

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 - Wileey) (1st and 2nd editions)

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