ME 212 Solid Mechanics - I (2-1-0-6)

Introduction. Stress and strain: stress at a point, Cauchy stress tensor, analysis of deformation and definition of strain components, principal stresses and strains, stress and strain invariants, Mohr's circle representation. Constitutive relations. Material properties for isotropic materials and their relations. Theories of failures for isotropic materials. Shear Force and Bending Moment diagrams. Axially loaded members. Torsion of circular shafts. Stresses due to bending: pure Bending, transverse shear. Combined stresses due to bending, torsion and axially loading. Deflections due to bending. Strain energy due to axial, torsion, bending and transverse shear. Castigliano's theorems. Thin cylinders and spherical vessels. Introduction to buckling of columns.

Texts:

[1] E. P. Popov, Engineering Mechanics of Solids, Prentice Hall, 1998.

[2] F. P. Beer, E. R. Johnston (Jr.) and J.T. DeWolf, Mechanics of Materials, Tata McGraw Hill, 2005.

References:

[1] S. H. Crandall, N. C. Dahl, and T. J. Lardner, An Introduction To The Mechanics Of Solids, 2nd Ed., Tata McGraw Hill, 2008.

[2] S. P. Timoshenko, Strength of Materials, Vols. 1 & 2, CBS Publishers, 1986.

[3] H. Shames and J. M. Pitarresi, Introduction to Solid Mechanics, Prentice Hall of India, 2003.

[4] J. M. Gere, Mechanics of Materials, Thomson Brooks/Cole, 2006.