

Engineering Mechanics

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Engineering Mechanics

Module-I: Introduction to Engineering Mechanics

Force System Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body Equilibrium; System of Force, Coplanar Concurrent Forces, Components in Space- Resultant- Moment of Force and its Application; Couples and Resultant for Force System, Equilibrium of System of Force, Free body diagrams, Equations of Equilibrium of Coplanar System and Spatial System; Static Indeterminacy.

Module-II: Friction and Basic Structural Analysis

Types of friction, Limiting friction, Laws of friction, Static and Dynamic friction; Motion of Bodies, Wedge friction, Screw jack and differential screw jack. Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension (or) compression; Simple Trusses; Zero force members; Beams and types of beams; Frames and Machines.

Module-III: Centroid and Centre of Gravity and Virtual Work and Energy Method

Centroid of simple figures from basic principle, Centroids of Composite Sections; Centre of Gravity and its Implications; Area moment of inertia-Definition, Moment of inertia plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment of inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

Module-IV: Particle Dynamics and Introduction to Kinetics

Particle dynamics-Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momen-

tum (linear, angular); Impact (Direct and oblique). Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems. D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its applications in plane motion of connected bodies; Kinetics of rigid body rotation.

Module-V: Mechanical Vibrations

Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulum, use of simple, compound and torsion pendulums.

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