

Mechanics and Relativity - Core Subject 1

Unit I

Newton's laws of motion, momentum and impulse - Law of conservation of linear momentum - collision - Elastic and Inelastic collision - Newton's law of impact coefficient of restitution - impact of moving sphere on a fixed plane - Direct Oblique impact of moving two smooth spheres - calculation of final velocity of the spheres - loss of Kinetic energy.

Unit II

Moment of inertia of circular disc, about an axis passing through its center and perpendicular to its own axis - Moment of inertia of a solid sphere about all axes - Angular momentum and Torque - Relation between angular momentum and torque - Kinetic energy of rotation - Expression for the acceleration of a body rolling down on an inclined plane.

Unit III

Satellites - Orbital Velocity - Stationary satellite - Escape velocity - Jet plane, Rocket - Principle theory of rocket - velocity of rocket at any instant - Rocket propulsion systems - Specific impulse - Multistage Rocket - Shape of the Rocket.

Unit IV

Frames of reference - Inertial frames of reference - Galilean transformation, Newtonian relativity - Michelson-Morley Experiment - Significance of negative result.

Unit V

Postulates of Special theory of relativity - Lorentz transformation - Lorentz, Fitzgerald contraction - time dialation - relativistic addition of velocities.

Simultaneity - relativistic momentum, relativistic mass - Mass-Energy equivalence - Relation between total energy, rest mass energy and momentum.

Books for study:

Mechanics - D.S. Mathur, S. Chand & Co, Edition 2002.

Reference Books

Mechanics Part I and Part II, Narayanammoorthy National Publishing Company, 2001.

Fundamental of Physics, D. Hallidary, Resnick and J. Walker, 6th Edition, Wiley, New York 2001.

PROPERTIES OF MATTER SKILL BASED

Unit I

Elasticity - stress, strain - Poisson's ratio - Hook's law - Young's modulus - bending of a beam - bending moment - uniform and non-uniform - theory.

Unit II

Kepler's law of planetary motion - Newton's law of gravitation - Mass of Earth.

Potential at a point inside and outside a spherical shell.

Unit III

Variation of 'g' with depth, altitude and latitude - Earth quake - Seismograph - Modern application of seismology.

Unit IV

Definition of surface tension - angle of contact - Excess of Pressure in synclastic and anticlastic surface - Capillary rise.

Unit V

Viscosity - coefficient of viscosity - stream lined and turbulent motion - Critical velocity - capillary flow - Bernoulli's theorem - Venturimeter - Pilot's tube.

Book for study

Elements of Properties of matter - D.S. Mathur - S. Chand & Co., 2004

Properties of matter - Murugesan - S.Chand & Co., 2004.

Reference Book:

Properties of matter - Brijlal and Subramanian S.Chand & Co., 2006.