

CC – III – MECHANICS AND RELATIVITY

UNIT – I : Dynamics Projectile, Impulse, Impact.

Projectile – range of horizontal and inclined plane – Impulse – Impact – Impulsive force – Laws of impact – Impact of a smooth sphere on a smooth horizontal plane – Direct and oblique impacts – Loss in kinetic energy – Motion of two interacting bodies – reduced mass.

UNIT – II : Dynamics of rigid bodies.

Kinetic energy of rotation – Theory of compound pendulum – Equivalent simple pendulum – Reversibility of centres of oscillation and suspension – Determination of g and radius of gyration of a bar pendulum – period of oscillation of a Bifilar pendulum with and without parallel threads - Centre of mass – Velocity and acceleration of centre of mass – determination of motion of individual particle – system of variable mass – equation for a Rocket – Conservation of linear and angular momentum.

UNIT – III

Gravitation and Centre of Gravity - Gravitational potential and field due to spherical shell - Gravitational energy – Boy's method of determination of G – Centre of gravity of solid and hollow tetrahedron. Solid and hollow hemisphere – Stability of equilibrium.

UNIT – IV: Centre of Pressure.

Vertical rectangular lamina – Vertical triangular lamina - Vertical circular lamina – Atmospheric pressure its variation with altitude – Reasons for such variation.

Hydrodynamics:

Equation of continuity of flow – Euler's equation for unidirectional flow – Torricelli's theorem – Bernoulli's theorem and applications.

UNIT – V : Relativity

Galilean – Newtonian relativity, Galilean transformations – Michelson Morley experiment and its importance – Einstein's postulates – Lorentz transformations and its interpretation – consequence of Lorentz transformation – Length contraction, time dilation – relativistic addition of velocities – Mass energy equivalence – Basic ideas of general theory of relativity.

Books for Study:

1. Mechanics – Part – I & II Naryanamoorthy.
2. Classical Mechanics – H. Goldstein.
3. Statistical Mechanics – Sathyaprakash and C. Agarwal.

Books for Reference:

1. Elementary Statistical Mechanics – Gupta Kumar.
2. Mechanics – D.S. Mathur.
3. Classical Mechanics – Gupta, Kumar and Sharma.
4. Feynman Lecture on Physics – Vol.I – R.P. Feynman.