I Year II Semester		L	T	P	C
		3	0	0	3
ENGINEERING MECHANICS					

Course Objectives:

1. To apply fundamental concepts of mechanics to find resultant of force systems and frictional forces.
2. To analyse plane trusses, draw free body diagrams calculate their resultant using equations of equilibrium.
3. To calculate the centroid, centre of gravity and moment of inertia of standard geometrical shapes and composite sections.
4. To apply the principles of D' Alembert, work-energy and impulse-momentum to find motion of a particle.
5. To solve the problems involving the translational and rotational motion of rigid bodies.

UNIT I

Introduction to Engineering Mechanics – Basic Concepts. Scope and Applications

Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couple and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, Co-efficient of friction, cone of Static friction.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar system strusses by method of joints and method of sections.

UNIT III

Centroid: Centroid of simple figures (from basic principles)–Centroid of Composite Figures.

Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.

Area Moments of Inertia: Definition– Polar Moment of Inertia –Radius of gyration – Transfer formula for moment of inertia - Moments of Inertia for Composite areas.

UNIT IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion.

TEXT BOOKS:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education.

2. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill.

REFERENCE BOOKS:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., McGraw Hill Education, 5th Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 4th Edition.
3. Introduction to Statics and Dynamics, Basudev Battacharia, Oxford University Press, 2nd Edition.
4. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 14th Edition
5. Beer F.P. and Johnston E.R., Vector Mechanics for Engineers - Volume I - Statics, Volume II - Dynamics, McGraw Hill, New York.

Web Links:

1. https://onlinecourses.nptel.ac.in/noc23_me74/unit?unit=17&lesson=18
2. https://youtube.com/watch?v=Z4WN2Z9okfs
3. https://www.youtube.com/watch?v=Hn_iozUo9m4
4. https://www.youtube.com/watch?v=q2ueCg9bvvQ

Course Outcomes: On Completion of the course, the student will be able to

CO 1	Apply fundamental concepts of mechanics to find resultant of force systems and frictional forces.
CO 2	Analyse plane trusses, draw free body diagrams calculate their resultant using equations of equilibrium.
CO 3	Calculate the centroid, centre of gravity and moment of inertia of standard geometrical shapes and composite sections.
CO 4	Apply the principles of D' Alembert, work-energy and impulse-momentum to find motion of a particle.
CO 5	Solve the problems involving the translational and rotational motion of rigid bodies.

I Year II Semester		L	T	P
		0	0	3
ENGINEERING MECHANICS LABORATORY				

Course Objectives:

1) To verify Triangle Law, Parallelogram Law and Polygon's Law of coplanar-concurrent forces acting on a particle in equilibrium.
2) To check the law of moments and conditions of equilibrium of a rigid body under the action of force system.
3) To draw the Free body diagram of force system to find the unknown forces and coefficient of friction.
4) To determine the Centre of Gravity of Plane lamina.
5) To determine the Moment of inertia of Compound pendulum and Flywheel.
6) To determine the Acceleration due to gravity using Compound Pendulum.

List of Experiments:

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.
5. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.
6. Study the systems of pulleys and draw the free body diagram of the system.
7. Determination of coefficient of Static and Rolling Frictions
8. Determination of Centre of Gravity of different shaped Plane Lamina.
9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.
10. Determine the Moment of Inertia of a Flywheel.
11. Find the efficiency of Screw jack.
12. Determine the acceleration due to gravity using a compound pendulum.

References:

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5th Edition, Mc Graw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14th Edition, Pearson Education, NC., New Delhi
3. Beer F.P. and Johnston E.R., Vector Mechanics for Engineers - Volume I - Statics, Volume II - Dynamics, McGraw Hill, New York.

Web Links:
1. https://vlab.amrita.edu/index.php?sub=1&brch=74
2. https://www.youtube.com/watch?v=YQUDqfivqd8
3. https://www.youtube.com/watch?v=V86OLIC2Hvk

Course Outcomes: On Completion of the course, the student will be able to

CO 1	Verify Triangle Law, Parallelogram Law and Polygon's Law of coplanar-concurrent forces acting on a particle in equilibrium.
CO 2	Check the law of moments and conditions of equilibrium of a rigid body under the action of force system.
CO 3	Draw the Free body diagram of force system to find the unknown forces and coefficient of friction.
CO 4	Determine the Centre of Gravity of Plane lamina.
CO 5	Determine the Moment of inertia of Compound pendulum and Flywheel.
CO 6	Determine the Acceleration due to gravity using Compound Pendulum