

PCI3I001 MECHANICS OF SOLID
Theory L/T (Hours per week): 3/1, Credit: 4

Module-I (12 classes)

Simple Stress and Strain -Load, Stress, Principle of St.Venant, Principle of Superposition, Strain, Hooke's law, Modulus of Elasticity, Stress-Strain Diagrams, Working Stress, Factor of safety, Strain energy in tension and compression, Resilience, Impact loads, Analysis of Axially Loaded Members, Composite bars in tension and compression, temperature stresses in composite rods, Statically indeterminate problems, Shear stress, Complimentary shear stress, Shear strain, Modulus of rigidity, Poisson's ratio, Bulk Modulus, Relationship between elastic constants.

Compound Stress and strain- Stresses in thin cylinders, thin spherical shells under internal pressure, wire winding of thin cylinders. Analysis of Biaxial Stress. Plane stress, Principal stress, Principal plane, Mohr's Circle for Biaxial Stress, Two dimensional state of strain, Mohr's circle for strain, Principal strains and principal axes of strain, strain measurements, Calculation of principal stresses from principal strains.

Module-II (10 classes)

Shear Force and Bending Moment for Determinate Beams - Types of load and Types of support. Support reactions, Shear force and bending moment, Relationship between bending moment and shear force, Point of inflection, Shear Force and Bending Moment diagrams for determinate beams.

Module-III (10 classes)

Simple Bending of Beams - Theory of simple bending of initially straight beams, Bending stresses, Shear stresses in bending, Distribution of normal and shear stress, beams of two materials, Composite beams.

Deflection of Beams - Differential equation of the elastic line, Slope and deflection of beams by integration method and area - moment method.

Module-IV (8 classes)

Theory of Columns - Eccentric loading of a short strut, Long columns, Euler's column formula, Lateral buckling, Critical Load, Slenderness ratio

Torsion in solid and hollow circular shafts - Twisting moment, Strain energy in shear and torsion, strength of solid and hollow circular shafts. Stresses due to combined bending and torsion, Strength of shafts in combined bending and twisting.

TEXT BOOKS

1. *Elements of Strength of Materials* by S.P. Timoshenko and D.H. Young, Affiliated East-West Press
2. *Strength of Materials* by G. H. Ryder, Macmillan Press
3. *Strength of Materials* by R. Subramaniam, Oxford University Press
4. *Strength of Material* by S. S. Ratan, McGraw Hill

REFERENCE BOOKS

1. *Mechanics of Materials* by Beer and Johnston, McGraw Hill
2. *Mechanics of Materials* by R.C. Hibbeler, Pearson Education
1. *Engineering Mechanics of Solids* by Egor P. Popov, Prentice Hall of India