PH 402: Classical Mechanics (3-1-0:4)

Lagrangian and Hamiltonian Formulations of Mechanics: Calculus of variations, Hamilton's principle of least action, Lagrange's equations of motion, conservation laws, systems with a single degree of freedom, rigid body dynamics, symmetrical top, Hamilton's equations of motion, phase plots, fixed points and their stabilities.

Two-Body Central Force Problem: Equation of motion and first integrals, classification of orbits, Kepler problem, scattering in central force field.

Small Oscillations: Linearization of equations of motion, free vibrations and normal coordinates, forced oscillations.

Special Theory of Relativity: Lorentz transformation, relativistic kinematics and dynamics, $E=mc^2$.

Hamiltonian Mechanics and Chaos: Canonical transformations, Poisson brackets, Hamilton-Jacobi theory, action-angle variables, perturbation theory, integrable systems, introduction to chaotic dynamics.

Textbooks and References:

1. H. Goldstein, Classical Mechanics, Pearson Education India.
2. L.D. Landau and E.M. Lifshitz, Mechanics,Butterworth-Heinemann
3. I.C. Percival and D. Richards, Introduction to Dynamics, Cambridge University Press.
4. J.V. Jose and E.J. Saletan, Classical Dynamics: A Contemporary Approach, Cambridge University Press.
5. E.T. Whittaker, A Treatise on the Analytical Dynamics of Particles and Rigid Bodies, Cambridge University Press.

N.C. Rana and P.S. Joag, Classical Mechanics,McGraw Hill Education (India) Private Limited.