PH103	Physics-I	L-T-P-CR-CH: 2-0-1-3-4

Course Objectives

CO1. To demonstrate the components of velocity and acceleration in different coordinate systems.

CO2. To display the use of Newton's laws of motion to explain ideas on uniformly rotating frame, centripetal acceleration, Coriolis force and its applications.

CO3. To provide an elaborate look at classical and modern optics and to develop a firm fundamental understanding of interference and diffraction.

CO4. To familiarize the students with Maxwell's laws governing electrodynamics, concepts of electromagnetic waves, solution of electromagnetic plane wave equations and polarization.

CO5. To explain the application of principles of mechanics, optics and electromagnetics in solving engineering problems.

Learning Outcomes

Upon the completion of the course, the students will be able to:

LO1. Solve numerical problems of mechanics by application of Newton's laws of motion.

LO2. Analyze the application of Newton's laws of motion in non-inertial frames of reference.

LO3.Recall the wave nature of light and interpret the intensity variation of light due to interference and diffraction.

LO4. Describe experimental arrangements for observing interference and diffraction pattern.

LO5. Formulate and solve engineering problems on electromagnetics and electromagnetic plane wave equations.

SYLLABUS

Unit 1: Mechanics (10 lectures)

Curvilinear coordinate systems; Concepts of potential energy, conservative and non-conservative forces; Angular momentum and orbital motion; Non-inertial frames of reference; Rotating coordinate system, Centripetal and Coriolis accelerations

Unit 2: Optics (9 lectures)

Fermat's principle of stationary time and its applications, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection. Young's double slit experiment, Newton's rings, Michelson interferometer, Farunhofer diffraction from a single slit and a circular aperture, Diffraction gratings and their resolving power.

Unit 3: Electromagnetic Theory (9 lectures)

Basics of electrostatics and magnetostatics; Displacement current, Maxwell's equations: Continuity equation for current densities; Maxwell's equation in vacuum; Energy in an electromagnetic field; Flow of energy and Poynting vector with examples. The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization.

Practical:

Experiment 1: Determine the value of surface tension of pure water with the help of capillary action. (Jurine's law).

Experiment 2: Determine the wavelength of He- light by observing the diffraction pattern produced with a plane transmission grating.

Experiment 3: Verify Hooke's law of elasticity and hence determine the value of Young's modulus of elasticity of the material of a given rod by the method of flexure.

Experiment 4: To determine the moment of a bar magnet and horizontal component of earth's magnetic field by Magnetometers.

Experiment 5: Determine the Planck's constant by solar cell.

Experiment 6: Prove the existence of atomic energy levels and determine the first excitation potential (eV) of Argon atom using Frank Hertz Experimental set-up.

Experiment 7: Determine the Planck's constant using different wavelength of light using Planck Constant Kit.

Total **(28 lectures)**

Text Books:

1. Engineering Mechanics. M. K. Harbola, Cengage Learning India Pvt. Ltd., 2nd Edition, 2012.
2. Optics. E. Hecht and A. R. Ganesan, Pearson Education, 5th Edition, 2019.
3. Introduction to Electrodynamics. D. J. Griffiths, Cambridge University Press, 4th Edition, 2017.

Reference Books:

1. Physics for Degree Students B.Sc. First Year. C. L. Arora and P. S. Hemne, S. Chand Publishing, 2nd Edition, 2010.
2. A Textbook of Engineering Physics. M. N. Avadhanulu, P. G. Kshirsagar and TVS A. Murthy, S. Chand Publishing, 11th Edition, 2018.
3.Engineering Physics. G. Aruldhas, Prentice Hall India Learning Private Limited, 1st Edition, 2010.
4. Physics for Engineering Applications. S. Puri, Narosa Publishing House, 1st Edition, 2010.
5.An Introduction to Mechanics (Sie). D. Kleppner and R. Kolenkow, McGraw Hill Education, 1st Edition, 2017.
6.University Physics with Modern Physics, H. D. Young and R. A. Freedman, Pearson Education, 14th Edition, 2017.