PURDUE UNIVERSITY FORT WAYNE | Department of Civil and Mechanical Engineering

Course	ME 55000 - Advanced Stress Analysis
Type of Course	Elective for ME program (Group 1) Required for MSE-ME concentration
Catalog Description	Studies of stresses and strains in three-dimensional problems. Failure theories and yield criteria. Stress function approach to two-dimensional problems. Bending of non-homogeneous asymmetric curved beams. Torsion of bars with noncircular cross sections. Energy methods. Elastic stability. Introduction to plates. Students may not receive credit for both ME 46900 and ME 55000.
Credits	3
Contact Hours	3
Prerequisite Courses	MA 36300, ME 25200, & ME 30300 with a grade of C or better
Corequisite Courses	None
Textbooks	A. P. Boresi and R. J. Schmidt, Advanced Mechanics of Materials, Sixth Edition, John Wiley, 2003. (Required) A.C. Ugural and S.K. Fenster, Advanced Strength and Applied Elasticity, Fourth Edition, Prentice Hall, 2003. (Suggested Reference)
Course Objectives	The objective of this course is to provide students the tools required for design and analysis of complex problems in mechanics of materials.
Course Outcomes	After completion of this course, the students should be able to: 1. Explain the concept of elasticity, and the difference between stress and strain. (1) 2. Explain the terms: isotropic, orthotropic and anisotropic, as applied to materials. (1) 3. Explain the terms: plane stress and plane strain. (1) 4. Conduct the transformation of plane stress or plane strain components using Mohr's circle, the method of eigenvalues and eigenvectors. (1) 5. Use the concepts of principal stress and principal strains. (1) 6. Apply the analytical procedures involved in strain gage measurements, in particular the transformation equations. (1) 7. Solve basic problems in two-dimensional elasticity using Airy's stress function. (1)

8 .Evaluate solutions of simple engineering problems using mechanics of material theories. (1,2)
9. Understand the importance of various yield criteria and material stability. (1)
10. Calculate the stresses and strains associated with thick-wall cylindrical pressure vessels and rotating disks. (1)
11. Apply energy methods for the determination of the deflections and rotations. (1)

Lecture Topics

1. Three-dimensional stress analysis
2. Plane stress and plane strain problems
3. Stress functions
4. Failure criteria
5. Bending of curved beams
6. Shear stresses
7. Shear center
8. Torsion
9. Thin-walled members
10. Statically indeterminate problems
11. Beams on elastic foundation
12. Fourier series
13. Energy methods
14. Introduction to plates
15. Introduction to Fracture Mechanics
16. Thick-wall cylindrical pressure vessels and rotating disks

Computer Usage Low

Laboratory Experience None

Design Experience Low

Coordinator Nashwan T. Younis, Ph.D.

Date 17 October 2022