

15AME02-ENGINEERING MECHANICS
(Common for CE & ME)

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Objective:

Through this course students will advance their development of the following specific capabilities:

1. Ability to utilise scalar and vector analytical techniques for analysing forces in statically determinate structures.
2. Ability to apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
3. This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.

UNIT I

Introduction of Engineering Mechanics - Basic concepts - System of Forces - Moment of Forces and its Application - Couples and Resultant of Force System - Equilibrium of System of Forces - Degrees of Freedom - Free body diagrams -Types of Supports - Support reactions for beams with different types of loading - concentrated, uniformly distributed and uniformly varying loading.

UNIT II

Friction: Types of friction- laws of Friction - Limiting friction- Cone of limiting friction- static and Dynamic Frictions - Motion of bodies - Wedge, Screw jack and differential Screw jack.

UNIT III

Centroid and Center of Gravity: Centroids of simple figures - Centroids of Composite figures - Centre of Gravity of bodies - Area moment of Inertia - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Moment of Inertia of Simple solids - Moment of Inertia of composite masses.(Simple problems only)

UNIT IV

Kinematics: Rectilinear and Curvilinear motion - Velocity and Acceleration - Motion of A Rigid Body - Types and their Analysis in Planar Motion.

Kinetics: Analysis as a particle and Analysis as a Rigid Body in Translation - Central Forces of motion - Equations of Plane Motion - Fixed Axis Rotation - Rolling Bodies - Work Energy Method - Equation for Translation - Work Energy application to Particle Motion, Connection System - Fixed axis Rotation and Plane Motion.

UNIT V

Analysis of Perfect Frames: Types of frames - cantilever frames and simply supported frames - Analysis of frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

Head
Mechanical Engineering Department,
JNTUA College of Engineering,
PULIVENDULA - 516 390.

Mechanical Vibrations: Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple Compound and Torsional pendulum- Numerical problems

Text Books:

1. Engineering Mechanics by Bavikatti - Pearson Education.
2. Engineering Mechanics by A.Nelson.
3. Engineering Mechanics - B. Bhattacharyya, Oxford University Publications.

Reference Books:

1. Engineering Mechanics by Fedrinand L.Singer - Harper Collings Publishers.
2. Engineering Mechanics by Seshigiri Rao, Universities Press, Hyderabad.
3. Engineering Mechanics (Statics and Dynamics) by Hibller and Gupta; Pearson Education.
4. Engineering Mechanics by S.Timoshenko, D.H.Young and J.V.Rao, Tata McGraw-Hill Company.
5. Engineering Mechanics by Chandramouli, PHI publications.
6. Engineering Mechanics -Arthur P. Boresi and Richard J. Schmidt. - Brooks/Cole - Cengage Learning.

Course outcomes:

After learning this course, Students will be able to

- Solve for the resultants of any force systems
- Determine equivalent force systems
- Determine the internal forces in plane frames, simple span trusses and beams
- Solve the mechanics problems associated with friction forces
- Obtain the centroid, first moment and second moment of an area .
- Describe the motion of a particle in terms of its position, velocity and acceleration in different frames of reference
- Analyze the forces causing the motion of a particle

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