COURSE CONTENT

ENGINEERING MECHANICS								
I Semester: ME								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
2520302	**Foundation**	3	0	0	3	40	60	100
Contact Classes:45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisites: **There are no prerequisites to take this course.**								

Course Overview:

This course introduces the fundamentals of engineering mechanics, beginning with basic concepts, force systems, moments, couples, and equilibrium of coplanar and spatial force systems. It covers the laws and applications of friction, including dry friction and practical cases such as ladders, wedges, and screw jacks. The course explains centroid and center of gravity concepts for lines, areas, and composite bodies, along with the Theorem of Pappus. Students learn area moment of inertia, polar moment, product of inertia, and mass moment of inertia using transfer theorems and integration. The kinetics of rigid bodies is studied, including types of motion, D'Alembert's principle, and connected body systems. The work–energy principle is applied to analyze plane motion and rigid body rotation problems in engineering applications.

Course Objectives:

1. To solve the resultant of any force system.
2. To analyze the types of frication for moving bodies and problems related to friction.
3. To determine the centroid of an area and center of gravity of body.
4. To understand the concept of area moment and mass moment about any axes.
5. Understand the work-energy principle

Course Outcomes: After Completion of the Course, Students should be able to

1. Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.(L1)
2. Analyze the bodies on rough horizontal and inclined planes and connected Bodies (L4)
3. Determine the centroid of composite areas, centre of gravity of composite bodies (L3)
4. Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.(L3).
5. Apply work-energy principle to solve the rigid body problems.(L3).

UNIT – 1

Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space -Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

LEARNING OUTCOME:

- Determine the resultant of coplanar concurrent and special force systems and analyse the bodies for equilibrium to find the unknown forces.(L1)

UNIT – 2

Friction: Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Simple Screw Jack

LEARNING OUTCOME:

- Analyze the bodies on rough horizontal and inclined planes and connected Bodies (L4)

UNIT – 3

Centroid and Center of Gravity: Introduction – Centroids of lines – Centroids of area - Centroids of Composite figures - Theorem of Pappus -Centre of Gravity - Center of gravity of composite bodies.

LEARNING OUTCOME:

- Determine the centroid of composite areas, centre of gravity of composite bodies L3

UNIT – 4

Area moments of Inertia: Introduction – Definition of Moment of Inertia -Polar Moment of Inertia – Radius of gyration - Transfer Theorem for moment of inertia – Moments of inertia by integration - Moments of Inertia of Composite Figures- Product of Inertia.

Mass Moment of Inertia: Introduction - Moment of Inertia of Masses – Radius of gyration - Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration - Mass moment of inertia of
composite bodies.

LEARNING OUTCOME :

- Determine the moment of inertia of simple areas and mass moment of inertia of simple bodies.(L3)

UNIT – 5

Kinetics of Rigid Bodies: Types of motion, D'Alemberts principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies kinetic of rigid body rotation.

LEARNING OUTCOME :

- Understanding basic laws and principles of kinetics of particle and rigid body.(L2)
- Apply work-energy principle to solve the rigid body problems.(L3)

TEXTBOOKS:

1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy and J.Suresh Kumar BSP
2. Engineering Mechanics/ Irving Shames, G.Krishna Mohan Rao / Prentice Hall.

REFERENCE BOOKS:

1. Engineering Mechanics/ Bhattaharyya/ Oxford.
2. Tayal A.K.(2010), Engineering Mechanics. Umesh Publications.
3. Engg. Mechanics by S.S. Bhavikati & K.G. Rajasekharappa

ELECTRONIC RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc22_me99/preview
2. https://www.youtube.com/watch?v=gp3wFTFGstM
3. https://www.youtube.com/watch?v=hOkV4Uo_w2Y
4. https://archive.nptel.ac.in/courses/112/107/112107219/
5. http://www.digimat.in/nptel/courses/video/112107145/L01.html
6. https://archive.nptel.ac.in/courses/112/107/112107145/
7. https://www.youtube.com/watch?v=6ISddRRHAhA