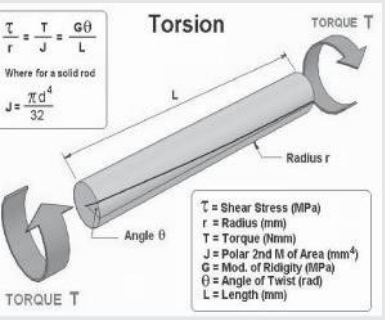

16ME203 MECHANICS OF SOLIDS

Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
10	20	-	5	5	5

Course Description and Objective:

This course deals with the fundamental concepts of mechanics of deformable solids, static equilibrium, stress analysis of pressure vessels and geometry of deformation. The objective of this course is to enable the students to solve problems in solid mechanics and design various types of structural members subjected to different types of loads.

Course Outcomes:

The student will be able to:

- understand the concepts of stress-strain for homogenous and isotropic materials.
- draw shear force and bending moment diagrams for beams subjected to different boundary and loading conditions.
- derive flexural formula and calculate shear stress variation for various cross sections.
- calculate stresses and strains for thin walls of spherical and cylindrical pressure vessels.
- determine the deflections and slopes produced by axial, torsional, and flexural loads.

SKILLS:

Plot stress-strain curves for various engineering materials.

Calculate axial deflection for various boundary conditions.

Analyze thermal stresses for statically determinate and indeterminate structures.

Identify shear stress distribution for different cross sections.

Calculate torsion of circular shafts fixed at both the ends.

Understand the concepts of columns and struts for different end conditions.

UNIT - 1 **L-9**

SIMPLE STRESSES AND STRAINS: Types of Stresses and Strains, Hooke's law, Stress-strain diagram for Ductile and Brittle materials, Elastic Constants - Relations; Stress analysis of simple and compound bars, Thermal stresses, Stress on an inclined plane, Principle stresses - Mohr circle.

UNIT - 2 **L-9**

SHEAR FORCE AND BENDING MOMENT: Types of loads and beams, Shear force and bending moment diagrams of Cantilever, Simply supported and over-hanging beams subjected to different types of loads, Point of contra flexure.
DEFLECTION OF BEAMS: Deflection equation for elastic curve of a beam, Deflection and slope for cantilever and simply supported beams for different types of loads using double integration, Macaulay's and Area moment methods.

UNIT - 3 **L-9**

FLEXURE AND SHEAR STRESSES: Assumptions in theory of simple bending, Derivation of flexural formula, Bending stresses for various cross sections in beams, Variation of shear stress in beams and shear stress distribution for various cross sections.

UNIT - 4 **L-9**

TORSION: Assumption and derivation of torsion equation, Shear stress distribution for circular shafts, Percentage of weight reduction (solid and hollow) fixed at both the ends.

UNIT - 5 **L-9**

THIN SHELLS: Introduction, Hoop and Longitudinal stresses and strains
COLUMNS AND STRUTS: Euler's Formula for critical load of columns for different end conditions, Limitations of Euler's theory, Rankines formula, Simple Numerical problems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours:30

1. Tensile test on mild steel
2. Deflection test on
   a) Simply supported beam.
   b) Cantilever beam.
3. Torsion test on solid circular shaft.
4. Brinell and Rockwell hardness test.
5. Impact test.

TEXT BOOKS:

1. S.S.Bhavikatti, "Strength of Materials", 3rd edition, New Age International Publishers, 1998.
2. Gere & Timoshenko, "Strength of Materials", 2nd edition, CBS Publishers, 2006.

REFERENCE BOOKS:

1. Egor P. Popov, "Engineering Mechanics of Solids", 3rd edition, Prentice Hall of India, 1997.
2. Arthur P. Borsei, "Advanced Mechanics of Materials", 6th edition, John Wiley and Sons, 2003.

ACTIVITIES:

- *Tensile test on mild steel and indicate the principal plane on which the crack appears.*
- *Torsion test for a solid circular shaft.*
- *Impact test on V-notch.*
- *Deflection of beams under transverse loading.*
- *Write a program for assessing deflection of beams for various support conditions.*