ENGINEERING MECHANICS

(Common to all Branches)

Course Code: 15ME1101

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Course Outcomes:

At the end of the course, a student will be able to

CO 1 Convert a given physical problem (by drawing the Free Body Diagrams) into a suitable force system and find i)the resultant force(if any) or, ii) the unknown reactions.

CO 2 Solve problems involving static and kinetic friction.

CO 3 Locate the centroid of a given plane area and find its area and area moment of inertia.

CO 4 Compute the mass moment of inertia of a body, calculate the displacement, velocity and acceleration of a particle subjected to rectilinear or curvilinear translation.

CO 5 Compute the motion of and torques on a body subjected to fixed axis rotation; apply work-energy principle to particles and connected systems.

UNIT-I (13 Lectures)

RESULTANT OF FORCE SYSTEMS:

Parallelogram law, forces and components, resultant of coplanar concurrent forces, components of forces in space, moment of force, principle of moments, coplanar applications, couples, resultant of any force system (coplanar concurrent cases only).

Equilibrium of force systems: Free body diagram, equations of equilibrium, equilibrium of planar systems. Analysis of structures-method of joints, method of sections.

UNIT-II (7 Lectures)

FRICTION:

Theory of friction, angle of friction, laws of friction, static friction, kinetic friction, friction in bodies moving up or down on an inclined plane, wedge friction.

UNIT-III (10 Lectures)

CENTROID AND CENTER OF GRAVITY:

Center of gravity of flat plate, centroids of areas and lines, importance of centroids of areas and lines, importance of centroids and first moments of area, centroids determined by integration, centroids of composite figures, theorems of Pappus, center of gravity of bodies.

MOMENT OF INERTIA:

Definition of moment of inertia, polar moment of inertia, radius of gyration, parallel axis theorem, moments of inertia by integration, moments of inertia for composite areas.

UNIT-IV (10 Lectures)

MASS MOMENT OF INERTIA:

Introduction, radius of gyration, parallel axis theorem, mass moments of inertia by integration, moments of inertia of composite bodies.

KINEMATICS AND KINETICS OF A PARTICLE:

Motion of a particle, rectilinear motion, rectangular components of curvilinear motion, normal and tangential components of acceleration, radial and transverse components, cylindrical coordinates, translation-analysis as a particle, further discussion of particle kinematics.

UNIT-V (10 Lectures)

KINEMATICS AND KINETICS OF A BODY UNDERGOING FIXED AXIS ROTATION:

Types of rigid-body motion, angular motion-fixed axis rotation, application of kinematic equations, kinetics of fixed axis rotation.

WORK-ENERGY METHOD:

Work-energy equation for translation, interpretation and computation of work, work-energy applied to particle motion, power, efficiency,

applied to fixed-axis rotation, work-energy applied to connected systems, work-energy method

TEXT BOOK:

1. Vijaya Kumar Reddy K and Suresh Kumar J (Adapters), "*Singer`s Engineering Mechanics : Statics and Dynamics*", 3rd Edition (SI Units), BS Publications, Hyderabad, 2011.

REFERENCES:

1. Timoshenko SP, Young DH, Rao and Pytel, "*Engineering Mechanics*", 4th Edition, McGraw Hill International Edition, 2013.
2. Hibbeler RC, "*Engineering Mechanics: Statics*", Low-priced Edition, Pearson Education,2000.
3. Hibbeler RC, "*Engineering Mechanics: Dynamics*", Low-priced Edition, Pearson Education,2000.
4. Tayal AK, "*Engineering Mechanics: Statics and Dynamics*", 13th Edition, Umesh Publications, Delhi, 2005.