT-II: QUANTUM MECHANICS (8 Hours)

Origin of the quantum Mechanics, Interpretation of Wave function, Normalization, Schrodinger time-independent & time-dependent equations, basic postulates of the quantum Mechanics, Probability Current Density, Expectation values, Operators, Hermitian operators, Commutation relation between Position & Momentum operators; Applications of Schrödinger equation in Particle in a box, Single step barrier, Harmonic Oscillator, Problems.

UNIT-III: SPECIAL THEORY OF RELATIVITY (8 Hours)

Inertial Frames of Reference, Galilian and Lorentz Transformations, Postulates of Relativity, Time Dilation, Twin Paradox, Length Contraction, Relativistic Mass, Energy and Momentum, Equivalence of Mass and Energy, Doppler Effect in light and its application in Expanding of Universe, Problems.

UNIT-IV: LASER & FIBER OPTICS (8 Hours)

Introduction; Absorption and Emission, Einstein's coefficients & equations; Metastable states, Population inversion, Pumping (three and four level laser schemes), Basic parts of a Laser, Characteristics of Laser Radiations; Classification of Lasers, Ruby Laser, He-Ne Laser, GaAs Laser; Applications of lasers in holography.

Basics of optical fiber, Total Internal Reflection, Acceptance angle, Numerical Aperture; Modes of Propagation, Single Mode Step Index Optical Fiber, Multimode Step Index

Optical Fiber, Graded Index Fiber, Losses, Dispersion in Optical Fiber, Intermodal and intramodal dispersion, Applications of optical fiber; Problems.

Unit-V: SEMICONDUCTOR PHYSICS

(8 Hours)

Introduction to semiconductors; Intrinsic and extrinsic semiconductors; Direct and in-direct band gap semiconductors; Carrier concentration in semiconductors; mechanism of current conduction in semiconductors; Dependence of Fermi level on carrier-concentration, carrier generation and recombination; carrier transport: diffusion and drift; fabrication, mechanism and I-V characteristics of p-n junction; Zener diode; measurement of conductivity-four probe, Hall effect; Problems.

BOOKS RECOMMENDED

1. Introduction to Electrodynamics by David J. Griffith (Prentice- Hall of India Private limited).
2. Introduction to Classical Mechanics by R. G. Takwale and P.S. Puranik (Tata-McGraw Hill Publishing Co).
3. Concept of Modern Physics by Arthur Besier, Shobhit Mahajan & S. Rai Choudhury (McGraw Hill Education).
4. Quantum Mechanics by G. Aruldas (PHI learning).
5. Quantum Physics by H C Verma (Surya Publications, Ghaziabad).
6. Introduction to Special Relativity by Robert Resnick (Wiley).
7. LASERS (Theory and Application) by K. Thyagarajan & A.K. Ghatak (Macmillan).
8. Semiconductor Physics and Devices by Neamen Donald (McGraw Hill).
9. Physics of Semiconductor Devices by Kwok K. Ng & S. M. Sze (Wiley).