



I Year-II Semester		L	T	P	C
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<b>ENGINEERING MECHANICS (ES1204)</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.

COs	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, center of gravity, Area moment of inertia and Mass moment	4
4	Analyze motion of particles and rigid bodies and apply the principles of motion	5
5	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, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.



### UNIT III:

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

**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.

**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 IV:

**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.

Rectilinear and Curvilinear motion of a particle: **Kinematics and Kinetics- Work Energy method and applications to particle motion- Impulse momentum method.**

### UNIT V:

**Objectives:** The students are to be exposed to rigid motion kinematics and kinetics

**Rigid body Motion:** Kinematics and kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse momentum method.

### TEXT BOOKS:

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4<sup>th</sup> Edn - , Mc Graw Hill publications.

### REFERENCE BOOKS:

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11<sup>th</sup> Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6<sup>th</sup> Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5<sup>th</sup> Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5<sup>th</sup> Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G. McLean, 5<sup>th</sup> Edn – Schaum's outline series - Mc Graw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Ferdinand . L. Singer, Harper – Collins.
9. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications