Syllabus

SEMESTER I
PHY (N)-101   **MECHANICS**   **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.
BLOCK 5: Relativity
Unit –16: **Frame of reference and Relativity:** Inertial and non-inertial frame of reference, Michelson-Morley experiment and its outcome, Lorentz Transformations, Postulates of special theory of relativity length contraction, time dilation, relativistic transformation of velocity, Velocity dependence of mass, equivalence of mass and energy, Relativistic Doppler Effect.