

Course Syllabi: UES003 Applied Mechanics (L : T : P :: 3 : 1 : 2)

1. **Course number and name:** UES003; Applied Mechanics
2. **Credits and contact hours:** Credits: 4.5; Hours: 6
3. **Text book, title, author, and year**
 - *Bhattacharya, B., Engineering Mechanics, Oxford University Press (2008).*
 - *Singh, D. K., Mechanics of Solids, Pearson Education Ltd. (2002).*
 - *Nanda, S., Basu, N. and Nayak, P. C., Introduction to Mechanics, Narosa Publishing House (1999).*
 - *Shames, I. H. and Pitarresi, J. M., Solid Mechanics, Prentice Hall of India (1993).*
 - *Crandall, S. H., Dahl, N. C. and Lardner, T. V. Mechanics of Solids: An Introduction, McGraw Hill International (1994).*
 - a. Other supplemental materials
 - Nil
4. **Specific course information**
 - a. Brief description of the content of the course (catalog description)

Equivalent Force Systems: Vector Algebra, Planar Force Systems, Coplanar Collinear Forces, Concurrent Forces, Coplanar Parallel Forces, Basic Concepts of Force-Couple Systems, Varignon's Theorem, Simplest Equivalent for General Force System, Distributed Force Systems.

Equations of Statics and Its Applications: Simple Frictionless Rigid Body Assemblies, Equations of Equilibrium, Free Body Diagrams, Support Reactions, Two-Force Members, Plane Trusses.

Centre of Gravity, Mass and Area Moment of Inertia: Centroid of Simple and Built Up Section, Second Moment of Area.

Axial Stress and Strain: Concept of Stress and Strain, Generalized Hooke's Law, Stress-Strain Diagram of Ductile and Brittle Materials, Properties of Engineering Materials, Statically Determinate and Indeterminate Problems, Compound and Composite Bars, Thermal Stresses.

Torsion of Circular Shafts: Basic Assumptions, Torsion Formula, Power Transmitted by Shafts, Design of Solid Hollow Shafts Based on Strength and Stiffness.

Shear Force and Bending Moment Diagrams: Types of Load on Beam, Classification of Beams, Shear Force and Bending Moment Diagrams: Simply Supported, Overhung and Cantilever Beams Subjected to Any Combination of Point Loads, Uniformly Distributed and Varying Load and Moment, Relationship Between Load, Shear Force and Bending Moment.

Theory of Pure Bending: Derivation of Flexural Formula for Straight Beams, Bending Stress Calculation for Beams of Simple and Built Up Sections, Flitched Beams.

Shear Stresses in Beams: Shear Stress Formula for Beams, Shear Stress Distribution in Beams.

Analysis of Plane Stress and Strains: Transformation Equations for Plane Stress and Plane Strain, Mohr's Stress Circle, Relation Between Elastic Constants, Strain Measurements, Strain Rosettes.

5. **Specific goals for the course**

After the completion of the course, the students will be able to:

- Learn the concept of equivalent force systems related vector and scalar systems.
- Explain the equations of statics for free body diagrams.
- Learn the concept of centre of gravity, mass and moment of inertia.
- Analyze the concept of axial stress and strain, torsion of circular shafts, shear force and bending moment diagrams, and analysis of plane stress and strains.

6. Brief list of topics to be covered

- Equivalent Force System
- Stress and Strain
- Gravity, Mass and Moment of Inertia
- Equations of Statics
- Torsion of Circular Shafts
- Shear Force and Bending Moment Diagrams
- Shear Stresses in Beams