ME 530 Advanced Mechanics of Solids (3-0-0-6)

Analysis of Stresses and Strains in rectangular and polar coordinates: Cauchy's formula, Principal stresses and principal strains, 3D Mohr's Circle, Octahedral Stresses, Hydrostatic and deviatoric stress, Differential equations of equilibrium, Plane stress and plane strain, compatibility conditions. Introduction to curvilinear coordinates. Generalized Hooke's law and theories of failure. Energy Methods. Bending of symmetric and unsymmetric straight beams, effect of shear stresses, Curved beams, Shear center and shear flow, shear stresses in thin walled sections, thick curved bars. Torsion of prismatic solid sections, thin walled sections, circular, rectangular and elliptical bars, membrane analogy. Thick and thin walled cylinders, Composite tubes, Rotating disks and cylinders. Euler's buckling load, Beam Column equations. Strain measurement techniques using strain gages, characteristics, instrumentations, principles of photo-elasticity.

Texts/References:

- M. H. Sadd, Elasticity: theory, applications, and numeric, 3rd edition, Academic Press, 2014.
- L. S. Srinath, Advanced mechanics of solids, 3rd Edition, McGraw-Hill, 2009. .
- R. G. Budynas, Advanced Strength and Applied Stress Analysis, 2nd Edition, McGraw Hill, 1999.
- A. P. Boresi, R. J. Schmidt, Advanced Mechanics of Materials, 6th Edition, John Willey and Sons, 2009.
- S. P. Timoshenko, J. N. Goodier, Theory of Elasticity, 3rd Edition, McGraw Hill, 2017.
- P. Raymond, Solid Mechanics for Engineering, 1st Edition, John Willey & Sons, 2001.
- J. W. Dally and W. F. Riley, Experimental Stress Analysis, 3rd Edition, McGraw Hill, 1991.