### **Physics**

 Course Title: Physics
 Full Marks: 60 + 20 + 20

 Course No.: PHY113
 Pass Marks: 24 + 8 + 8

Nature of the Course: Theory + Lab Credit Hour: 3

Semester: I

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 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, 9<sup>th</sup> ed., John-Wiley and Sons, Inc.
- 2. Francis W. Sears, Hugh D. Young, Roger Freedman, Mark Zemansky, University Physics, Volume 1 & 2, 14<sup>th</sup> ed., Pearson Publication
- 3. Knight Randall D., Physics for Scientists and Engineers: A Strategic Approach, 3<sup>rd</sup> ed., Pearson Publication