



I Year-I Semester		L	T	P	C
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<b>ENGINEERING MECHANICS (R161111)</b>					

**Pre-requisite Course:** Fundamentals of Physics and Mathematics.

**Course Description and Objectives:**

The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, Forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, Analysis of frames and trusses, different types of motion, friction and application of work - energy method.

**Course Outcomes:**

Upon completion of the course, the student will be able to achieve the following outcomes.

CO	Course Outcomes	POs
1	Apply concepts of force, friction and its application.	4
2	Draw free body diagrams for rigid bodies and solve in plane, space problems	4
3	Determine centroid for lines, areas and center of gravity for volumes	4
4	Computation of Area and mass moment of inertia for composite sections	4
5	Analyze motion of particles and rigid bodies and apply the principles of motion	5
6	Apply Concepts of work energy and impulse – momentum for analysis.	5

**Syllabus:**

**UNIT I:**

**Objective: The students are to be exposed to the concepts of force and friction, direction and its application.**

Introduction to Engg. Mechanics – Basic Concepts.

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

**Friction:** Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction.

**UNIT II:**

**Objectives: The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.**

**Equilibrium of Systems of Forces:** Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorem, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

**UNIT III:**

**Objectives : The students are to be exposed to concepts of centre of gravity.**

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

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

**UNIT IV:**

**Objective:** The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.

**Area moments of Inertia:** Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

**Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

**UNIT V:**

**Objectives:** The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.

**Kinematics:** Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

**Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

**UNIT VI:**

**Objectives:** The students are to be exposed to concepts of work, energy and particle motion

**Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

**TEXT BOOKS:**

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and Jaan Kiusalaas; Cengage Learning publishers.

**REFERENCE BOOKS:**

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, dynamics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
4. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
5. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
6. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
7. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications
10. Engineering Mechanics, Tayal. Umesh Publ.