

Course code	Course Title	C	H	I	E	T
17U1PMC1	Mechanics, properties of matter and sound	5	5	25	75	100

Unit 1 Dynamics of rigid bodies

Newton's law of motion – Principle of conservation of linear momentum – Collision – impulse – Work done by a constant force – Translatory and rotatory motion – Uniform circular motion – Centripetal and centrifugal forces - Moment of inertia (M.I.) and its physical significance – Angular acceleration and angular momentum – Conservation of angular momentum – Torque – Work done by torque – Theorem of perpendicular and parallel axes – M.I. of a thin uniform bar, ring, uniform circular disc and solid sphere – Kinetic energy of a body rolling on a horizontal plane – Acceleration of a body rolling down an inclined plane – M.I. of a flywheel and its uses.

Unit 2 Friction and gravitation

Static friction –Laws of friction–Sliding friction – Angle of friction – Cone of friction – Rolling friction – Friction and stability – Necessity of friction – Newton's law of gravitation – acceleration due to gravity – Compound bar pendulum – Inter changeability of points of suspension and oscillation – Minimum time period –Difference between mass and weight – Gravitational field – Gravitational potential energy – Gravitational potential and field due to a uniform solid sphere and thin circular plate – Rocket equation.

Unit 3 Elasticity

Elasticity – Definition – Stress – Strain – Three moduli of elasticity – Units – Dimension – Hook's law – Definition – Yield point – Elastic limit – Elastic fatigue – Poisson's ratio – Definition – Limiting values – Relation between three moduli – Twisting of a cylinder – Torsion pendulum – Bending of beams – Bending moment – Basic assumptions for theory of bending – Cantilever – Beam supported at its ends and loaded in the middle.

Unit 4 Viscosity, physics of low pressure and surface tension

Introduction – Stream line motion and rate of flow - Equation of continuity – Bernoulli's theorem – Venturimeter – Poiseuille's flow – Rotary oil pump – Mercury diffusion pump – Pirani gauge - Surface tension (S.T.) – Explanation and examples of S.T. – Surface energy – excess pressure inside a spherical liquid drop and soap bubble – Difference in pressure across a curved surface – Angle of contact (Definition only) – Capillarity – Theory – determination of surface tension by capillary rise and Jaeger's method.

Unit 5 Sound

SHM – Compositions of two SHMs in a straight line (analytical method only) – Composition of two simple harmonic vibrations of equal time periods acting at right angles – Uses of Lissajous figures - Free, undamped, damped and forced vibrations – Resonance and sharpness of resonance – Q factor – Applications. interference of sound waves – Analysis – Beats – analytical treatment of beats – Acoustics – Reverberation – Acoustic measurements – Factors affecting the

acoustics of buildings – Requisites for good acoustics – Ultrasonics – production – Piezo-electric oscillator – Applications.

Text Book(s):

1. Brijlal & N. Subrahmanyam, Properties of matter, 2001, S.Chand & Co. Ltd.
Unit 1: Chapters 2.10–2.15, 2. 17–2.20, 2.23, 3.1–3.11, 3.16–3.17, 3.20, 3.27–3.30.
Unit 2: Chapters 5.4, 5.9, 5.11–5.14, 5.20, 5.22–5.24, 5.26, 5.28, 5.34–5.35.
Unit 3: Chapters 6.1–6.2, 6.5, 6.6, 6.9–6.11, 6.14, 6.16, 6.18–6.22.
Unit 4: Chapters 7.1–7.5, 7.7(1), 7.9, 7.11, 7.12, 7.21–7.22, 7.24, 8.1–8.5,8.7–8.10, 8.13–8.17.
2. D.S. Mathur, Elements of Properties of Matter, 2006, S.Chand & Co. Ltd.
Unit 2: Chapters 11.1–11.3, 11.5–11.7.
3. Brijlal & N. Subrahmanyam, Text Book of Sound, 2010, Vikas publishing House Pvt. Ltd.
Unit 5: Chapters 1.3, 2.2 (analytical method only), 2.4, 2.9, 3.1–3.8, 6.6–6.7, 6.13–6.14, 10.14–10.15, 10.19–10.20, 10.22–10.23, 10.24 (3), 10.27.

References:

1. D.S. Mathur, Mechanics, 2006, S. Chand & Co. Ltd.
 2. Alonso and Finn, Physics, 1992, Addison–Wesley Publishing Company Inc.
 3. Halliday, Resnick and Walker, Fundamentals of Physics, 6th edition, 2001, John Wiley & Sons, Inc.
 4. Brijlal & N. Subrahmanyam and Jivan Seshan, Mechanics and Electrodynamics, 2011, S. Chand & Co. Ltd.
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