

SEMESTER 1st
MAJOR / MINOR COURSE

PHY122M: PHYSICS (MECHANICS)

CREDITS: 04 + 02

THEORY (04 CREDITS)

Unit - I

Cartesian co-ordinate system, spherical & cylindrical coordinate system with expression for velocity and acceleration, Laws of motion: Inertial and non-inertial frames of references, uniformly rotating frame, Coriolis force & its applications, Newton's laws of motion, dynamics of a system of particles. centre of mass.

Unit - II

Momentum and energy: Conservation of linear momentum in system of particles. Work and energy, Conservation of energy. Motion of rockets (principle and equation). Rotational motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum in system of particles.

Special theory of relativity: Galilean and Lorentz transformations. Postulates of special theory of relativity. Length contraction. Time dilation. Relativistic addition of velocities.

Unit - III

Gravitation: Newton's laws of Gravitation. Motion of a particle in a central force field. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits.

Weightlessness. Basic idea of global positioning system (GPS).

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and potential energy. Total energy and their time averages. Damped oscillations

Unit - IV

Elasticity: Hooke's, Stress-strain diagram. Elastic moduli -Relation between elastic constants. Poisson's ratio-expression for Poisson's ratio in terms elastic constants. Work done in stretching and work done in twisting a wire * Twisting couple on a cylinder.

Viscosity. Streamline and turbulent motion: Derivation of Poissulle's Equation, Stoke's law. Effect of temperature on viscosity.

TEXTBOOK:

Mechanics Berkeley Physics course, Volume-I: Charles Kittel, et.a\,2007, Tata McGraw-Hill.

REFERENCE BOOKS:

1. University Physics. F. W. Sears, M. W. Zemansky and H. D. Young, 1986. Addison Wesley
2. Physics, Resnick, Halliday & Walker 9/e,2010, Wiley.
3. Engineering Mechanics, Basudeb Bhattachary42nd edn.,2015, Oxford U
4. University Physics, Ronald Lane Reese.2003, Thomson Brooks/Cole
5. Special Theory of Relativity, Robert Resnik, Addison-Wily.

LABORATORY COURSE (PRACTICAL) (CREDITS: 02)

1. Measurements of length (or diameter) using vernier calliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method/bending of beam.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kate's Pendulum.
9. To determine g and velocity for a freely falling body using Digital Timing Technique.
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) value of g.

REFERENCE BOOKS:

1. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted I 985, Heinemann Educational Publishers.
3. Engineering Practical Physics, S. Panigrahi& B. Mallick,2015, Cengage Learning India P\1. Ltd.
4. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11 th Edition, 2}ll, Kitab Ma hal, New Delhi.