

# Strength of Materials

S.E. Sem. III [MECH/AUTO]

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## EVALUATION SYSTEM

	Time	Marks
<b>Theory Exam</b>	3 Hrs.	100
<b>Practical Exam</b>	2 Hrs.	25
<b>Oral Exam</b>	–	25
<b>Term Work</b>	–	25

## SYLLABUS

### 1. Stress and Strain

Definition, Stress strain, tensile and compressive stresses, shear, stress-Elastic limit, Hooke's law, Poisson's ratio, modulus of elasticity, modulus of rigidity, bulk modulus, yield stress, ultimate stress, factor of safety, state of simple shear, relation between elastic constants, volumetric strain, volumetric strain for tri-axial loading, deformation of tapering members, deformation due to self weight, bars of varying sections, composite sections, Temperature stresses.

### 2. Shear force and bending moment in Beams

Axial force, shear force and bending moment diagrams for statically determinate beams including beams with internal hinges for different types of loading, relationship between rate of loading, shear force and bending moment.

### 3. Stresses in Beams

Theory of pure bending. Assumptions, Flexural formula for straight beams, moment of resistance, bending stress distribution. Section moduli for different sections, beams of uniform strength, Fatched beams, principle axes, principle moment of inertia.

**Direct and bending stresses.** Core of section, chimneys subjected to wind pressure.

**Shear stresses in Beams :** Distribution of shear stress across plane sections used commonly for structural purposes, shear connectors.

### 4. Torsion

Torsion of circular shafts – solid and hollow, stresses in shaft when transmitting power, Shafts in series and parallel.

**Strain Energy :** Resilience, proof Resilience, strain energy stored in the member due to gradually applied load, suddenly applied load, impact load, strain energy stored due to shear, strain energy due to bending, strain energy due to Torsion.

### 5. Deflection of Beams

Deflection of cantilevers, simply supported and over hanging beams using double integration and Macaulay's methods for different types of loadings.

**Thin Cylindrical and Spherical Shells :** Stress and strain in thin Cylinders and spheres due to internal pressure, Cylindrical shell with hemispherical ends.

### 6. Principle Stresses

General equations for transformation of stress. Principal planes and principal stresses, maximum shear stress, determination using Mohr's circle, maximum principal & maximum shear stress theory of failure. Combined Bending and Torsion, Equivalent Bending moment and equivalent torque.

**Columns and struts :** Backling load, Types of end conditions for column, Euler's column theory and its Limitations, Rankin Gordon Formula.

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**Reference :**

1. Mechanics of Structure (Vol. 1) (*SB Junnakar & Shah*) Charotar Publisher.
2. Strength of Materials (*S. Ramamarutham*).
3. Engineering Mechanics (*Timoshenko & Young*) Tata McGraw Hill.
4. Mechanics of Materials (*EP Popov*) Prentice Hall of India.
5. Strength of Materials (*W.A. Nash*) Schaum's Outline Series, Tata McGraw Hill.
6. Mechanics of Materials (*James Gere*) Thompson Learning.
7. Mechanics of Materials (*Ferdinand P. Beer, E. Russell Johnson, Jr. John Dewolf*) McGraw Hill Int.
8. Theory of Elastic Stability (*Timoshenko & Gere*) Tata McGraw Hill.
9. Strength of Materials (*G.H. Ryder*) MacMillan.
10. Strength of Materials (*R. Subramaniam*) Oxford.
11. Strength of Materials A Practical Approach (Vol. 1) (*D.S. Prakash Rao*) University Press.

