19CE102 STRENGTH OF MATERIALS

Hours Per Week :

L	T	P	C
1	0	2	2

Total Hours :

L	T	P
15	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	5

Source :
https://canantesting.com/Upload/products/20161208_060322_369337.jpg

COURSE DESCRIPTION AND OBJECTIVES:

It deals with concepts of mechanics of deformable solids including static equilibrium. Know the behaviour of materials when subjected different loading and boundary condition. Enable the students to have an exposure to the systematic methods of solving engineering problems in solid mechanics. In addition, it also provides the basic mechanical principles underlying modern approaches for design of various types of structural members subject to axial, torsion, bending, transverse shear, and combined loading.

COURSE OUTCOMES:

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

COs	Course Outcomes	POs
1	Understand the various stresses acting on elastic materials for different loading conditions.	---
2	Apply the concept of elasticity in project, research and industry.	1
3	Analyze the strength of riveted and welded connections.	2
4	Apply, Design of beams having different boundary conditions, under different types of loading conditions.	3

SKILLS:

- ✓ *Measure tensile and compressive strength of materials using UTM.*
- ✓ *Measures shear strength of materials.*
- ✓ *Analyze deflections produced by axial, torsional and flexural loads.*
- ✓ *Analyze hardness of materials by using different types of tests.*

UNIT - I **L-3**

Types of stress and strains: Hook's law , stress- strain diagrams for ductile and brittle materials, elastic constant and relations , thermal stress : simple and compound bars.

UNIT - II **L-3**

Shear Force and Bending Moment: Types of beams, loads, supports, determination of support reactions. shear force and bending moment diagrams of cantilevers, simply supported beam for point loads UDL. point of contra flexure for overhanging beams.

UNIT - III **L-3**

Deflection of Beams Introduction: Deflection, Slope for cantilever beam and simply supported beams – point loads, UDL and uniformly varying loads, Double integration method, Macaulay's method, Area moment method and conjugate beam method.

UNIT - IV **L-3**

Theory of simple bending: Assumption , flexural formula, bending stress in beams for various cross-sections.

UNIT - V **L-3**

Columns and Struts: Failure of a Columns, Euler's Column Theory, End conditions for long columns, Expressions for crippling loads, Effective length of a column.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS-30**

1. To perform direct tensile test on metal specimen (M.S. and C.I) and calculate the value of E, ultimate stress, permissible stress and percentage elongation on UTM.
2. To perform bending test on the specimens; M.S. Grider, Wooden beam, Plain concrete beams and R.C.C beams to determine various physical and mechanical properties.
3. To perform the compression test on concrete cylinders and cubes, C.I., M.S and Wood specimens and to determine various physical and mechanical properties.
4. To determine Young's modulus of elasticity of beam with the help of deflection produced at centre due to loads placed at centre and quarter points.
5. To study the behaviour of materials (G.I. pipes, M.S, C.I) under torsion and to evaluate various elastic constants.
6. To study load deflection and other physical properties of closely coiled helical spring in tension and compression.
7. To perform the Rockwell, Vicker's and Brinell's Hardness tests on the given specimens.
8. To perform the Drop Hammer Test, Izod Test and Charpay's impact tests on the given specimens.
9. To determine compressive and tensile strength of cement after making cubes and briquettes.
10. To measure workability of concrete (slump test, compaction factor test).
11. To determine voids ratio and bulk density of cement, fine aggregates and coarse aggregates.
12. To determine fatigue strength of a given specimen.
13. To write detail report emphasizing engineering importance of performing tension, compression, bending, torsion, impact and hardness tests on the materials.

TEXT BOOK:

1. Junarkar S.B. 2001, "Mechanics of Structures (Vo-I)". Choratar Publishing House, Anand.

REFERENCE BOOKS:

1. Bansal, R. K. 2018, "A Text Book of Strength of Materials", Laxmi Publications, New Delhi.
2. Khurmi, R. S. 2015, "Strength of Materials", S. Chand & Co. Ltd. New Delhi.