Course No	Course Name	L-T-P-Credits
CE 201	**SOLID MECHANICS**	**(3- 0/1- 0:3/4)**

Prerequisite: nil;   Co requisite: nil

Course Objectives:
1.   To understand the basic concepts of solid mechanics
2.   To introduce the concept of stress strain and deformation due to internal actions.

Course Outcomes:
1.   To understand the theory of elasticity including strain/displacement and Hooke's law relationships;
2.   To analyse solid mechanics problems using classical methods and energy methods;
3.   To solve torsion problems in bars and thin walled members;
4.   To solve for stresses and deflections of beams under unsymmetrical loading;
5.   To locate the shear centre of thin wall beams;
6.   To obtain stresses and deflections of beams on elastic foundations;

SYLLABUS

Module	Contents	Hours
	Stress	05
I	Definition of stress, Stress at a point – matrix of stress / stress tensor, Symmetry of stress tensor, Equilibrium of a body – differential equations of equilibrium, Different states of stress – uniaxial, biaxial, plane stress, etc., Transformation of plane stress; extension to 3-D, Principal stresses and maximum shear stress, Mohr's circle	
	Strain	04
II	Definition of strain – shear and normal strains, Strain at a point – matrix of strain / strain tensor, Symmetry of strain tensor, Different states of strain – uniaxial, plane strain, etc., Transformation of plane strain; extension to 3-D, Principal strains, Mohr's circle for plane strain	
	Mechanical properties	04
III	Stress-strain diagrams, generalized Hooke's law, Lame's constant, elastic modulus, bulk modulus, Relationship between different elastic constants	
	Bending	07
IV	Relation between transverse loads, shear and bending moments, Shear and bending moment diagrams, Pure bending – beams with symmetric cross-sections, Beams with composite cross-section, Shear stresses in beams, Deflections in beams	
	Torsion	05
V	Torsional moment diagrams, Torsion formula for circular cross-sections, Maximum normal and shear stresses, Angle of twist	
VI	**Energy methods** Stored energy in elastic members – axial, torsional, bending, etc. Castigliano's theorem, Application of Castigliano's theorem to different classes of problems, Virtual work principles – the basis, Application of virtual work principles to classes of problems	07
VII	**Elastic stability** Motion of stability of equilibrium, Euler buckling, Members with eccentric loading, etc.	04

Essential Readings:

1. Kazimi S.M.A., "Solid mechanics- First revised edition", Tata McGraw Hill.; Twenty sixth edition, 2006
2. Popov E. P., "Engineering Mechanics of Solids", Dorling Kindersley (India) Pvt Ltd; Second edition, 1999
3. Timoshenko, S.P. and Gere, J.M., Mechanics of Materials, Tata McGraw Hill, First edition, 1992.

Supplementary Readings:
1. Srinath L. S., "Advanced Solid Mechanics", Tata McGraw Hill; Third edition, 2010
2. Pitarresi J.M., "Introduction to Solid Mechanics", Prentice Hall of India; Third edition, 2000