



CVM
UNIVERSITY

Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2025-26

Programme: Bachelor of Technology

Semester: II

Course Code: 102091201

Course Title: Mechanics of Solid

Course Group: Professional Core

Course Objectives:

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 18	25 / 9	25 / 9	150/54

* J: Jury; V: Viva; P: Practical

Detailed Syllabus: List of Practicals / Tutorials:

Sr.	Contents	Hours
1	Introduction: Free, Forced and Fixed Vectors, rigid body, deformable body. Types of forces, Characteristics of a force, System of forces, Composition and resolution of forces. Laws of mechanics: Principle of transmissibility, Principle of superposition, Law of gravitation, Law of parallelogram of forces.	05
2	Fundamentals of Statics Coplanar concurrent and non-concurrent force system: Resultant, Equilibrant, Free body diagrams. Coplanar concurrent forces: Resultant of coplanar concurrent force system by analytical and graphical method, Law of triangle of forces, Law of polygon of forces, Equilibrium conditions for coplanar concurrent forces, Lami's theorem. Application of statically determinate pin – jointed structures. Coplanar non-concurrent forces: Moments & couples, Characteristics of moment and couple, Equivalent couples, Force couple system, Varignon's theorem, Resultant of non-concurrent forces by analytical method, Equilibrium conditions of coplanar non-concurrent force system, Application of these principles.	07



3	<p>Friction: Theory of friction, Types of friction, Static and kinetic friction, Cone of friction, Angle of repose, Coefficient of friction, Laws of friction, Application of theory of friction: Friction on inclined plane, ladder friction, wedge friction, belt and rope friction.</p>	07
4	<p>Centroid: Centroid of lines, plane areas and volumes, Examples related to centroid of composite geometry, Pappus – Guldinus first and second theorems. Moment of inertia of planar cross-sections: Derivation of equation of moment of inertia of standard lamina using first principle, Parallel & perpendicular axes theorems, polar moment of inertia, radius of gyration of areas. Examples related to moment of inertia of composite geometry,</p>	07
5	<p>Simple stresses & strains: Basics of stress and strain: 3-D state of stress (Concept only) Normal/axial stresses: Tensile & compressive Stresses: Shear and complementary shear Strains: Linear, shear, lateral, thermal and volumetric. Hooke’s law, Elastic Constants: Modulus of elasticity, Poisson’s ratio, Modulus of rigidity and bulk modulus and relations between them with derivation. Application of normal stress & strains: Homogeneous and composite bars having uniform & stepped sections subjected to axial loads and thermal loads, analysis of homogeneous prismatic bars under multidirectional stresses.</p>	06
6	<p>Structure Elements: Structural elements - Beams, Columns, & Trusses – uses. Statics determinants: Types of loads, Types of supports, Determination of support reactions in beams, Flexural stresses – Theory of simple bending, Assumptions, derivation of equation of bending, neutral axis, determination of bending stresses, section modulus of rectangular & circular (solid & hollow), I, T, Angle sections Shear stresses – Derivation of formula, shear stress distribution across various beam sections like rectangular, circular, triangular, I, T, angle sections.</p>	07
		39

List of Practical / Tutorials:

Sr.	Contents	Hours
1	To verify Equilibrium of coplanar concurrent forces	2
2	To verify Equilibrium of coplanar non-concurrent forces	2
3	To verify Equilibrium of coplanar parallel forces: Determination of reactions of simply supported beam.	2
4	To verify principle of moment: Bell crank lever.	2
5	To determine of coefficient of static friction using inclined plane	2
6	To determine center of gravity of laminas & 3D objects.	2
7	To determine Friction coefficient of given problems	2
8	To calculate Centroid & Moment of Inertia of given problems	2
9	To verify Equilibrium Conditions in Statically Determinate Beams	2
10	To calculate of Section Modulus for Rectangular, Circular (Solid & Hollow), I, T, and Angle Sections	2

Reference Books:

1	Applied Mechanics by S. B. Junarkar and H. J. Shah, Charotar Publications
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2	Engineering Mechanics by S. S. Bhavikatti, New Age Publishers
3	Mechanics of Solids by P.J. Shah, S Chand Publishing, New Delhi
4	Engineering Mechanics by R. K. Bansal, S Chand Publishing, New Delhi
5	Engineering Mechanics by R S Khurmi
6	Engineering Mechanics statics by R. C. Hibbeler, McMillan Publication.
7	Engineering Mechanics, Bansal R K, Laxmi Publication.

Pedagogy:

- Direct classroom/ laboratory teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (50% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	U	A	N	E	C	
20%	20%	20%	20%	20%	--	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To apply fundamental principles of mechanics & principles of equilibrium to simple and practical problems of engineering.	20
CO-2	To apply principles of statics to determine reactions & internal forces in statically determinate beams.	20
CO-3	To determine centroid and moment of inertia of a different geometrical shape and able to understand its importance.	20
CO-4	To know basics of friction and its importance through simple applications.	20



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CO-5	To estimate different types of stresses and strains developed in the member subjected to axial, bending, shear, torsion loads, including basic understanding of mechanical properties.	20
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Curriculum Revision:	
Version:	1
Drafted on (Month-Year):	April-2025
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	