

1151AU103

STRENGTH OF MATERIALS

L T P C
2 2 0 3**1. Preamble**

This course provides knowledge of stresses, strains and deformations in components due to various loads. It helps in assessing the stresses and deformations through mathematical models of beams, twisting bars or combinations of both.

2. Prerequisite

1151AU101	Engineering Mechanics
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3. Links to other Courses

- Engine Design and Development
- Vehicle Design and Data Characteristics
- Finite Element Analysis

4. Course Educational Objectives

After successful completion of this course, students will be able to

- Understand the basic concepts related tensile, compressive and shear stresses in engineering components.
- Understand the basic principles of torsion in shafts, shear force and bending moment in beams, deflection in springs and beams.

5. Course Outcomes

Upon the successful completion of the course, learners will be able to

CO Nos.	Course Outcomes	Level of learning domain (Based on revised Bloom's)
CO1	Explain the fundamental concepts of rigid and deformable solids in the perspective of stress, strain and energy.	K2
CO2	Illustrate the theory, principles associated to torsion in solid, hollow, stepped shaft and springs.	K3
CO3	Calculate the loads in beams, forces and moments associated with different sections.	K3
CO4	Derive moment and deflection of various types of beams using different methods	K3
CO5	Apply the principles of bi-axial state of stresses in various problems	K3

6. Correlation of Cos with Programme Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	H	H	H								L	L	H	H
CO2	H	H	H								L	L	H	H
CO3	H	H	H								L	L	H	H
CO4	H	H	H								L	L	H	H
CO5	H	H	H								L	L	H	H

H- High; M-Medium; L-Low

7. Course Content:

UNIT – I: DEFORMATION OF SOLIDS

L-6 T-6

Introduction to Rigid and Deformable Bodies – Types of Load, Stress, Strain, Tensile- Stress And Strain, Compressive Stress and Strain - Normal Stress – Hooke’s Law, Shear Stress and Strain, Shear Modulus, Bearing Stress, Stress-Strain Diagram, Factor of Safety, Selection of Factor of Safety, Poisson’s Ratio, Volumetric Strain-Relation Between Bulk Modulus and Young's Modulus, Relation Between Young's Modulus and Modulus of Rigidity, Impact Stress, Stress in Simple and Composite Bars Under Axial Load – Thermal Stress – Strain Energy

UNIT – II: TORSION

L-6 T-6

Theory of Torsion Equation-Torsion of Solid and Hollow Circular Bars – Shear Stress Distribution – Stepped Shaft – Twist And Torsion Stiffness – Compound Shafts – Springs – Types - Helical Springs – Shear Stress And Deflection in Springs.

UNIT – III: BEAMS&COLUMNS

L-6 T-6

Types : Beams , Short and Long Beam, Supports and Loads – Shear Force and Bending Moment Diagram – Cantilever, Simply Supported ,Overhanging Beam, Fixed Beam, Continuous Beam –Theory of Simple Bending – Stress, Shear Stress in Beams – Evaluation Of ‘I’ , ‘L’ & ‘T’ Sections - Columns

UNIT – IV: DEFLECTION OF BEAMS

L-6 T-6

Introduction –Flexural Formula, Evaluation of Beam Deflection and Slope: Cantilever, Simply Supported Beams- Macaulay Method and Moment-Area Method

UNIT – V: ANALYSIS OF STRESSES IN TWO DIMENSIONS

L-6 T-6

Biaxial State of Stresses – Principal Planes And Stresses – Mohr’s Circle For Biaxial Stresses – Maximum Shear Stress. Introduction to Theories of Failure-Stresses in Thin Cylindrical and Spherical Shells

Total: 60 periods

8. Text Books

1. Nash W.A, “Theory and problems in Strength of Materials”, Schaum Outline Series, McGraw-Hill Book Co, New York, 2014.
2. Timoshenko S.P, “Elements of Strength of Materials”, Tata McGraw-Hill, New Delhi 2013.

9. References

1. Popov E.P, “Engineering Mechanics of Solids”, Prentice-Hall of India, New Delhi, 2010.
2. Ramamurtham, S, Narayan .R, "Strength of materials", 16th Edition, DhanpatRaiPublishing Co, 2008.
3. Jindal U.C. “Strength of Materials” Asian Books Pvt Ltd, New Delhi 2007.
4. Bansal, R.K., A Text Book of Strength of Materials, Lakshmi Publications Pvt. Limited, New Delhi, 2012
5. Rajput.R.K. “Strength of Materials”, S.Chand& co Ltd. New Delhi 2012.
6. Khurmi R.S, A Text book of strength of materials, S.Chand& co Ltd. New Delhi 2012
7. <http://nptel.ac.in/courses/112101095/>