

COURSE CODE	COURSE TITLE	L	T	P	C
1151AE103	STRENGTH OF MATERIALS	2	2	0	3

Course Category:

Programme core

a. Preamble :

The course provides an introductory study on stresses and strain on deformable solids. It focuses on the analysis of members subjected to axial, bending, and torsional loads. The course discusses in detail, the shear force and bending moments on beams. It introduces the concept of principal stresses in the analysis of structural members. In a nutshell, the course aims at developing the skill to solve engineering problems on strength of materials

b. Prerequisite Courses:

- Engineering Mathematics II

c. Related Courses:

- Aircraft structural mechanics
- Approximate Methods in structural Mechanics
- Composite Materials and Structures
- Experimental Stress Analysis
- High Temperature Materials
- Theory of Elasticity

d. Course Educational Objectives:

- To develop understanding of the basic concepts related to tensile, compressive and shear stresses in engineering components.
- To discuss the basic principles of torsion in shafts, shear force and bending moment in beams, deflection in springs and beams and to analyze the axial stresses of thin cylinders and spherical shells

e. Course Outcomes:

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Quote the stress and strain relationship and also distinguish the determinate and indeterminate structures.	K2
CO2	Determine the shear force and bending moment diagrams for various beams.	K3
CO3	Solve deflection of beams under various loading conditions	K3
CO4	Estimate the torsional load over shaft.	K5
CO5	Illustrate principle stresses, knowledge of calculating deformation in thin cylindrical and spherical shells.	K4

f. Correlation of COs with POs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M		H			M	H	L	H		
CO2	H	M		H			M	H	L	H		
CO3	H	M		H			M	H	L	H		
CO4	H	M		H			M	H	L	H		
CO5	H			H			M	H	L	H		

H- High; M-Medium; L-Low

g. Course Contents:

UNIT I - BASICS AND AXIAL LOADING

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Stress and Strain – Hooke’s Law – Elastic constants and their relationship– Statically determinate cases - statically indeterminate cases –composite bar. Thermal Stresses – stresses due to freely falling weight.

UNIT II - STRESSES IN BEAMS

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Shear force and bending moment diagrams for simply supported and cantilever Beams-Bending stresses in straight Beams-Shear stresses in bending of beams with rectangular, I&T, etc. cross sections-beams of uniform strength

UNIT III - DEFLECTION OF BEAMS

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Double integration method – McCauley’s method - Area moment method – Conjugate beam Method-Principle of super position-Castigliano’s theorem and its application

UNIT IV –TORSION

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Torsion of circular shafts - shear stresses and twist in solid and hollow circular shafts – closely coiled helical springs. –

UNIT V - BI AXIAL STRESSES

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Stresses in thin circular cylinder and spherical shell under internal pressure – volumetric Strain. Combined loading – Principal Stresses and maximum Shear Stresses - Analytical and Graphical methods.

Total Periods: 30 + 30 = 60 periods

h. Learning Resources

i. Text Books:

1. James M. Gere, Timoshenko, “Mechanics of Materials” 2nd edition, CBS Publisher,2006
2. Timoshenko.S. and Young D.H. – “Elements of strength materials Vol. I and Vol. II”., T. Van Nostrand Co-Inc Princeton-N.J. 1990.

ii. References:

1. William Nash, “Strength of Materials”, Schaum's Outlines, 4th edition, 1998
2. Irving H. Shames, James M. Pitarresi, “Introduction to Solid Mechanics”, Pearson, 3rd edition, 1999