

PH1010: Physics-1

Learning Objectives: To be able to solve various range of non-relativistic mechanics problems in different co-ordinate systems

Learning Outcomes: At the end of the course, the students should be able to

- (i) Understand the different coordinate systems
- (ii) Solve problems based on inertial and non-inertial frames of reference in different coordinate systems
- (iii) Thorough understanding of Planetary motion
- (iv) Thorough understanding of mathematical operators like gradient, divergence and curl

Course content:

1. Newton's Laws of Motion: Vectors in mechanics, Vectors and time derivatives of vectors.

Coordinate transformations, Transformation properties of vectors, axial and Polar vectors. Motion Plane Cylindrical, and spherical polar coordinates systems.

2. Introduction to physics of fields: Conservative vector fields. Gradient and equipotentials. Equilibrium and critical points.

3. Introduction to phase space and phase trajectories; equilibrium and stability, small oscillations, forced and dissipative oscillations.

4. Motion in a central potential and conservation of angular momentum. Kepler problem: Effective potential for the radial problem. Kepler's laws (planetary motion), satellite orbits.

5. Concepts of divergence and Gauss' a thorem. Curl and Stokes theorem and applications. Divergence and Curl in Cylindrical and Spherical and Coordinate systems.

9. Text books:

1. Daniel Kleppner and Robert Kolenkow , An Introduction to Mechanics, TMH, (2007)

2. David Morin, Introduction to Classical Mechanics, with problems and solutions, Cambridge Univ. Press (2008).

3. D. J. Griffiths, Introduction to Electrodynamics, PHI Learning, (2012).
