

CE1001E ENGINEERING MECHANICS

Pre-requisites: Nil

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Total lecture sessions: 39

Course Outcomes:

Students will be able to:

CO1: Solve rigid body static problems using equations of equilibrium

CO2: Analyse truss using method of joints and method of sections

CO3: Draw SFD and BMD of statically determinate beams

CO4: Analyse chains and cables, calculate friction forces and properties of surfaces

Fundamentals of mechanics: Introduction - idealisations of mechanics - vector and scalar quantities - equality and equivalence of vectors - laws of mechanics.

Important vector quantities: Elements of vector algebra - position vector - moment of a force about a point - moment of a force about an axis - the couple and couple moment - couple moment as a free vector - addition and subtraction of couples - moment of a couple about a line.

Equivalent force systems: Translation of a force to a parallel position - resultant of a force system - simplest resultant of special force systems - distributed force systems.

Equations of equilibrium: Free body diagram - free bodies involving interior sections - general equations of equilibrium - problems of equilibrium - static indeterminacy.

Introduction to structural mechanics: Trusses - The structural model - the simple truss - solution of simple trusses - method of joints - method of sections.

Section forces in beams: Shear force - axial force and bending moment - differential relations for equilibrium - SFD - BMD - various types of statically determinate beams.

Chains and cables: Coplanar cables - parabolic and catenary cables - elementary problems.

Friction forces: Laws of Coulomb friction - simple contact friction problems.

Properties of surfaces: First moment of area and centroid - theorems of Pappus-Guldinus, second moments and the product of a plane area, transfer theorems, computations involving second moments and products of area - relation between second moments and products of area - polar moment of area - principal axes.

References:

1. Engineering Mechanics - Statics and Dynamics, I. H. Shames, 4th Edition, Prentice Hall of India.
2. Vector Mechanics for Engineers – Statics, F.P. Beer and E.R. Johnston, McGraw Hill Book Co.
3. Engineering Mechanics - Statics, J.L. Meriam and L.G. Kraige, John Wiley & Sons.
4. Engineering Mechanics - S. Timoshenko, D.H. Young, J.V. Rao, Sukumar Pati, 5th Edition, McGraw Hill Education.
5. Engineering Mechanics – Statics, R. C. Hibbeler, 14th Edition, Pearson Prentice Hall.