PHYSICS-I

[1st and 2nd Semester, First Year]

Course Description

Offered by Department	Credits	Status	Code
Physics	**3-0-0 (3)**	**EPR**	**PHI01005PH**

(Pre-requisites: Basic Physics]

Course Outcomes: After learning this course, students can able to

CO-1	Apply the knowledge of mass-energy conversion in nuclear power management; Doppler effect and functioning of GPS for navigation and space engineering purposes
CO-2	Examine and distinguish behavior of objects at nano-scales; and can design innovative devices based on wave properties of microscopic objects
CO-3	Apply the ideas of quantum theory to quantum information, cryptography and quantum computation
CO-4	Analyze and explain the functioning of optical devices, anti-reflection coating and filters, smoothness of a surface, and determination of refractive index and identification of distant objects
CO-5	Evaluate and examine different materials for novel devices using the knowledge of quantum concept and development of new efficient materials for sustainable development
CO-6	Apply magnetic, dielectric and superconducting properties of materials to fabricate devices for energy generation and saving. Design ultra sensitive sensors based on magnetic and superconducting behavior of materials

Course Content

Unit -1: Theory of Relativity

Galilean relativity, Michelson-Morley experiment, Einstein relativity, Lorentz transformations and its consequences, velocity addition, mass variation, mass-energy conversion, Doppler effect and road safety, functioning of GPS and navigation, nuclear power generation and ethical use for sustainable development of society **[8 Hours]**

Unit-II: Quantum Physics

Inadequacy of classical mechanics and Planck's quantum theory, photoelectric effect, Compton effect, de-Broglie's hypothesis, Davison-Germer experiment, uncertainty principle and its application, wave function, normalization, probability, Schrödinger equation, particle in a box, tunneling effect, functioning of scanning and tunneling electron microscope, spin and qubit, superposition, entanglement, quantum computation and information. **[12 hours]**

Unit-III: Wave Optics

Interference in thin films, Newton's rings experiment, Diffraction at single slit, diffraction grating, Resolving Power of grating, anti-reflection coating, refractive index determination, optical testing of surfaces, Polarized light and its production, Nicol prism as polarizer and analyzer, optical filters, display technology. **[8 hours]**

Unit-IV: Advanced Materials

Dielectric polarization, polar and non-polar dielectrics, susceptibility, dielectric constant, polarizability and its sources, dielectrics in ac field, dielectric loss with frequency, supercapacitor and LCR meter; electromagnet and permanent magnet, dia, para and ferro magnetic materials, hysteresis and domain theory, hard and soft magnetic materials, vibrating sample magnetometer; Superconductors, Meissner effect, Type-I and II superconductors, BCS theory, SQUIDs, ideas of maglev train, MRI machine. **[12 hours]**

Course Materials: Text books	**Optional Materials: Reference Books**
1. Modern Physics: A. Beiser, Tata McGraw-Hill 2. Quantum Mechanics: D. Griffiths 3. Optics: Ajay Ghatak, McGraw-Hill 4. Engg.Physics: Kshirsagar, S Chand Publ	1.Relativity: R. Resnick 2. Solid State Physics: Puri, Babbar, S. Chand Publ. 3.Solid State Physics: S.O. Pillai, New Age Publ 4.Solid State Physics: C. Kittel, Wiley Eastern

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	3	3	3	3	3	3	3	3	3	3	3
CO-2	3	3	3	3	3	1	2	2	2	2	3
CO-3	3	3	3	3	3	1	1	1	1	1	3
CO-4	3	3	3	3	3	2	2	2	2	2	3
CO-5	3	3	3	3	3	1	1	1	1	1	3
CO-6	3	3	3	3	3	1	1	1	1	1	3