

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B Tech Civil Engineering
Course Code:	2CL101CC23
Course Title:	Mechanics of Solids
Course Type:	Core
Year of introduction:	2023-2024

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. analyse statically determinate structures and determine internal forces (BL4)
2. evaluate different types of stresses for structural elements and structures subjected to gravity and lateral load (BL5)
3. apply various methods to find displacements of statically determinate structures (BL3)
4. examine behavior of materials and structural elements through experimentation. (BL4)

Unit	Contents	Teaching hours (Total 30)
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 length, buckling, principal axes, euler's and rankine's formula.	04

Self-Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Suggested Readings/
References:

Hibbeler, R. C. *Structural Analysis*, Pearson.
 Shah, H. J. *Mechanics of Solids*, Charotar Publishing House.
 Subramanian, R. *Strength of Materials*, Oxford University Press.
 Junnarkar, S. B. & Shah, H. J., *Mechanics of Structures, Vol. - I & II*, Charotar Publishing House.
 Vazirani, V. N., Ratwani, M. M. & Duggal, S. K. *Analysis of Structures, Vol. - I & II*, Khanna Publisher.
 Kassimali, A. *Structural Analysis*, Cengage Learning India.
 Hibbeler, R. C. *Mechanics of Materials*. Pearson Publication.
 Beer, F. P., Johnston, E. R. & Dewolf, J.T. *Mechanics of Materials*. Tata McGraw-Hill Education.
 Popov, E. P. *Mechanics of Materials*. Pearson.
 Megson, T.H.G. *Structural and Stress Analysis*, Butterworth - Heinemann.

Suggested List of Experiments/Exercises: Laboratory work will be based on the above syllabus with minimum 10 experiments / exercises to be incorporated.

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