

Course code	Course Title	C	H	I	E	T
17U1PAC1/ 17U4PAC2	Mechanics and properties of matter	2	4	25	75	100

Unit 1 Mechanics

Laws of impact – Direct impact of spheres – Expression for loss of kinetic energy during collision – Moment of inertia – Parallel & perpendicular axes theorem – Proof – Law of conservation of angular momentum – Expression for rotational kinetic energy – Torque – Moment of inertia of a uniform rod, circular disc and solid sphere (proof).

Unit 2 Elasticity

Definition of elasticity – Stress – Strain – Three moduli of elasticity – Units – Dimensions – Hooke's law – Definition – Yield point – Elastic limit – Elastic fatigue – Poisson's ratio – Definition – Limiting values – Relation between the three moduli – Torsion pendulum theory – Expression for bending moment – Cantilever – Beam supported at its ends and loaded in the middle.

Unit 3 Viscosity & fluid motion

Definition – Units – Dimension – Stream lined motion & turbulent motion – Definition – Poiseuille's formula to determine η (without correction for pressure head) – Equation of continuity – Bernoulli's theorem – Statement only – Venturimeter – Ostwald's viscometer – Motion of bodies in highly viscous media – Definition – Terminal velocity – Stoke's formula – Derivation – Experiment to determine the viscosity of a highly viscous liquid.

Unit 4 Surface tension

Definition – Units – Dimensions – Surface energy definition – Units – Excess pressure across a curved surface (special cases: spherical and cylindrical drop and bubble) – Angle of contact – Capillarity – Determination of surface tension by capillary rise – Experiment to determine surface tension & interfacial surface tension by drop weight method – Determination of surface tension of a liquid by Jaeger's method.

Unit 5 Gravitation

Kepler's laws of motion – Newton's universal law of gravitation – Determination of Gravitational constant by Boy's method – Acceleration due to gravity – Compound pendulum theory – Period – Inter changeability of point of suspension and oscillation – Variation of acceleration due to gravity (g) with altitude, depth, rotation of the earth, poles and equator – Difference between mass and weight – Inertial mass & gravitational mass – Satellites – Stationary satellite – Escape velocity.

Text Book(s):

1. Brijlal & N Subrahmanyam, 2001, Mechanics & Properties of matter, S.Chand & Co. Ltd.
Unit 1: Chapters 3.1, 3.2, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.16, 3.17, 3.20.
Unit 2: Chapters 6.1, 6.2, 6.5, 6.6, 6.9–6.11, 6.16, 6.17, 6.18, 6.19, 6.21, 6.22.
Unit 3: Chapters 7.1–7.5, 7.7(1), 7.9–7.11, 7.13.
Unit 4: Chapters 8.1–8.5, 8.7–8.10, 8.13–8.16, 8.17.
Unit 5: Chapters 5.2, 5.4, 5.6, 5.7, 5.9, 5.11, 5.12, 5.13, 5.16–5.21, 5.29–5.31.

References:

1. R.Murugesan, Mechanics, Properties of matter and sound, 2006, S.Chand & Co. Ltd.
 2. D.S. Mathur, Mechanics, 2006, S.Chand & Co. Ltd.
 3. Brijlal, N. Subrahmanyam and Jivan Seshan, Mechanics and Electrodynamics 2011, S.Chand & Co. Ltd.
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