

Subject Name:
Structural Mechanics

Subject Code:66441

Conducted by:Bikash Debnath

Course Plan

4. **Understand the concept of frictional forces.**
- 4.1 State friction, static friction and dynamic friction.
 - 4.2 Mention the laws of static friction and dynamic friction.
 - 4.3 Explain angle of friction and co-efficient of friction.
 - 4.4 Compute friction of a body on horizontal planes.
 - 4.5 Compute friction of a body on inclined planes.
 - 4.6 Compute frictional force acting on a ladder.
5. **Understand the aspects of centroid and centre of gravity.**
- 5.1 Define the terms: centroid and centre of gravity.
 - 5.2 State the axis of symmetry and parallel axis.
 - 5.3 Compute the centroid by the method of moment of the following sections:
 - a. rectangular
 - b. triangular
 - c. circular
 - d. semi-circular
 - e. hollow
 - f. I-shaped
 - g. T-shaped
 - h. L-shaped
 - 5.4 Solve problem on centre of gravity of a composite parallelepiped body.
6. **Understand the concept of moment of inertia.**
- 6.1 State 1st and 2nd moment of area.
 - 6.2 Explain the meaning of radius of gyration.
 - 6.3 Mention the theorems of moment of inertia.
 - 6.4 Compute the moment of inertia of plane area about any axis of the following sections:
 - a. rectangular
 - b. triangular
 - c. circular
 - d. semi-circular
 - e. hollow
 - f. I-shaped
 - g. T-shaped
 - h. L-shaped
7. **Understand the aspects of torsion on solid and hollow circular shaft.**
- 7.1 State the laws of motions.
 - 7.2 Explain the term circular motion.
 - 7.3 Define the terms: torsion and torsional stress.
 - 7.4 Mention the fundamental assumptions of torsional stress.
 - 7.5 Find the relation between torsional stress and strain.
 - 7.6 Interpret the formulas relating to finding torque
 - 7.7 Solve problems involving torsion.
8. **Understand shear force (SF) and bending moment (BM).**
- 8.1 Define the term 'beam'.
 - 8.2 List different types of beams.
 - 8.3 Mention various types of load on beams.
 - 8.4 Define shear force and bending moment.
 - 8.5 Differentiate between shear force and bending moment.

- To enable to apply the knowledge of scientific principles to problems of mechanical nature.
- To develop an understanding of mechanical properties of materials.
- To assist in applying mathematical and geometrical calculations to the analysis of statically determinate beams.

SHORT DESCRIPTION

Mechanical properties of material; Laws of forces; Moment; Friction; Centroid and centre of gravity; Moment of inertia; Torsion on circular shaft; Shear force and bending moment.

DETAIL DESCRIPTION

Theory:

- 1. Understand the important aspects of mechanical properties of materials.**
 - 1.1 Mention the necessity to know about the mechanical properties of materials.
 - 1.2 Define the following terms:
 - (a) Stress, tensile stress, compressive stress, shear stress.
 - (b) Strain, tensile strain, compressive strain, shear strain,
 - (c) Hooke's law, modulus of elasticity and modulus of rigidity.
 - 1.3 Explain stress-strain diagram of mild steel and concrete.
 - 1.4 Define the following terms:
 - (a) Elasticity, proportional limit, yield point, ultimate stress, breaking stress, working stress and factor of safety.
 - (b) Strength, stiffness, toughness, ductility, malleability, brittleness, creep, fatigue failure, resilience, modulus of resilience, thermal stress in simple bar and Poisson's ratio.
 - 1.5 Compute stress, strain, modulus of elasticity and modulus of rigidity.
 - 1.6 Solve problems involving resilience, thermal stress and Poisson's ratio.
 - 1.7 Compute stress developed in composite bar under tension and compression.
- 2. Understand the concept of laws of forces.**
 - 2.1 Explain the laws of forces.
 - 2.2 Define the following terms:
Force, co-planar forces, non-coplanar forces, concurrent forces, non-concurrent forces, co-linear forces, parallel forces, laws of equilibrium of forces.
 - 2.3 Mention the parallelogram laws of forces.
 - 2.4 State the composition of forces and resolution of force.
 - 2.5 Define component of force, rectangular component and resultant of forces.
 - 2.6 Compute the resultant force-
 - a. Triangle of forces
 - b. Polygon of forces
 - c. Converse laws of triangle and polygon laws of forces graphically.
 - 2.7 Calculate the resultant of forces: co-planar forces, concurrent forces, parallel forces and co-linear forces
 - 2.8 Explain Lami's theorem.
 - 2.9 Solve problems on Lami's theorem.
- 3. Understand the aspects of moment of forces.**
 - 3.1 Define the term moment (analytically and graphically).
 - 3.2 Differentiate moment with force.
 - 3.3 Explain Varignon's principle of moment.
 - 3.4 Distinguish like and unlike parallel forces.
 - 3.5 State the meaning of couple.
 - 3.6 Mention the properties of couple.
 - 3.7 Solve problems on moment of couple and moment of forces.
 - 3.8 Solve problems on moment of like and unlike parallel forces.