7th SEMESTER

FPYC701: CLASSICAL MECHANICS

Marks-100

UNIT-I: Mechanics of a system of particles:

Inertial and non-inertial frames of reference. Lagrangian Formulation, Velocity dependent potentials and Dissipation Function, conservation theorems and symmetry properties, Homogeneity and Isotropy of space and Conservation of linear and Angular momentum, Homogeneity of time and conservation of energy.

Hamiltonian Formulation:

Calculus of variations and Euler Lagranges equation, Brachistochrone problem , Hamiltons principle, extension of Hamiltons principle to nonholonomic systems , Legendre transformation and the Hamilton equations of motion, physical significance of Hamiltonian , Derivation of Hamiltons equations of motion from a variational principle , Rouths procedure , Principle of least action. (12)

UNIT-II: Canonical transformations:

Canonical Transformation , types of generating function , conditions for Canonical Transformation , integral invariance of Poincare , poissons theorem , Poisson and Lagrange bracket , Poisson and Lagrange Brackets as canonical invariant , Infinitesimal canonical Transformation and conservation theorems , Liouvilles theorem.

Hamilton -Jacobi Theory:

Hamilton - Jacobi equation for Hamiltons principal function , Harmonic oscillator and Kepler problem by Hamilton - Jacobi method , Action angle variables for completely separable system , Kepler problem in Action angle variables , Geometrical optics and wave mechanics. (15)

UNIT-III: Small oscillation:

Problem of small oscillations , Example of two coupled oscillator , General theory of small oscillations, Normal coordinates and Normal modes of vibration , Free vibrations of a linear Triatomic molecule.

Rigid body motion:

The independent of coordinates of a rigid body, orthogonal transformations , The Eulers angles , The Cayley-Klein parameters , Eulers theorems on the motion of a rigid body , infinitesimal rotations , rate of change of a vector, The Coriolis Force.

Rigid body dynamics:

Angular Momentum and kinetic energy of motion about a point. : The Inertia Tensor and momentum of Inertia ,Eigenvalues of Inertia Tensor and the principal Axis transformation. The Heavy symmetrical Top with one point Fixed .Elementary idea about non- linearity and chaos. (13)

BOOKS:
1. Classical Mechanics H. Goldstein
2. Classical Mechanics - Landau and Liftshitz
3. Classical Mechanics Corben&Stehle
4. Classical Dynamics Marion & Thornton
5. Analytical Mechanics L. Hand and J. Finch
6. Classical Mechanics J. C. Upadhyaya