

Course Name: Classical Mechanics Course Code: MAT608 Credit: 04

SYLLABUS

Mechanical Systems

The Mechanical System, Angular Velocity, Definition of angular Acceleration, Rate of Change of a Unit Vector in a Plane, Relation Between Angular and Linear Velocity, Component of velocity and acceleration along the coordinate axes in two dimensions, Equations of Motion, Newton's Laws of Rotational Motion, General Theorems on Moment of Inertia, Formulation and Derivation of Moment of Inertia

Motion of rigid body

Motion of rigid body, Theory of small oscillations, Problems on Hamilton-Jacobi Method, Separability. D'Alembert Principle, Angular Momentum of a system of Particle, General equation of a motion, Motion of the center of inertia, Scalar equation, Motion relative the center of inertia, Virtual Work,

Hamilton's equations

Hamilton's Principle, Hamilton's Equation, The principle of least Action, Derivation of Hamilton's Equations from a Variational Principle and Cyclic Coordinates. Hamilton-Jacobi Equation for Hamilton Principal function., Centre Force, Centre Orbit, Differentiable Equation of Centre Orbit, Rate of Description of the Sectorial Area, Elliptic Orbit, Hyperbolic and Parabolic orbits, Velocity in Circle, Given Central orbit, to find the law of force, Apse and apsidal Distance, Property of Apse Line, Areal Velocity, Small Oscillations, 3 Equilibrium of a Mechanical System, Stable Equilibrium, Small Oscillations about Equilibrium.

Canonical form

Special Transformations, Lagrange and Poisson Brackets. Equation of motion of top (deduce LaGrange equations), steady motion, Range of theta.

References

1. Goldstein, H., Poole, C., & Safko, J. – Classical Mechanics, 3rd Edition, Pearson Education, 2002.
2. Kleppner, D. & Kolenkow, R. – An Introduction to Mechanics, 2nd Edition, Cambridge University Press, 2014.
3. Mathur, D. S. – Mechanics, S. Chand & Company, 2008.
4. Bansal, R. K. – Classical Mechanics, Laxmi Publications, 2010.