

AMEV-02 MECHANICS OF SOLID

OBJECTIVES:

- 1 To learn fundamental concepts of stress, strain and deformation of solids with applications to bars, beams and thin cylinders.
- 2 To know the mechanism of load transfer in beams, the induced stress resultants and deformations.
- 1 To understand the effect of torsion on shafts and springs.
- 2 To analyse a complex two dimensional state of stress and plane trusses

UNIT I STRESS AND STRAIN

Stress and strain at a point – Tension, Compression, Shear Stress – Hooke's Law – Relationship among elastic constants – Stress Strain Diagram for Mild Steel, TOR steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety – Thermal Stresses – Thin Cylinders and Shells – Strain Energy due to Axial Force – Resilience – Stresses due to impact and Suddenly Applied Load – Compound Bars.

UNIT II SHEAR AND BENDING IN BEAMS

Beams and Bending- Types of loads, supports – Shear Force and Bending Moment Diagrams for statically determinate beam with concentrated load, UDL, uniformly varying load. Theory of Simple Bending – Analysis of Beams for Stresses – Stress Distribution at a cross Section due to bending moment and shear force for Cantilever, simply supported and overhanging beams with different loading conditions - **Flitched Beams.**

UNIT III DEFLECTION

Double integration method - Macaulay's methods - Area moment method - conjugate beam method for slopes and deflections of determinant beams.
computation of beams.

UNIT IV TORSION

Torsion of Circular and Hollow Shafts – Elastic Theory of Torsion – Stresses and Deflection in Circular Solid and Hollow Shafts – combined bending moment and torsion of shafts - strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel – Closed and Open Coiled helical springs – Leaf Springs – Springs in series and parallel – Design of buffer springs.

UNIT V COMPLEX STRESSES AND PLANE TRUSSES

2 D State of Stress – 2 D Normal and Shear Stresses on any plane – Principal Stresses and Principal Planes – Mohr's circle - Plane trusses: Analysis of plane trusses - method of joints - method of sections.

OUTCOMES:

The students will have

- 1 Thorough understanding of the fundamental concepts of stress and strain in mechanics of solids and structures.

- 2 the ability to analyse determinate beams and trusses to determine shearforces, bending moments and axial forces.
- 3 a sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities.

TEXT BOOKS:

- 1 Rajput.R.K. "Strength of Materials", S.Chand and Co, New Delhi, 2007.
- 2 Bhavikatti. S., "Solid Mechanics", Vikas publishing house Pvt. Ltd, New Delhi, 2010.

REFERENCES:

- 1 Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 200-.
 - 2 Timoshenko.S.B. and Gere.J.M, " Mechanics of Materials", Van Nos Reinbhold, New Delhi 1--5.
 - 3 Vazirani.V.N and Ratwani.M.M, "Analysis of Structures", Vol I Khanna Publishers, New Delhi,1--5.
 - 4 Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 1--7.
- Ugural. A.C., "Mechanics of Materials", Wiley India Pvt. Ltd., New Delhi, 2013.