AHL-102-A	APPLIED PHYSICS-II	L T P	Cr.
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(Common for B. Tech, Integrated M. Tech, Dual Degree MBA)

OBJECTIVE:

Students should become proficient in the topics of optics, dielectrics, quantum mechanics, magnetism, thermal physics and relativity. Superconductivity, Fiber Optics, Holography, Nanoscience, Acoustics and Ultrasonics are emerging trends in technology covered in this syllabus. Students should be able to connect the concepts presented in this syllabus to the uses in engineering applications.

SECTION A

UNIT - 1

CRYSTAL STRUCTURE: Introduction, space lattice, translation vectors, unit cell, primitive cell, Miller indices, simple crystal structure-NaCl, CsCl, Diamond, hcp, X-ray diffraction, Bragg's law and Powder method, point defects, Schottky defect, Frenkel defect. Numerical problems based on Miller indices and X-ray Diffraction

UNIT - 2

QUANTUM PHYSICS: Failures of Classical Physics, wave-particle duality, de-Broglie relation, group velocity, phase velocity, particle velocity and relation between them, wave packet, Schrödinger wave equation: time dependent and time independent, significance of wave function, Numerical problems based on Quantum mechanics

UNIT – 3

OSCILLATIONS: Simple harmonic motion, Damped Oscillations, Forced Oscillations, Resonance, Quality factor

SUPERCONDUCTIVITY: Introduction, hard & soft superconductors, Meissner effect, London equations, Applications of superconductivity.

SECTION B

UNIT – 4

FREE ELECTRON THEORY: Elements of classical free electron theory and its limitations, Quantum theory of free electron, Fermi level, Density of states, Fermi-Dirac distribution function, thermionic emission and Richardson equation

UNIT – 5

BAND THEORY OF SOLIDS: Kronig –Penny model (qualitative), E-k diagram, Brillouin zones, concept of effective mass and holes, classification of solids into metals, semiconductors and insulators. Intrinsic and extrinsic semiconductors, Fermi energy and its variation with temperature, Hall Effect and its applications

UNIT – 6

ELECTRIC & MAGNETIC PROPERTIES OF SOLIDS: Molecular theory, polarization, Electric displacement vector, susceptibility, dielectric coefficient, permittivity and various relations between these, Gauss's law in dielectrics, energy stored in an electric field. Atomic magnetic moments, Langevin's theory of diamagnetism, classical theory of paramagnetism, Domain theory of Ferromagnetism, Hysteresis and B-H curve

NOTE:

1. The syllabus is divided into 2 sections comprising three units each. Total seven questions would be set. One question would be compulsory that would comprise all the units. Remaining six questions will be set from both the sections taking three questions from each section. Students need to attempt at least two questions from each section. A student has to attempt five questions in all.
2. 20% numerical problems are to be set.
3. Use of Scientific (non-programmable) calculator is allowed.

TEXT BOOKS:

1. Modern Physics for engineers by S. P. Taneja (R. Chand)
2. Engineering Physics by Satya Praksh (Pragati Prakashan)
3. Engineering Physics by S. L. Gupta, Vol 1 & 2

REFERENCE BOOKS:

1. Introduction to Solid State Physics by C. Kittel; Wiley Eastern Ltd
2. Materials Science and Engineering by V. Raghavan; Prentice-Hall, India
3. Engineering Physics by Dr. M. Arumugam; Anuradha Agencies
4. Concepts of Modern Physics by Arthur Beiser (Tata Mc-Graw Hill)
5. Modern engineering Physics by A. S. Vasudeva (S. Chand)
6. Engineering Physics by R. K. Gaur & S.L. Gupta; (Dhanpat Rai)