

Physics

Course Title: Physics

Course No.: PHY113

Nature of the Course: Theory + Lab

Semester: I

Full Marks: 60 + 20 + 20

Pass Marks: 24 + 8 + 8

Credit Hour: 3

Course Description: This course covers the fundamentals of physics including oscillations, electromagnetic theory, and basics of quantum mechanics, band theory, semiconductors and universal logic gates and finally physics of manufacturing integrated circuits.

Course Objectives: The main objective of this course is to provide knowledge in physics and apply this knowledge for computer science and information technology.

Course Contents:

Unit 1: Rotational Dynamics and Oscillatory Motion (5 Hrs.)

Moment of inertia and torque, Rotational kinetic energy, Conservation of angular momentum, Oscillation of spring: frequency, period, amplitude, phase angle and energy

Unit 2: Electric and Magnetic Field (5 Hrs.)

Electric and magnetic field and potential, Force on current carrying wire, magnetic dipole moment, Force on a moving charge, Hall effect, Electromagnetic waves

Unit 3: Fundamentals of Atomic Theory (8 Hrs.)

Blackbody radiation, Bohr atom, Spectrum of Hydrogen, Franck-Hertz experiment, de Broglie's hypothesis and its experimental verification, Uncertainty principle and its origin, matter waves and the uncertainty principle, group velocity.

Unit 4: Methods of Quantum Mechanics (5 Hrs.)

Schrodinger theory of quantum mechanics and its application, Outline of the solution of Schrodinger equation for H-atom, space quantization and spin, Atomic wave functions

Unit 5: Fundamentals of Solid State Physics (6 Hrs.)

Crystal structure, Crystal bonding, Classical and quantum mechanical free electron model, Bloch theorem, Kronig-Penny model, Tight-binding approximation, conductors, insulators and semiconductors, effective mass and holes.

Unit 6: Semiconductor and Semiconductor devices (8 Hrs.)

Intrinsic and extrinsic semiconductors, Electrical conductivity of semiconductors, Photoconductivity, Metal-metal junction: The contact potential, The semiconductor diode, Bipolar junction transistor (BJT), Field effect transistor (FET).

Unit 7: Universal Gates and Physics of Integrated Circuits (8 Hrs.)

Universal gates, RTL and TTL gates, Memory circuits, Clock circuits, Semiconductor purification: Zone refining, Single crystal growth, Processes of IC production, Electronic component fabrication on a chip.

Laboratory Works:

Students should be able to perform at least one experiment from units 1, 2 and 5, 6, 7. The details of the experiment will be provided in the manual.

Text Books:

1. Garcia Narciso, Damask Arthur, Physics for Computer Science Students, Springer-Verlag

Reference Books:

1. Heliday David, Resnick Robert and Walker Gearl, Fundamentals of Physics, 9th ed., John-Wiley and Sons, Inc.
2. Francis W. Sears, Hugh D. Young, Roger Freedman, Mark Zemansky, University Physics, Volume 1 & 2, 14th ed., Pearson Publication
3. Knight Randall D., Physics for Scientists and Engineers: A Strategic Approach, 3rd ed., Pearson Publication