

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B Tech in Civil Engineering
Course Code:	2CL101
Course Title:	Mechanics of Solids
Course Type:	(<input checked="" type="checkbox"/> Core/ <input type="checkbox"/> Value Added Course/ <input type="checkbox"/> Departmental Elective/ <input type="checkbox"/> Institute Elective/ <input type="checkbox"/> University Elective/(<input type="checkbox"/> Open Elective <input type="checkbox"/> Any other)
Year of Introduction:	2023-24

L	T	Practical Component				C
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Course Learning Outcomes (CLOs):

At the end of the course, the student will be able to –

1. solve statically determinate structures for internal forces (BL3)
2. analyse various types of stresses for structural elements and structures subjected to gravity and lateral loads (BL4)
3. apply various methods to find displacements of statically determinate structures (BL3)
4. identify buckling load of compression member (BL3)
5. examine behaviour of materials and structural elements through experimentation. (BL4)

Syllabus:

Teaching hours: 30

Unit	Syllabus	Teaching hours
Unit-I	Mechanics of Rigid Body System of forces, free body diagrams, computation of support reactions and internal forces in statically determinate planar structures. Geometrical properties of cross-section	06
Unit-II	Mechanics of Deformable body Direct stress and strain, Hooke's law, Poisson's ratio, change in volume, elastic constants, temperature stresses; Theory of pure bending, bending stresses, shear stresses, strain energy	08
Unit-III	Direct and Bending Stresses Structures subjected to eccentric loads, core of the section, Analysis of structures subjected to lateral load such as chimney and retaining wall	04
Unit-IV	Slope and Deflection Differential equation of elastic curve of beam; Computation of Slope and Deflection of determinate structures using Double Integration method, Macaulay's method, Moment Area method, Unit Load method	08
Unit-V	Column and Strut Standard cases of end conditions and corresponding effective	04

length, buckling, principal axes, Euler's and Rankine's formula.

Self-Study:	The self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from self-study contents.
Suggested Readings/ References:	<ul style="list-style-type: none"> ● Shah, H. J. <i>Mechanics of Solids</i>, Charotar Publishing House. ● Subramanian, R. <i>Strength of Materials</i>, Oxford University Press. ● Junnarkar, S. B., & Shah, H. J., <i>Mechanics of Structures, Vol. - I & II</i>, Charotar Publishing House. ● Kassimali, A. <i>Structural Analysis</i>, Cengage Learning India. ● Hibbeler, R. C. <i>Mechanics of Materials</i>. Pearson. ● Beer, F. P., Johnston, E. R., & Dewolf, J.T. <i>Mechanics of Materials</i>. Tata McGraw-Hill Education. ● Popov, E. P. <i>Mechanics of Materials</i>. Pearson. ● Hibbeler, R. C. <i>Structural Analysis</i>, Pearson. ● Megson, T.H.G. <i>Structural and Stress Analysis</i>, Butterworth - Heinemann.
Suggested List of Experiments:	Laboratory work will be based on the above syllabus with minimum 10 experiments/exercises to be incorporated.

Sr. No.	Name of Experiment/Exercise	Hours
1.	Simple Roof Truss	04
2.	Support Reactions of Beam	04
3.	Proportioning of Cross Section and Derivation of Cross-sectional Properties	04
4.	Tension Test on Metals	02
5.	Shear Test	02
6.	Transverse Test on Timber	02
7.	Compression Test on Metal	02
8.	Qualitative demonstration of concepts of Direct and Bending Stresses	04
9.	Deflection of Statically Determinate Beam	04
10.	Column and Strut	02