PHYSICS-II

(1st and 2nd Semester; First Year)

Course Description

Offered by Department	Credits	Status	Code
Physics	3-0-0 (3)	EPR	PH101006PH

(Pre-requisites: Basic Physics)

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

CO-1	Apply the knowledge of band gap, carrier concentrations and mobility to characterize semiconducting materials using the techniques of four probe and Hall effect
CO-2	Analyze and explain the functioning of solid state devices as voltage regulator, solar cell, LED and transistor and their technological applications in daily life/society
CO-3	Examine and distinguish behavior of EM waves and energy propagation in free space and dielectric material
CO-4	Apply the concept of EM wave propagation and interaction with material in explaining the functioning of microwave oven and RFID
CO-5	Explain the functioning of various Lasers, can design a new laser source and use these knowledge for various novel technological applications including holograms
CO-6	Evaluate and examine different optical materials to achieve low attenuation and distortion for efficient optical communication.

Course Content

Unit 1: Theory of Semiconductors

Crystal structure, unit cell, Miller indices, inter planar spacing, reciprocal lattice, Kronig-Penney model, semiconductors, effective mass, density of states, Fermi level in intrinsic and extrinsic semiconductors, determination of band gap, carrier concentrations and mobility using four probe and Hall effect **[10 hours]**

Unit 2: Solid State Devices

Diode as voltage regulator, solar cell and LED, transistor and its characteristics, transistor as amplifiers and oscillators, design and characteristics of JFET and MOSFET, operational amplifiers and its application **[10 hours]**

Unit 3: Electro-Magnetic Theory

Gradient, divergence and curl, line, surface and volume integrals, Gauss divergence and Stoke theorems (application only), Gauss law, Ampere law, Faradays law, continuity equation, displacement current, Maxwell's equations, wave propagation, Poynting vector and power flow, functioning of RFID, microwave heating, wireless device radiation and health. **[10 hours]**

Unit 4: Laser & Fiber Optics

Coherence, principle and characteristics of Laser, Einstein coefficients, population inversion, components of Laser, Ruby, He-Ne and semiconductor lasers, Holography; Optical fibers, structure and classification, principle of light propagation in fibers, acceptance angle and cone, numerical aperture, attenuation and distortion, concept of optical communication. **[10 hours]**

Course Materials: Text books	**Optional Materials: Reference Books**
1. Solid State Physics: Puri, Babber, S. Chand Publication. 2. Electronics: Rakshit, New Age Publication. 3. Electrodynamics: D. Griffiths, PHI learning 4. Engg. Physics: Kshirsagar, S. Chand Publication	1.Solid State Physics: S.O. Pillai, New Age Publication 2. Solid State Physics: C. Kittel, PHI 3. Laser: A. Ghatak Tata McG Hill 4. Integrated Electronics: Millman Halkias, McGraw-Hill

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