



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Advanced Strength of Materials and Elasticity Theory

MECHENG 7163

Credit Hours:

4.00 - 4.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Stress-Strain analysis of elastic solids: curved beams; non-symmetrical bending; non-circular torsion; beams on elastic foundations; load-deflection relations by energy methods; plane problems in elasticity theory; and applications to design

Prerequisites and Co-requisites:

Prereq: 2020 (420) or 2040, or equiv, and Math 2174 or 2255 (255) or 2415 (415); or Grad standing in MechEng.

Course Goals / Objectives:

- Ability to use energy methods for determination of displacement or deflection
 - Ability to analyze beam bending including: nonsymmetrical bending of straight beams, curved beams, thin walled beams (shear center), and elastic foundations
 - Ability to understand governing equations of elasticity, plane stress, plane strain, Airy stress function
 - Ability to analyze plane elastic boundary value problems both in Cartesian coordinates and polar coordinates
 - Ability to understand thermoelastic governing equations and solve problems
 - Ability to analyze torsion and bending problems with several cross sections
 - Ability to analyze axisymmetric and spherically symmetric boundary value problems
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Course Topics:

- Transformation of stress, transformation of strain, principal stresses/strains, 3D stress & strain relations
 - Application of energy methods, Castigliano's theorem on deflections for linear load-deflection relations, statically indeterminate structures
 - Torsion, Saint-Venant's semi-inverse method, soap-film analogy, thin-wall torsion members and multiply connected cross sections
 - Bending of straight beams, bending stresses and deflections in beams subjected to nonsymmetrical bending
 - Shear center for thin wall beam cross sections
 - Curved beams, circumferential stresses, radial stresses, deflections, statically indeterminate curved beams
 - Beams on elastic foundations, infinite beam subjected to a concentrated load, distributed load, semi-infinite beam
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Designation:

Elective