

(ME 503) ADVANCED MECHANICS OF SOLIDS

Objective of the Course :

To analyze and predict the mechanical behaviour of deformable solid bodies like beams, columns, plates and non circular shafts using techniques of engineering mechanics and applied mathematics.

UNIT - I

Unsymmetrical bending and Shear Centre : Introduction, product of inertia – parallel axes theorem for product of inertia – principal axes and principal moments of inertia, bending stresses in beams due to unsymmetrical bending, deflection of straight beams due to unsymmetrical bending. Concept of shear center, determination of shear center for symmetrical and unsymmetrical sections.

UNIT - II

Torsion of non-circular shafts : Introduction, Membrane Analogy, torsion of non-circular solid sections, thin wall tubular sections, thin-walled multi-cell sections.

Rotating Discs : Centrifugal stresses- Rotating ring, flat discs-Disc of uniform thickness and Disc of uniform strength.

UNIT - III

Beams on Elastic foundation : General theory, infinite beam subjected to concentrated load at its end boundary conditions, infinite beam subjected to a distributed load, semi-infinite beam with point load near its end; short beams.

UNIT - IV

Columns and struts : Introduction, Definitions, classification of columns, strength of columns, end conditions, equivalent length, Euler's theory (for long columns), Rankine's hypothesis for struts columns, columns subjected to Eccentric loading, beam columns.

UNIT - V

Curved Beam Theory: Winkler bach formula for circumferential stresses – Limitations, corrections factors – Radial stress in curved beams – closed rings subjected to concentrated and uniform loads.

TEXT BOOKS:

1. Boresi, "Advanced Mechanics of Materials", 6th Edition, John Wiley & Sons, 2003.
2. Timoshenko and S. Woinowsky - Krieger, "Theory of Plates and Shells", 2nd Edition, Tata Mc Graw Hill, 2010.

REFERENCE BOOKS:

1. J.P. Den Hartog, "Advanced Strength of Materials", 1st Edition, Dover Publications, 1987.
2. L.S. Srinath, "Advanced Solid Mechanics", 3rd Edition, Tata Mc Graw Hill, 2009.
3. R.K. Rajput, "Strength of Materials", 2nd Edition, S. Chand Publications, 2002.
4. B.C. Punmia, "Strength of Materials and Theory of Structures", 3rd Edition, Lakshmi Publications, 2003.