Course 1: Mechanics

Course code: BSCPH101 **Credit: 3**

BLOCK 1 Vector Analysis

Unit –1: **Vector**: Types of vectors, vector representation, dot product and cross product scalar triple product and vector triple product

Unit –2: **Vector Calculus:** Differentiation of vector, Del operator, scalar and vector fields, gradient, divergence and curl

Unit –3: **Gauss, Stoke and Green's theorem**: Gauss divergence theorem, Stokes' theorem, Greens theorem

BLOCK 2 Mechanics of a Particle

Unit –4: **Newton's laws and Conservation principles:** Newton's laws of motion, principle of conservation of linear momentum

Unit –5: **Principles of conservation of energy and angular momentum**: Conservation of energy, principle of conservation of angular momentum

Unit –6: **Rotational motion**: Rotational motion, angular velocity, angular acceleration, angular momentum, torque

Unit –7: **Motion of Charged particle**: Motion of Charged particle in Crossed electrical and magnetic field

BLOCK 3 Dynamics of Rigid Bodies:

Unit –8: **Moment of inertia**: Equation of motion, angular momentum vector, Moment of inertia and radius of gyration Physical significance of MI, theorems of parallel and perpendicular axes, Rotational kinetic energy

Unit –9: **Formulation of moment of inertia**: Formulation and derivation of moment of inertia for some simple symmetric systems (rod, rectangular lamina, circular lamina, solid sphere, cylinder)

Unit –10: **Pendulums:** Compound pendulum, Kater's pendulum, and applications.

BLOCK 4 : Gravitation and Properties of matter

Unit –11: **Gravitation**: law of Gravitation, Gravitational field and potential, Gravitational potential energy

Unit –12: **Escape velocity and gravitational potential**: Escape velocity, Gravitational field, Gravitational potential and intensity due to thin uniform spherical shell and solid sphere of uniform density

Unit –13: **Conservative forces and inverse square law**: Conservative and non-conservative forces. Force as gradient of potential energy. Particle collisions. Centre of mass frame and laboratory frame, Inverse square law, Kepler's laws

Unit –14: **Elasticity and elastic constants:** Hook's law, elastic constants, relation between elastic constants.

Unit –15: **Torsion of cylinder and bending of beam**: Torsion of cylinder, bending of beam cantilever, shape of girder.