

Strength of Materials

ME 302

Contact Week / Semester = 12 minimum

Contact per week: 3L

Credit: 3

Module 1A

Concept of mechanics of deformable solids; concept of stress developed against external force/pressure; brief review of normal and shearing stress and strain; [1L]

Module 1B

Deformation of axially loaded members, statically determinate and indeterminate problems. [4L]

Module 1C

Strain energy in tension and compression [1L]

Module 2

Analysis of Biaxial stresses-Mohr's circle for biaxial stress; concept of normal stress, principal stress and pure shear. Shear strain and shear strain energy. Stresses in thin walled pressure vessels-tangential and Hoop stress.

Relation between shear modulus and Young's modulus. [6L]

Module 3

Stresses in beams; shear force (SF), axial force and bending moment (BM); differential relations for BM, SF and load; SF and BM diagrams; bending stresses in straight beams –symmetric loading; stresses in beams of various cross sections; stresses in built-up beams and beams of different materials. [7L]

Module 4

Torsion of a circular shaft, shear energy in torsion. Concept of closed and open coiled helical springs, Stresses and deflection of helical springs under axial pull. [4L]

Module 5

Deflection of statically determinate and indeterminate beams due to bending moment, differential equation of elastic line, Area-moment method, Strain energy method- Castiglino's theorem, superposition method. [7L]

Module 6

Theory of columns; eccentric loading of short strut; column buckling: Euler load for columns with pinned ends and other end restraints; Euler's curve; empirical column formulae – (i) straight line, (ii) parabolic and (iii) Rankine Gordon. [6L]

Note for Teachers:

1. Stress should be given to clarify different concepts of the subject.
2. Deduction of all relevant equations should be worked out and explained.
3. Sufficient number of problems from each topic should be worked out during class and as home assignment.

Note for examination paper setter:

At least one question should be set from each module.

Books Recommended

1. *Elements of Strength of Materials* by Timoshenko & Young, 5th Ed.- East west press.
2. *Introduction to Solid Mechanics* by Shames & Pitarresi, 3rd Ed., Prentice Hall India.
3. *Mechanics of Materials* by Beer & Johnston, TMH
4. *Engineering Mechanics of Solids* by E.P. Popov; 2nd Ed., Prentice Hall India