

1/4 B.Tech. SECOND SEMESTER

CE2T5

ENGINEERING MECHANICS

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Objectives:

- To gain a basic knowledge of rigid-body mechanics, elasticity and structural analysis
- To understand the Moment of inertia of plane areas and material bodies and the dynamics of particles and rigid bodies

Learning outcomes:

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

- Determine the resultant of a force system and construct free body diagrams and develop appropriate equilibrium equations.
- Simplify the system of forces and moments to equivalent systems.
- Locate centroids and determine moment of inertia for composite areas.
- Determine the mass moment of inertia of rigid bodies.
- Apply equations of motions to particle and rigid body motion.
- Analyze motion of particles & rigid bodies using the principle of energy

UNIT – I

CONCURRENT 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.

UNIT –II

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 – III

CENTROIDS:

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

UNIT – IV

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.

MOMENT OF INERTIA OF MATERIAL BODIES:

Moment of inertia of a rigid body – Moment of inertia of laminas- slender bar, rectangular plate, Circular plate, circular ring, Moment of inertia of 3D bodies- cone, solid cylinder, sphere & parallelepiped.

UNIT – V

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 – VI

PRINCIPLE OF VIRTUAL WORK:

Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion.

UNIT – VII

KINEMATICS OF RECTILINEAR TRANSLATION - I:

Introduction, displacement, velocity and acceleration. Motion with Uniform and Variable acceleration.

UNIT – VIII

KINETICS OF RECTILINEAR TRANSLATION - II:

Equations of rectilinear motion. Equations of Dynamic Equilibrium: D'Alembert's Principle. Work and Energy, Conservation of energy, Impulse and Momentum, Impact-Direct central Impact.

Learning resources

Text books:

1. Engineering Mechanics, (4th edition) by Timoshenko, S. and Young, D.H., Tata McGraw-Hill, 1956.(For Concepts and symbolic Problems).
2. Engineering Mechanics Statics and dynamics, (14th edition) by Tayal, A.K., Umesh Publication, Delhi, 2012.

Reference books:

1. Vector Mechanics for Engineers Statics and Dynamics, (3rd edition) by Beer and Johnston., Tata McGraw-Hill, New Delhi, 1997.
2. Engineering Mechanics by Bhavikatti, S.S. and Rajasekharappa, J.G., New Age International Publications, 2009.
3. Singer's Engineering Mechanics Statics and Dynamics, (3rd Edition) by Vijaya Kumar Reddy, K. and Suresh Kumar. J.,BS Publications, 2012.

Web Reference:

1. http://openlibrary.org/books/OL22136590M/Basic_engineering_mechanics
2. http://en.wikibooks.org/wiki/Engineering_Mechanics
3. <http://nptel.iitm.ac.in/video.php?courseId=1048>
4. <http://imechanica.org/node/1551>
5. <http://emweb.unl.edu/>
6. <http://ebooks-freownload.com/2009/11/engineering-mechanics-statics-12.html>
7. http://www.ebookee.com/Engineering-Mechanics-Statics_37859.html