SOLID MECHANICS – I

Lectures / Tutorials : 4 / 1 Periods/Week	Sessional marks: 40
Semester End Exam. : 3 Hours	Semester End Exam. marks: 60
	Credits : 4

Course objectives:

- To understand the internal resistances against the applied loads on different shaped materials.
- To know the stress, strains and different engineering properties of materials.
- To introduce concept of shear force and bending moment.
- To introduce concept of torsion and design for torsion for materials.

Course outcomes:

- Able to understand the engineering properties of materials.
- Able to draw bending moment and shearing force diagrams for beams.
- Able to know and design for torsion problems.

UNIT-I

Stress

Introduction; Method of sections; Definition of stress; Normal stresses in axially loaded bars; Shear stresses ; Analysis for normal and shear stresses; Stresses on inclined sections in axially loaded bars; Allowable stress and factor of safety

Strain

Introduction; Normal strain; Stress-strain diagrams; Hooke's law; Deformation of axially loaded bars; Thermal strain and deformation; statically indeterminate axially loaded bars; Shear strain; Hooke's law for shear stress and shear strain

Generalized Hooke's law and Pressure vessels

Poisson's ratio; Generalized Hooke's law for isotropic materials; Relationship between Modulus of elasticity and Modulus of rigidity; Dilatation and Bulk modulus; Thin-walled pressure vessels **–** Cylindrical and spherical vessels

UNIT-II

Internal forces in beams

Introduction; Diagrammatic conventions for supports and loads; Calculation of beam reactions; Application of method of sections; Shear force in beams; Bending moment in beams; Shear force and bending moment diagrams; Differential equations of equilibrium for a beam element.

UNIT-III

Normal stresses in beams

Introduction; Basic assumptions; The elastic flexure formula ; application of flexure formula; Unsymmetric bending **–** Bending about both principal axes of a beam with symmetric cross section.

UNIT-IV

Shear stresses in beams

Introduction; Shear flow; The shear stress formula for beams; Shear stress in beam flanges; Shear centre

Torsion

Introduction; Application of the method of sections; Torsion of circular elastic bars – Basic assumptions, the torsion formula ; Power transmission by circular shafts

NOTE

Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOK

1. Mechanics of Materials by Pytel and Kiusalaas , Cengage Learning, 2003.

REFERENCES

1. Mechanics of materials by E.P. Popov , Prentice Hall of India ,1986.
2. Elements of strength of materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press Pvt.Ltd.,2005.

WEB REFERENCES:

http://nptel.iitm.ac.in/video.php?subjectId=105101084
http://www.engineeringcivil.com/theory/civil-engineering-notes-from-universities/