11PH301 CLASSICAL MECHANICS

Credits: 4:0:0

Course Objectives:
Students will be able
- To increase in the conceptual understanding of classical mechanics and develop their problem solving skills
- To gain more experience and increased ability with the mathematics associated with Classical Mechanics

Course Outcome:
The student will be able to:
- Apply the techniques and results of classical mechanics to real world problems
- Effectively communicate problems and their solutions relevant to classical mechanics
- Apply physics principles to novel situations

Unit I

Unit II

Unit III
The Kinematics of Rigid Body Motion: The independent coordinates of a rigid body – orthogonal transformations – The Euler Angles – Symmetric top – Rate of change of a vector – angular velocity vector in terms of the Euler angles.
Small Oscillation
Formulation of the problem – Eigen value equation and the principal axis transformation – frequencies of free vibration – Triatomic molecule.

Unit IV
The Hamilton Equations Of Motion: Legendre Transformations and the Hamilton equation of motion – Cyclic coordinates – Routh’s procedure and oscillations about steady motion – Derivation of Hamilton’s equations from variational principle – The equations of canonical transformation – Examples of canonical transformation, Poisson brackets, invariance of Poisson brackets with respect to canonical transformation

Unit V
Hamiltonian-Jacobi Theory: Hamilton-Jacobi equations for principle function-Harmonic Oscillator problem as an example of the Hamilton-Jacobi method-Hamilton-Jacobi equation for Hamilton’s characteristic function- Actions angle variables in the Systems with one degree of freedom- The Kepler Problem in action angle variables- Hamilton-Jacobi Theory, Geometrical Optics and Wave Mechanics
Text Books:

Reference Books: