

Classical Mechanics and Special Relativity

Dimensions of Physical Quantities : Principle of dimensional homogeneity

Vectors : Axial and polar vectors, dot product and cross product, scalar triple product and vector triple product. Scalar and vector fields --- gradient, divergence and curl, statement of divergence theorem, statement of Stokes' theorem.

Mechanics of a Particle : (a) Newton's laws of motion, principle of conservation of linear momentum, time and path integral of force, conservative force field, concept of potential, conservation of total energy, equation of motion of a system with variable mass.
(b) Rotational motion, angular velocity, angular acceleration, angular momentum, torque, fundamental equation of rotational motion, principle of conservation of angular momentum, radial and cross-radial acceleration.

Dynamics of Rigid Bodies : Moment of inertia and radius of gyration - their physical significance, theorems of parallel and perpendicular axes, rotational kinetic energy, calculation of moment of inertia for some simple symmetric systems. Physical significance of MI.

Gravitation : Gravitational potential and intensity due to thin uniform spherical shell and solid sphere of uniform density, escape velocity.

Special Theory of Relativity : Frame of reference, Galilean relativity, Postulates of STR, formulae of (i) Length contraction; (ii) Time dilation; (iii) Velocity addition; (iv) Mass variation, and (v) Mass-Energy equivalence.