Code: 1BCIV105/205 **Course: Engineering Mechanics**
Credits: 3 **L:T:P 3:0:0**
SEE: 50% **CIE: 50%**
SEE Hours: 3 **Max. Marks:100**

Prerequisites if any	Pre-University Physics and Mathematics
Learning objectives	• Construct "Free Body Diagrams" of real-world problems and apply Newton's Laws of motion and vector operations to evaluate equilibrium of particles and bodies. • Identify the moment of a force and calculate its value about a specified axis. Define the moment of a couple. • To analyze the member forces in trusses and students to learn the effect of friction on different planes • To develop the student's ability to find out the Centre of gravity and moment of inertia and their applications and learn about kinematics and kinetics and their applications.

Course Outcomes:

On the successful completion of the course, the student will be able to

COs	Course Outcomes	Bloom's level
CO1	Understand coplanar concurrent and non-concurrent forces acting on particles and rigid bodies	Understand
CO2	Analyze the loading types, reactions for beams and apply the principles of friction.	Analyze
CO3	Analyse the equilibrium of force system including friction.	Apply
CO4	Compute centroid and second moment of area of composite sections	Apply

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-		3	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-		3	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-		3	-	-
CO4	-	2	2	-	-	-	-	-	-	-	-		3	-	-

Mapping Strength: Strong– 3 Medium – 2 Low – 1

Course Structure

		No. of Lecture Hours	No. of Tutorial Hours	No. of Practical Hours
Module – 1				
1.1	**Coplanar force system:** Basic dimensions and units, Idealisation Classification of force system	01	----	----
1.2	Principle of transmissibility of a force, Composition and resolution of forces, Numerical examples	02	----	----
1.3	Free body diagrams, Resultant of coplanar concurrent and non-concurrent force system, Numerical examples	02	----	----
1.4	Moment, Couple and Characteristics of couple	01	----	----
1.5	Non-concurrent force system Varignon's theorem: Numerical Examples.	02	----	----
Module – 2				
2.1	**Equilibrium:** Conditions of static equilibrium, Equilibrium of coplanar concurrent force systems, Lami's theorem, Numerical ex	02	----	----
2.2	Equilibrium of coplanar non-concurrent force system, Numerical examples.	02	----	----
2.3	Types of supports, loadings and beams, Concept of statically determinate and indeterminate beams.	02	----	----
2.4	Support reactions for statically determinate beams subjected to various loadings: Numerical examples.	02	----	----
Module – 3				
3.1	**Friction:** Introduction, Types of friction, Concept of static friction	01	----	----
3.2	Kinetic (Dynamic) friction, Laws of friction, Angle of repose, Cone of friction, Numerical examples	01	----	----
3.3	Equilibrium of blocks on horizontal, Numerical examples	02	----	----
3.4	Equilibrium of blocks on inclined plane, Numerical examples	03	----	----
3.5	Ladder friction: Numerical examples	01	----	----
Module – 4				
4.1	**Centroid:** Introduction, definitions of centroid and centre of gravity.	01	----	----
4.2	Axes of symmetry, Locating the centroid of square, rectangle, triangle using method of integration	02	----	----
4.3	Circle, semicircle, quadrant and sector of a circle using method of integration	02	----	----
4.4	Centroid of composite areas and simple built up sections: Numerical examples	03	----	----
Module – 5				
5.1	**Moment of Inertia of plane Areas:** Introduction, Moment of inertia about an axis	01	----	----
5.2	Parallel axes theorem, Perpendicular axes theorem, Polar moment of inertia, Radius of gyration.	01	----	----
5.3	Moment of inertia of square, rectangular, triangular from the method of Integration	02	----	----
5.4	Circular areas from the method of Integration	01	----	----
5.5	Moment of inertia of composite areas and simple built-up sections: Numerical Examples.	03	----	----
	Total No. of Lecture Hours	**40**		
	Total No. of Tutorial Hours		----	
	Total No. of Practical Hours			----

Self-learning topics:

1. Introduction to vector approach
2. Vector representation of moment of a force
3. Centroid of line segments
4. Product of inertia

Textbooks:

1. Bansal R. K., Rakesh Ranjan Beohar and Ahmad Ali Khan, Basic Civil Engineering and Engineering Mechanics, third edition, 2015, Laxmi Publications, ISBN: 9789380856674.
2. Kolhapure B K, Elements of Civil Engineering and Engineering Mechanics, Eleventh edition, 2018, Eastern Book Promoters Belgaum [EBPB], ISBN: 5551234003896.

Reference Books:

1. Beer F.P. and Johnston E. R., Mechanics for Engineers: Statics and Dynamics, Fourth edition, 1987, McGraw Hill, ISBN: 9780070045842.
2. Meriam J. L. and Kraige L. G, Engineering Mechanics-Statics, Vol I–sixth Edition,2008, Wiley publication.
3. Irving H. Shames, Engineering Mechanics-Statics and Dynamics, fourth edition, 2002, Prentice-Hall of India(PHI).
4. Hibbler R. C., Engineering Mechanics: Principles of Statics and Dynamics, fourteenth edition, 2017, Pearson Press, New Delhi.ISBN:9789332584747.
5. Timoshenko S, Young D. H., Rao J. V., Sukumar Patil, Engineering Mechanics, fifth Edition, 2017,McGraw Hill Publisher, ISBN: 9781259062667
6. Bhavikatti S S, Engineering Mechanics, fourth edition, 2018, New Age International Publications.

Online Resources:

1. Engineering Mechanics by Prof. K. Ramesh, IIT Madras https://nptel.ac.in/courses/112106286