Course Code	Course Name	Credits
26PH001	MECHANICS AND PROPERTIES OF MATTER	04

Course Objectives

- To know the fundamentals of kinematics and dynamics of an object in different coordinate systems
- To understand the techniques for studying motion of an object in different systems
- To apply the fundamental concepts of vector for solving complex problems in mechanics.
- To study the properties of matter leads to information this is of practical value to both the physicist and the engineers.
- To recall about bending moments, beam deflection, energy of bending, and Cornu's method for measuring μ.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand about moment of inertia and its physical significance.
- Gain the knowledge about Newtonian mechanics of systems.
- Understand about various dynamics.
- Gain the knowledge of properties of matter.
- Gain the knowledge of theories of bending beam.

Unit 1 - Kinematics and Dynamics (12 Hrs.)

Kinematic equation - plane polar coordinates-circular motion and straight-line motion - Newton's laws - applications of Newton's laws - astronaut's tug of war, Freight train - Constraints - wedge and block - masses and pulley - contact forces - block and string - normal force and friction- block and wedge with friction.

Unit 2 – Momentum (12 Hrs.)

System of particles - Bola, center of mass - drum major's baton, non-uniform rod, conservation of momentum - Three body system, impulse -rubber ball rebound, flow of mass- spacecraft, rocket in free space and gravitational field, momentum transport to the surface.

Unit 3 - Work and Energy (12 Hrs.)

Equation of motion in one dimension - mass thrown upward, simple harmonic oscillator - work energy theorem in one dimension - Vertical motion in an inverse square field - work energy theorem - escape velocity, Applying the work energy theorem - inverted pendulum- work done by a central force - Potential energy - Energy diagrams – Power.

Unit 4 – Elasticity (12 Hrs.)

Stress and Strain - Stress - strain curve - Hooke's Law and Elastic Moduli - Poisson's ratio - Relation between elastic constants - Torsion of a Cylinder - Measurement of modulus of rigidity: Statical & Dynamical method - Measurement of moment of inertia by the torsional pendulum method - Potential Energy due to Deformation.

Unit 5 - Bending of Beams (12 Hrs.)

Internal bending moment - Beam bent by a constant couple - Cantilever - supported beam - energy of bending - beam rigidly fixed at both ends - Asymmetrically bent beam - Cornu's method of measuring μ - Uniform bending and Non-uniform bending - theory and experiments.

Reference Books:

1. Kleppner.,&Kolenkow. (2017). An introduction to Mechanics, (1st Ed.). McGraw-Hill.
2. Kittel, C., Knight, W., Helmholtz.,Ruderman., & Moyer. (2017). Mechanics, (2nd Ed.). McGraw-Hill.
3. SatyendraNathMaiti, Debi Prasath Raychaudhuri. (2008). Classical mechanics and general properties of Matter, (2nd Ed.). New Age International Publishers.
4. D.S. Mathur (2010), Elements of Properties of Matter. S. Chand & Company.

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc23_mm08/preview
2. https://scienceinfo.com/viscosity-definition-types-significance-applications/
3. https://youtu.be/eE7Ox8Rb0FE?si=JKMsByz5rgyFeuAj

COs and Bloom's Taxonomy Mapping – 26PH001		
Course Outcomes	**On successful completion of this course, students will be able to**	**BTL**
CO1	Recall and describe fundamental concepts, laws, and equations of mechanics, including rotational motion and harmonic oscillations.	K1, K2
CO2	Apply Newton's laws, energy, and momentum conservation principles to solve problems involving systems of particles.	K3
CO3	Analyze rotational dynamics of rigid bodies and compare methods for determining moment of inertia.	K4
CO4	Evaluate elastic properties of materials and justify the applicability of elasticity theories in practical situations.	K5
CO5	Design and perform experiments related to elasticity and bending of beams, and interpret the results.	K6

BTL (Bloom's Taxonomy Level) - K1 – Remembering, K2 – Understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6 - Create

Relationship Matrix – 26PH001													
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**						**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	3	2	1	1	1	1	3	3	1	1	1	1	1.58
CO2	3	2	3	1	1	1	2	2	3	2	1	1	1.83
CO3	3	3	2	1	1	1	2	2	3	2	2	1	1.92
CO4	2	2	2	2	1	1	2	1	2	3	3	1	1.83
CO5	3	2	3	1	1	2	2	2	3	2	2	3	2.17
												Total	1.87

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

FULLY HUMAN
Fully
Alive