ENGINEERING MECHANICS

(Common to Civil & Mechanical Engineering)

Course code	23ME3201	**Year**	I	**Semester**	II
Course Category	Professional Core	**Offering Branch**	ME	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes: On Completion of the course, the student should be able to	
CO1	Understand the fundamental concepts in mechanics and analyze different force systems such as concurrent, coplanar forces and calculate their resultant forces and moments. (L2)
CO2	Determine the frictional forces for bodies in contact and analyze the trusses (L3)
CO3	Calculate the centroids and center of gravity of different geometrical shapes. (L3)
CO4	Apply the principles of work-energy to solve the problems of rectilinear and curvilinear motion of a particle. (L3)
CO5	Solve the problems involving the translational and rotational motion of rigid bodies. (L3)

Contribution of Course outcomes towards achievement of programme outcomes & Strength of correlations (High :3, Medium :2, Low :1)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	3	2						1	1		1	3	1
CO 2	3	3	2						1	1		1	3	1
CO 3	3	3	2						1	1		1	3	1
CO 4	3	3	2						1	1		1	3	1
CO 5	3	3	2						1	1		1	3	1

	Syllabus	
Unit	**Content**	**Mapped CO**
1	**Introduction to Engineering Mechanics:** Basic Concepts. Scope and Applications. **Systems of Forces**: Coplanar Concurrent Forces—Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems. **Equilibrium of Systems of Forces:** Free Body Diagrams, Lami's Theorm, Triangle law of forces and Parallelogram Law of forces. Equations of Equilibrium of Coplanar Concurrent Force System.	**CO 1**

2	**Friction:** Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of static friction, equilibrium of force systems involving frictional forces. Ladder and wedge friction. **Analysis of plane trusses:** Introduction to plane trusses, Types of trusses, Assumptions in analysis of truss, analysis of plane trusses by method of joints	**CO 2**
3	**Centroid:** Centroid and centre of gravity, derivation of centroids of rectangle, triangle, circle, semi-circle from first principles, centroid of composite areas. **Area Moments of Inertia:** Definition, Area moment of inertia of plane and composite figures, parallel axis theorem, perpendicular axis theorem, polar moment of inertia.	**CO 3**
4	**Kinematics of Rectilinear motion:** Displacement, Velocity, and acceleration. Motion of uniform acceleration. **Kinetics of Rectilinear motion**- D'Alembert's Principle - Work Energy method. **Kinematics of Curvilinear motion:** Rectangular components of velocity and acceleration. Normal and tangential acceleration.	**CO 4**
5	**Rigid body Motion: Kinematics of rotation:** Linear & angular velocity, Linear & angular acceleration in uniformly accelerated motion. **Kinetics of a rigid body in rotation of about a fixed axis:** Equation of motion for a rigid body rotating about a fixed axis- rotation under the action of constant moment.	**CO 5**

Learning Resources

Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati, McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

E Resources:

1. https://nptel.ac.in/courses/112/103/112103108/
2. https://www.coursera.org/learn/engineering-mechanics-statics