19CE202 STRENGTH OF MATERIALS

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Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	20	46	6	12	3	5

PRE-REQUISITE COURSES: ENGINEERING MECHANICS

COURSE DESCRIPTION AND OBJECTIVES:

The course deals with various engineering propertiesof solid materials and caliculation of Internal stress and starins produced in the material. The objective of course is to be deter-mines here force and bending moments in beams and columns and also to impact the students the knowledge to understand the behaviour of metalrods, cables and thin,under the action of applied loads.
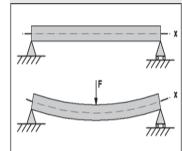
Course Outcomes:

Upon completion of the course, the student will able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Explain the simple stresses and strains Understanding	2
2:	Determine the Principle Stresses and Strains on different sections of a bar	2
3:	Determine the shear forces and bending moments for different beams with various loading.	2
4	Compute the flexural, shear stresses, direct and bending stresses for various cross-sections of the beams.	1
5:	Analyze thin cylinders and the behavior of circular shafts & springs for torsion.	2

SKILLS:

✓ Determine shear force and bending moment at a given section of a beam.

✓ Determine principal stresses and principal strains.

✓ Determine shear stress and bending stresses in all types of beams.

✓ Calculate biaxial stresses on an inclined plane.

✓ Analyse stability of columns by applying Euler's and Rankine's formula.

UNIT – I   L-9,T-3

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.

UNIT–II   L-9,T-3

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, twoperpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses, Principal stresses and strains,

Analytical and graphical solutions. Introduction to Failure Theories.

THIN CYLINDRICAL SHELLS: Introduction, Hoop and Longitudinal stresses and strains, thin spherical shells.

UNIT–III   L-9,T-3

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   L-9,T-3

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 circularsections(Solid and Hollow),I,T,Angle and Channelsections,Design of simplebeamsections.

SHEAR STRESSES: Derivation of formula, Shear stress distribution across various beam sections like Rectangular, Circular, Triangular, I, T, Angle sections.

UNIT–V   L-9,T-3

THEORY OF TORSION: Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs, Leaf springs

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.

TEXT BOOKS:

1. S.S.Bhavikatti,"Strengthof Materials",3rdedition,VikasPublishingHouse,2008.

2. S.Ramamrutham,"StrengthofMaterials",7thedition,DhanpatRaiPublishingHouse, 2011.

REFERENCE BOOKS:

1. L. N. Srinath, "Advanced Mechanics of Solids", 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi,2009.

2. S. Timshenko, "Strength of Materials", 3rd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi,2004.