ENGINEERING MECHANICS-I

(Common to ME and AE during I B.Tech., I Semester)

Course Code(s): ME1T6, AE1T6 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial/Interaction Session: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations.
2. To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
3. To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering

COURSE OUTCOMES:

At the end of course the student will be able to:

1. Construct free body diagrams and develop appropriate equilibrium equations.
2. Simplify the system of forces and moments to equivalent systems.
3. Determine centroids and determine moment of inertia for composite areas.
4. Determine the axial forces in the members of determinate truss.
5. Analyze systems with friction.
6. Develop the equilibrium conditions in terms of virtual work.

Pre-Requisites: Mathematics, Engineering Physics

UNIT - I

ANALYSIS OF FORCES IN A PLANE:

Principles of statics, Force, Addition of two forces: Parallelogram Law - Composition and resolution of forces - Constraint, Action and Reaction. Types of supports and support reactions. Free body diagram. Equilibrium of concurrent forces in a plane - Method of projections - Moment of a force, Theorem of Varignon, Method of moments.

Types of parallel forces, Resultant. Couple, Resolution of force into force and a couple. General case of parallel forces in a plane.

UNIT - II

CENTROIDS AND AREA MOMENTS OF INERTIA:

Introduction, Determination of centroids of simple figures by integration method, Centroids of composite plane figures, Pappus theorem.

Area Moments of Inertia, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

UNIT - III

ANALYSIS OF TRUSSES BY METHOD OF JOINTS:

Types of Trusses - Assumptions for forces in members of a perfect truss, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT - IV

FRICTION :

Introduction, Classification of friction, Laws of dry friction. Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Frictional forces on wheel, Wedge friction.

UNIT - V

PRINCIPLE OF VIRTUAL WORK:

Principle of virtual work, advantages of principle of virtual work, principle of virtual applied to stability of equilibrium. Application of principle of virtual work limited to beams, ladder problems and trusses only.

LEARNING RESOURCES

TEXT BOOKS :

1. Engineering Mechanics, (2nd Edition) by S.Timoshenko & D.H.Young, McGraw Hill publications.

2. Engineering Mechanics Statics and dynamics, by A.K.Tayal, Umesh Publication, Delhi, 2009.

REFERENCE BOOKS :

1. Vector Mechanics for Engineers Statics and Dynamics, (9^{th} edition) by Beer and Johnston, Tata McGraw Hill Publishing Company, New Delhi.

2. Engineering Mechanics, by S.S. Bhavikatti & J.G. Rajasekharappa, New Age International Publishers, New Delhi, 2008.

3. Engineering Mechanics, (3^{ed} edition) by Statics and Dynamics K.Vijaya Kumar Reddy and J Suresh Kumar, BS Publications.

e-learning resources:

http://nptel.ac.in/courses.php

http://jntuk-coeerd.in/