Course Name Engineering Mechanics

Course Code ME(EE)101

Course Credit 3

Contact Hour 3L-1T

Prerequisite

Course Objective

The course objectives are:

1. Solve for the resultants of any force systems
2. Determine equivalent force systems
3. Introduction to vector algebra.
4. Solve the mechanics problems associated with friction forces
5. Obtain the centroid, first moment and second moment of an area
6. Describe the motion of a particle in terms of its position, velocity and acceleration.
7. Analyze the forces causing the motion of a particle
8. Use the equation of motion to describe the accelerated motion of a particle
9. Apply work, energy, impulse and momentum relationships for a particle in motion
10. To understand and solve problems of rectilinear & curvilinear motion of particles and kinetics of particles**.**

Course Outcome

On completion of the course students will be able to

1. Understand the basic laws of Mechanics.
2. Construct free-body diagrams and to calculate the reactions necessary to ensure static equilibrium.
3. Analysis of distributed loads.
4. Gain the knowledge of internal forces and moments in members.
5. Calculate centroid/C.G. and moments of inertia.
6. Gain the knowledge of kinematic and kinetic analyses and energy and momentum methods for particles and systems of particles.
7. Gain the Knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies.
8. Analyze problems involving vectors, static equilibrium and dynamic equilibrium.
9. Develop solutions for various static determinants and in determinant problem.

CO Mapping with departmental POs

H: High, M: Medium, L: Low

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1												
CO 2												
CO 3												
CO 4												
CO 5												

Course Content:

Module I:

Importance of Mechanics in engineering; Introduction to Statics; Concept of Particle and Rigid Body; Types of forces: collinear, concurrent, parallel, concentrated, distributed; Vector and scalar quantities; Force is a vector; Transmissibility of a force (sliding vector). **2L**

Introduction to Vector Algebra; Parallelogram law; Addition and subtraction of vectors; Lami's theorem; Free vector; Bound vector; Representation of forces in terms of i,j,k; Cross product and Dot product and their applications. **4L**

Two dimensional force system; Resolution of forces; Moment; Varignon's theorem; Couple; Resolution of a coplanar force by its equivalent force-couple system; Resultant of forces. **5L**

Module II:

Concept and Equilibrium of forces in two dimensions; Free body concept and diagram; Equations of equilibrium. **4L**

Concept of Friction; Laws of Coulomb friction; Angle of Repose; Coefficient of friction. **4L**

Module III:

Distributed Force: Centroid and Centre of Gravity; Centroids of a triangle, circular sector, quadralateral, composite areas consisting of above figures **5L**

Moments of inertia: MI of plane figure with respect to an axis in its plane, MI of plane figure with respect to an axis perpendicular to the plane of the figure; Parallel axis theorem; Mass moment of inertia of symmetrical bodies, e.g. cylinder, sphere, cone. **4L**

Principle of virtual work with simple application **2L**

Concept of simple stresses and strains: Normal stress, Shear stress, Bearing stress, Normal strain, Shearing strain; Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Ultimate stress; Yielding; Modulus of elasticity; Factor of safety. **3L**

Module IV:

Introduction to Dynamics: Kinematics and Kinetics; Newton's laws of motion; Law of gravitation & acceleration due to gravity; Rectilinear motion of particles; determination of position, velocity and acceleration under uniform and non-uniformly accelerated rectilinear motion; construction of x-t, v-t and a-t graphs. **4L**

Plane curvilinear motion of particles: Rectangular components (Projectile motion); Normal and tangential components (circular motion). **4L**

Module V:

Kinetics of particles: Newton's second law; Equation of motion; D.Alembert's principle and free body diagram; Principle of work and energy ; Principle of conservation of energy; Power and efficiency. **7L**

Text Book

1. Engineering Mechanics [Vol-I & II]by Meriam & Kraige, 5th ed. – Wiley India
2. Engineering Mechanics: Statics & Dynamics by I.H.Shames, 4th ed. – PHI
3. Engineering Mechanics by Timoshenko , Young and Rao, Revised 4th ed. – TMH
4. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P
5. Fundamentals of Engineering Mechanics by Debabrata Nag & Abhijit Chanda– Chhaya Prakashani
6. Engineering Mechanics by Basudeb Bhattacharyya– Oxford University Press.
7. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – Pearson