

Year & Sem: E1S2	Course Code: CE1201	Course Name: Mechanics of Materials	No. of Credits: 4	L 2	T&PS 2	P 0
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UNIT-I: Stresses and Strains:

Normal stress, shear stress, state of stress at a point, ultimate strength, allowable stress, factor of safety, normal strain, shear strain, Poisson's ratio, Hooke's law, stress-strain characteristics for mild steel. Elastic moduli and the relationship between them, Bars of varying section, temperature stresses, composite bars, Strain energy, Resilience. Normal and tangential stresses on an inclined plane for biaxial stresses, Two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses, Principal stresses and strains, Analytical and graphical solutions. Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and Volumetric strains, Changes in diameter, and volume of thin cylinders, Thin spherical shells.

UNIT-III: Shear Force and Bending Moment:

Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load uniformly varying loads and combination of these loads, Point of contra flexure, Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-IV: Flexural Stresses & Shear Stresses

Theory of simple bending, Assumptions, Derivation of bending equation: $M/I = f/y = E/R$, Neutral axis, Determination of bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections. Derivation of formula, Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT VI: Deflection of Beams:

Bending into a circular arc-slope, deflection and radius of curvature, Differential equation for the elastic line of a beam - Double integration and Macaulay's methods, Determination of slope and deflection for cantilever and simply supported beams subjected to various types of loads, Mohr's theorems, and Moment area method.

UNIT-V: Torsion of Circular Shafts & Springs:

Theory of pure torsion, Torsion equation, Assumptions made in the theory, Theory of pure torsion, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts, Combined bending and torsion and end thrust. **Springs:** Introduction, Types of springs, deflection of close and open coiled helical springs under axial

UNIT – VI: Columns and Struts:

Introduction, Types of columns, Axially loaded compression members, Crushing load, Euler's theorem for long columns, assumptions, derivation of Euler's critical load formulae for various end conditions, Equivalent length of a column, slenderness ratio, Euler's critical stress, Limitations of Euler's theory, Long columns subjected to eccentric loading

References/Text Books:

1. Beer, F.P., and Johnston, JR, E.R., "Mechanics of Materials", (2nd Edition), McGraw Hill, 1992.
2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2007
3. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2007
4. Popov, E.P., Mechanics of Materials, Prentice Hall of India Private Limited, 1976.
5. Punmia B C, Mechanics of Materials, Laxmi Publications Ltd, New Delhi

Lecture Plan: Unit-I & -II syllabus for MID-I, Unit-III & -IV syllabus for MID-II and Unit-V & -VI syllabus for MID-III examinations.

Video Lectures (Web Links):

1. <http://nptel.ac.in/courses/105105108/>
- 2.
- 3.