MECHANICS OF SOLIDS

III Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AAEB04	Core	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The primary objective of mechanics of solid is concerned with establishing an understanding of the behavior of structure basic structural components such as beams, columns, frames, plates and shells, when subjected to different loads or other actions which have the effect of changing the state of stress and deformation of the structure.

II. OBJECTIVES:

The course should enable the students to:
I.   Understand various aspects of mechanics of materials as applied to engineering problems in a systematic manner stressing the fundamentals.
II. Analyze problems on thermal stresses, shear force, bending moment and deflection of beams
III. Discuss the equilibrium and compatibility conditions for two-dimensional and three-dimensional elastic bodies.

III. COURSE OUTCOMES (COs):

COs	Course Outcome
CO 1	To understand the basics of material properties, stress and strain.
CO 2	To apply knowledge of various kinds of beams for engineering applications.
CO 3	Ability to identify, formulate, and solve engineering & real life problems.
CO 4	Ability to design and conduct experiments, as well as to analyze and interpret data.
CO 5	Ability to design a component to meet desired needs within realistic constraints of safety.

IV. SYLLABUS:

MODULE -I	INTRODUCTION	Classes: 10

Properties of Engineering materials, Stresses and strains, Hooke's law, elastic constant, relation between module, working stress, factor of safety, poisons ratio, bars of varying cross section; Thermal stresses. Torsion of solids, Concept of Stain Energy.

MODULE -II	FORCES, DEFLECTION IN BEAMS	Classes: 09

Shear force and bending moment diagrams for different types of beams with point load, uniform distributed load and uniform varying load.

Deflection of beams by Double integration method, Macaulay's method, moment area method, Principle of superposition.

MODULE -III	STRESS IN BEAMS	Classes: 09

Bending stresses: Theory of simple bending, Bending stress, Position of neutral axis, Bending stresses in beams of symmetric and un-symmetric sections, Beams of uniform strength.

Shear stresses: Shearing stresses at a section in a loaded beam, Distribution of shearing stresses over different sections like Rectangular, Triangular, circular, I, L and T-sections.

MODULE -IV	COLUMNS	Classes: 08

Columns, types of columns, Euler's formula instability of columns, Rakine's and Jonson's formula, Eigen values and Eigen modes, concept of beam-column.

MODULE -V	THEORY OF ELASTISITY	Classes: 09

Equilibrium and compatibility conditions and constitute relations for elastic solid and plane: generalized plane strain cases Airy's stress function

Stress on inclined planes, stress transformations determination of principal stresses and strains by analytical method and graphical method - Mohr's circles and its constructions.

V. Text Books:

1. B C Punmia, "Mechanics of Materials", Laxmi publications (P) Ltd, 2006.
2. T. H. G. Megson, "Aircraft Structures for Engineering Students", Butterworth-Heinemann Ltd, 5th Edition, 2012.
3. Gere, Timoshenko, "Mechanics of Materials", McGraw Hill, 3rd Edition, 1993.

VI. Reference Books:

1. R. K Bansal, "Strength of Materials", Laxmi publications, 5th Edition, 2012.
2. Dym, C. L, Shames, I. H, "Solid Mechanics", McGraw Hill, Kogakusha, Tokyo, 7th Edition, 2007.
3. Stephen Timoshenko, "Strength of Materials", Vol I & II, CBS Publishers and Distributors, 3rd Edition, 2004.
4. R. K. Rajput, "Strength of Materials", S. Chand and Co., 1st Edition, 1999.
5. Timoshenko, S, Young, D. H. "Elements of Strength of Materials", T. Van Nostrand Co. Inc., Princeton N.J, 4th Edition, 1977.

VII. Web References:

1. www.nptel.ac.in/courses/112107147/
2. www.vssut.ac.in/lecture_notes/lecture1423904647.pdf
3. www.web.mit.edu/emech/dontindex-build/

VIII. E-Text Books:

1. www.e-booksdirectory.com/listing.php?category=456
2. www.esag.harvard.edu/rice/e0_Solid_Mechanics_94_10.pdf
3. www.itiomar.it/pubblica/dispense/MECHANICAL%20ENGINEERING%20HANDBOOK/