

2000 - 2001

SEMESTER SYSTEM (SYLLABUS)

M.Sc., Physics, M.Sc., Material Science, M.Sc., Space Physics
and M.Sc., (Tech.) Electronics.

(With Effective from 2000 - 2001 Admitted Batch)

SSP - S102. PH02 - CLASSICAL MECHANICS

I SEMESTER.

UNIT - I.

1. Mechanics of a particle and a system of particles, constraints. D'Alembert's principle and Lagrange's equations. Ch 1, Sec. 1,2,3, & 4. 5 Hrs.
2. Hamilton's principle, some techniques of the calculus of variations. Derivation of Lagrange's equations from Hamilton's principle. Extension of Hamilton's principle to non-conservative and non-holonomic systems. Conservation theorems and symmetry properties. Ch.2, Sec 1,2,3,4 & 6. 6 Hrs.
3. Two-body central force problem reduction to equivalent one body problem, Kepler's problem- planetary motion. The equation of motion and first integrals. Scattering in a central force field Ch 3, Sec.1,2,3,4. 7Hrs.
4. Legendre transformations and Hamilton's equations of motion. Derivation of Hamilton's equation of motion from variational principle, Principle of least action. Ch.8. Sec. 1,5 &6. 6 Hrs.

UNIT - II

5. Equations of canonical transformations, Legendre and Poisson brackets as canonical invariants. Equations of motion in poisson bracket notation. Ch.9. Sec.1,2 & 4. 5 Hrs.
6. Hamilton - Jacobi equation of Hamilton's principal function, Hamilton - Jacobi equation for Hamilton's characteristic function. Action - angle variables, Kepler's problem in action angle variables. Ch 10, Sec 1,2,3,5 & 7. 8 Hrs.
7. Independent coordinates of a rigid body. Eulerian angles coriolis force. Inertia tensor and moment of inertia, Eulerian equations of motion for a rigid body. Heavy symmetrical top with one point fixed. Ch 4, Sec. 1,4, 6 & 10, Ch.5. Sec 3 & 7. 7 Hrs.
8. Theory of small Oscillations: Principal axis transformation, normal coordinates and normal modes, vibration of linear symmetric molecules. Ch 6, Sec 2,3, & 4. 6 Hrs.

TEXT: Classical Mechanics by H.Goldstein (Addison - Wilely) (1st and 2nd editions)

REFERENCE: Classical Dynamics of Particles and Systems. by J.B.Marion