

**ENGINEERING MECHANICS**  
(Only for CE during I B.Tech., II Semester)

**Course Code: CE2T4**

**Credits: 3**

**Lecture: 3 periods/week**

**Internal assessment: 30 marks**

**Tutorial: 1 period /week**

**Semester end examination: 70 marks**

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**Course Objectives:**

- To understand the basic principles, fundamental concepts and theory with adequate problems of static and dynamics of rigid bodies.
- To gain an appropriate knowledge of centroid, moment of inertia, friction, transmission of power and perfect trusses.

**Course outcomes:**

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

- Determine the resultant of a force system, construct free body diagrams and develop appropriate equilibrium equations.
- Solve friction and transmission of power related problems.
- Locate centroid and determine moment of inertia for composite areas.
- Determine the mass moment of inertia of rigid bodies.
- Analyze perfect trusses using the method of joints and motion of particles & rigid bodies using the principle of virtual work.
- Analyze kinematics and kinetics of rectilinear motion.

**UNIT – I**

**SYSTEM OF FORCES:**

Principles of statics, Composition and resolution of forces, Free body diagram, Equilibrium of Coplanar Concurrent in a plane, Equilibrium of concurrent forces in a plane, Method of projections, Moment of a force, Method of moments.

**FRICTION:**

Introduction, Classification of friction, Laws of dry friction, Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Wedge friction.

**UNIT – II**

**CENTROID:**

Determination of centroid of simple figures by integration method, Centroid of composite plane figures, Pappus theorem,

**AREA MOMENT OF INERTIA:**

Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of composite figures, Products of Inertia, Transfer Formula for Product of Inertia

**UNIT – III**

**MASS MOMENT OF INERTIA:**

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

**PRINCIPLE OF VIRTUAL WORK:**

Equilibrium of Ideal systems, Potential energy and stability: Stable and Unstable Equilibrium, Application on the principle of virtual work.

#### **UNIT – IV**

##### **KINEMATICS OF RECTILINEAR MOTION:**

Introduction to dynamics, Principles of Dynamics, Kinematics of rectilinear Motion with Uniform and Variable acceleration, Differential equation of rectilinear motion.

##### **KINETICS OF RECTILINEAR MOTION:**

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.

#### **UNIT – V**

##### **CURVILINEAR MOTION:**

Kinematics of curvilinear motion, Differential equations of curvilinear motion, Motion of a projectile, D'Alembert's Principle, Moment of momentum, Work and energy.

##### **ROTATION OF RIGID BODIES:**

Kinematics of rotation, Equation of motion for a rigid body rotating about fixed axis, Rotation under action of a constant moment, Angular momentum in rotation.

#### **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](http://openlibrary.org/books/OL22136590M/Basic_engineering_mechanics)
2. [http://en.wikibooks.org/wiki/Engineering\\_Mechanics](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-freedownload.com/2009/11/engineering-mechanics-statics12.html>
7. [http://www.ebookee.com/Engineering-Mechanics-Statics\\_37859.html](http://www.ebookee.com/Engineering-Mechanics-Statics_37859.html)

##### **e-learning resources:**

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

<http://jntuk-coeerd.in/>