Course Code: ES 208
Course Name: Mechanics
Credits: 3 (2-1-0)
Course Position: Semester 3

Contents:

Module 1: Introduction to mechanics: Fundamental concepts and definitions – Systems of units – Force vectors – Equilibrium of a particle – Resultants of force systems – Moment of a force – Moment of a couple – Simplification of force and couple systems – Reduction of simple distributed loading.

Module 2: Analysis of structures: Equilibrium of a rigid body – Conditions for rigid-body equilibrium – Free-body diagrams – Equilibrium in two dimensions – Equations of equilibrium – Simple trusses – The method of joints – The method of sections – Analysis of frames – Analysis of cables – Cables subjected to concentrated loads – Cables subjected to distributed loads.

Module 3: Friction, center of gravity and moment of inertia: Characteristics of dry friction – Problems involving dry friction – Wedges – Frictional forces on screws and flat belts – Rolling resistance – Center of gravity, center of mass and centroid – Composite bodies – Theorems of Pappus and Guldinus – Resultant of general distributed loading – Definition of moments of inertia for areas – Parallel-axis theorem for an area – Radius of gyration of an area – Moments of inertia for composite areas.

Module 4: Virtual work: Definition of work – Principle of virtual work – Principle of virtual work for a system of connected rigid bodies – Conservative forces – Potential energy – Potential energy criterion for equilibrium.

Module 5: Selected topics in engineering dynamics: Brief review of kinematics and kinetics of particles: Rectilinear kinematics, Curvilinear motion, Motion of a projectile – Newton's laws of motion – Central-force motion and space mechanics – Principle of work and energy – Conservation of energy – Principle of impulse and momentum – Conservation of linear momentum for a system of particles – Angular momentum – Planar rigid-body motion – Translation – Rotation about a fixed axis – Instantaneous centre of rotation.

Textbook:

1. F. Beer, E. Johnston, D. Mazurek, P. Cornwell, B. Self, S. Sanghi, Vector Mechanics for Engineers: Statics and Dynamics, McGraw Hill India, 2017.

References:

1. R.C. Hibbeler, Engineering Mechanics: Statics and Dynamics, 11th edition, Pearson, 2009.
2. A.P. Boresi, R.J. Schmidt, Engineering Mechanics: Statics and Dynamics, 1st edition, Cengage Learning, 2008.