II Year B.Tech. Civil Engg. I - Semester	L	T	P	To	C
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CE219 SOLID MECHANICS

Objective of the Course:
To impart the students the knowledge to understand the internal behavior of mechanical elements under the action of applied loads.

UNIT - I
Simple Stresses and Strains : Elasticity and plasticity, Types of stresses and strains, Hook's law, stress, strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio and volumetric strain, Elastic moduli and the relationship between them, Bars of varying section, composite bars, Temperature stresses.
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 - II
Flexural Stresses: Theory of simple bending, Assumptions, Derivation of bending equation: M/I = f/y = E/R, Neutral axis, Determination bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections.
Shear Stresses: Derivation of formula, Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle sections.

UNIT – III
Principal Stresses and Strains: Introduction, Stresses on an inclined section of a bar under axial loading, compound stresses, 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.
Torsion: Introduction, Torsion equation, shear stress distribution for circular solid and hollow shafts, Stepped shafts, Shafts fixed at both the ends.

UNIT – IV
Thin Cylindrical Shells: Introduction, hoop and longitudinal stresses and strains, thin spherical shell stresses.
Columns and struts: Introduction-types of columns, Euler's formula, equivalent length-end conditions, Rankine's formula, slenderness ratio.

UNIT – V
Direct and Bending Stresses: Stresses under the combined action of direct loading and B.M, core of a section, determination of stresses in the case of dams, conditions for stability.
Failure Theories: Introduction, maximum normal stress theory, maximum shearing stress theory, maximum strain energy theory, maximum distortion energy theory, comparison of theories.

TEXT BOOKS:

1. Bhavikatti, "Strength of Materials", 3rd ed., Vikas Publishing house, 2008.
2. R.K.Bansal, "Strength of Materials", 4th ed., Laxmi Publishers, 2006.
3. Ramamrutham, "Strength of Materials", 7th ed., Dhanpat Rai Publishing house, 1983.

REFERENCE BOOKS:

1. Egor P. Popov, "Engineering Mechanics of Solids", 2nd ed., Prentice hall of India, New Delhi, 1976.
2. Srinath L.N, "Advanced Mechanics of Solids", 3rd ed., Tata McGraw Hill Publishing Company Ltd., New Delhi, 2009.
3. S. Timshenko, "Strength of Materials", 3rd ed., Tata McGraw Hill Publishing Company Ltd., New Delhi, 1956.
4. Vazirani and Ratwani, "Analysis of Structures", 17th ed., Khanna publishers, 2007.
5. Sadhu Sing, "Strength of Materials", 8th ed., Khanna Publishers, 2003.