25CV103: Mechanics of Solids

w. e. f. Academic Year:	**2025-26**
Semester:	**2**
Category of the Course:	**Engineering Science**
Prerequisite:	Zeal to learn the subject
Rationale:	Mechanics of Solids provides a platform to learn, be creative, and build a capacity to apply logic to real-life problems with sound engineering judgment. It forms the foundation for driving various alternatives of the final solution, depending on the shape, size of the body/structure, and the properties of the materials, by applying all the principles of mathematics, physics, and trigonometry.

Course Outcomes:

After Completion of the Course, students will be able to:

	Course Outcome (CO)	**RBT Level (Cognitive Domain)**
CO1	Understand and apply the fundamental laws of physics.	Understand / Apply
CO2	Analyze and create systems in equilibrium in coplanar-concurrent, coplanar-non-concurrent force systems.	Analyze / Create
CO3	Understand and apply the concepts of centre of gravity and locate the CG in compound lines and 2D figures after evaluation.	Understand / Apply / Evaluate
CO4	Understand the concepts of Moment of Inertia and locate the MI in 2D figures after evaluation.	Understand / Evaluate
CO5	Understand the concepts of stress-strain, the different materials, and analyse stress and strain, and plot the stress-strain graphs.	Apply / Analyze
CO6	Understand and analyze the concepts of material and shape constants	Apply / Create

Teaching and Evaluation Scheme:

Teaching Scheme					**Examination Scheme**				
L	**T**	**P**	**C**	**Hrs/Week**	**IE**	**Theory**	**CIA**	**Practical**	**Total Marks**
03	-	02	04	05	40	60	30	20	150

IE: Internal Evaluation Theory: Theory Exam (End Semester)

CIA: Continuous Internal Assessment Practical: Practical Exam (End Semester)

Detailed Syllabus:

Topic		Hrs.	% of Weightage
UNIT: 1	**INTRODUCTION**	**03**	**10**
Introduction to Mechanics and its branches, Fundamental concepts, Idealizations in mechanics, Fundamental Principles of mechanics, SI system of units, Scalar and vector quantities			
UNIT: 2	**FUNDAMENTALS OF STATICS**	**15**	**30**
Force and force system and types of forces, understanding of resultant, equilibrium, moment and couple, Solution of coplanar concurrent force system using: (a) Law parallelogram, (b) Law of triangle, (c) Resolution of force system (d) Law of polygon, (e) Lami's theorem Solution of coplanar non concurrent force system using: (a) Resolution of force system, (b) Varignon's theorem			
UNIT: 3	**CENTER OF GRAVITY AND MOMENT OF INERTIA**	**15**	**30**
Introduction, Basic definitions, Calculation of CG of compound lines, planes, Pappus-Guldinus theorems, Basic understanding of moment of inertia, Calculation of moment of inertia of compound planes			
UNIT: 4	**SIMPLE STRESS AND STRAIN**	**12**	**30**
Simple stress and strain Types of stress and strain, Elastic limit, Hooke's law, Determination of stress in members due to external load, Stress-strain curve for mild steel in tension, Ultimate stress, Working stress, Factor of safety, Deformation of a body due to self-weight, Stresses in members with varying cross section, Principle of superposition, Extension of a tapered uniformly due to an axial force applied at each end, Stresses in composite members Elastic constants Introduction Longitudinal & lateral strain, Poisson's ratio, volumetric strain. Bulk modulus Relation between Bulk modulus and Young's modulus, Shear stress and strain, Modulus of rigidity, Relation between Modulus of rigidity and Young's modulus, Thermal stress and strain Introduction, Thermal stresses and strain for composite bars.			
		45	**100**

List of Practical:

Topic	Hrs
Equilibrium of Coplanar–Concurrent Forces (Resolution of Forces)	04
Equilibrium of Coplanar – Concurrent Forces (Lami's Theorem)	04
Equilibrium of Coplanar – Non-Concurrent Forces	04
Equilibrium of Coplanar–Parallel Forces (Simply Supported Beam)	04
Verification of the Principle of Moments	04
Izod Impact Test	02
Compression Test on Timber	04
Tension Test on Mild Steel Bar	04
	30

Reference Books:

1. Mechanics of solids by Sanju Unadkat & Indrajeet Jain (Tech-Max Publication).
2. Mechanics of solids by Prof. C.S. Sanghavi (Mahajan Publication).
3. Mechanics of Solids by Dr. A.K. Arora (Books India Publication).
4. Mechanics of Solids by Prof. P.J. Shah (S. Chand Publication)
5. Mechanics of Solids by H.J. Sawant (Technical Publication)
6. Mechanics of Solids by Gajjar & Shah (Tata McGraw-Hill's Publication)
7. Mechanics of solids by Dr. R.P. Rethaliya (Atul Prakashan)
8. Engineering Mechanics by S. Ramamrutham (Dhanpat Rai Publication)
9. Engineering Mechanics by M. Chakraborti (S.K. Kataria & Sons Publication)
10. A Text Book of Engineering Graphics By P.J.Shah, S.Chand & Company Ltd., New Delhi
11. Strength of Materials by S. Ramamrutham (Dhanpat Rai Publication)

Course Outcomes Mapping:

CO No.	Course Outcome (CO)	POs/ PSOs Mapped	Cognitive Level (RBT)	Knowledge Category	Lecture (hours)	Lab Sessions (hours)
CO1	Understand and apply the fundamental laws of physics.	PO1, PO2, PSO1, PSO2	Understand / Apply	Conceptual, Procedural	03	04
CO2	Analyze and create systems in equilibrium in coplanar-concurrent, coplanar-non-concurrent force systems.	PO1, PO2, PSO1, PSO2	Analyze / Create	Conceptual, Procedural	14	12
CO3	Understand and apply the concepts of centre of gravity and locate the CG in compound lines and 2D figures after evaluation.	PO1, PO2, PSO1, PSO2	Understand / Apply / Evaluate	Conceptual, Procedural	09	-
CO4	Understand the concepts of Moment of Inertia and locate the MI in 2D figures after evaluation.	PO1, PO2, PSO1, PSO2	Understand / Evaluate	Conceptual, Procedural	06	-
CO5	Understand the concepts of stress-strain, the different materials, and analyse stress and strain, and plot the stress-strain graphs.	PO1, PO2, PSO1, PSO2	Apply / Analyze	Conceptual, Procedural	09	08

CO6	Understand and analyze the concepts of material and shape constants	PO1, PO2, PO3, PSO1, PSO2	Apply / Create	Conceptual, Procedural	07	06

Mapping of COs with POs & PSOs:

CO	PO												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	0	0	0	0	0	0	0	0	0	0	3	3
CO2	3	3	0	0	0	0	0	0	0	0	0	0	3	3
CO3	3	2	0	0	0	0	0	0	0	0	0	0	3	3
CO4	3	2	0	0	0	0	0	0	0	0	0	0	3	3
CO5	3	3	0	0	0	0	0	0	0	0	0	0	3	3
CO6	3	3	2	0	0	0	0	0	0	0	0	0	3	3

3: High, 2: Medium, 1: Low