



Department of

Mechanical Engineering

M e r c e r U n i v e r s i t y

Syllabus for MAE 628
Applied Elasticity
Spring Semester 2016
Meeting Days: Tuesday, Thursday
6:00 – 7:15 pm
Room SEB 144

Instructor: Richard K. Kunz, Ph.D., P.E.
Associate Professor
Department of Mechanical Engineering

Office: Suite 105F, School of Engineering

Hours: MTWRF 9:00 am – 5:00 pm, **except**
MWF 9 – 11
MWF 1 – 2
F 3 – 5

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Textbook:

Required

Phillip L. Gould, *Intorduction to Linear Elasticity*, 3rd edition, Springer, 2013, ISBN:
978-1-4614-4832-7 (hardcover); 978-1-4899-9810-1 (softcover).

Course Description:

Analysis of stress, analysis of strain, and development of the governing field equations of linear elasticity: equilibrium, kinematic, constitutive, and compatibility equations. Formulation of elastic boundary value problems. Application to two- and three-dimensional problems.

Course Objectives:

Development of the general field equations of elasticity, with emphasis on linear elasticity:

- Kinematics of deformation and specification of strain
- Compatibility equations
- Stress and equilibrium
- Constitutive equations

Formulation of boundary-value problems in linear elasticity

- Stress formulation
- Displacement formulation

Application to selected two- and three-dimensional problems

- Plane stress and plane strain problems
- Torsion and bending of bars

Prerequisites:

MAE 310: Engineering Analysis for Mechanical Engineers, or equivalent; MAE 320: Solid Mechanics II, or equivalent.

Grading:

Homework	20%
Tests (2)	25% each
Final Exam	30%

Course Standards:

1. **Homework** problems will be assigned in class approximately weekly. They will generally be due at the start of the class one week after assigned.
2. **Reading** assignments will be posted at each class meeting. You are expected to read the listed sections before the next class to prepare for the material to be covered.
3. **Tests:** There will be two 75-minute tests during the semester. Test dates and format will be announced in class no less than 1 week in advance. No make-up tests will be given without a documented excuse. Tentative test dates are February 12 and March 26.
4. **Final Exam:** There will be a comprehensive final exam. Date, time and location will be announced.

Additional Information:

1. Please feel free to arrange a meeting with me at any point that you feel you need it. If you would like to see me, catch me after class to schedule a time, call, email, or stop by my office.
2. The **honor code** provisions as outlined in the *Catalog* and in the student handbook, *The Lair*, and on the web at <http://www2.mercer.edu/HonorCouncil/default.htm> apply to everyone and to all work handed in. By turning in a paper to the instructor, each student certifies that he/she has neither given nor received unauthorized aid in its completion. Plagiarism is a violation of the honor code and is prohibited. When in doubt, please ask to avoid potentially embarrassing situations.
3. Please turn off cell phones before entering the classroom.
4. Electronic communication is an important adjunct to face-to-face communication, including from professor to students, students to professor, and students to students. You must have regular access to your Mercer e-mail. If you do not have an active e-mail address on the first day of class, please secure one.
5. Students requiring accommodations or modifications for a disability should inform the instructor at the close of the first class meeting or as soon as possible. The instructor will refer you to the ACCESS and Accommodation Office to document your disability, determine eligibility for accommodations under the ADAAA/Section 504 and to request a Faculty Accommodation Form. Disability accommodations or status will not be indicated

on academic transcripts. In order to receive accommodations in a class, students with sensory, learning, psychological, physical or medical disabilities must provide their instructor with a Faculty Accommodation Form to sign. Students must return the signed form to the ACCESS Coordinator. A new form must be requested each semester. Students with a history of a disability perceived as having a disability or with a current disability who does not wish to use academic accommodations are also strongly encouraged to register with the ACCESS and Accommodation Office and request a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Director and ADA/504 Coordinator, at 301-2778 or visit the ACCESS and Accommodation Office website at <http://www.mercer.edu/disabilityservices>

Tentative Course Coverage

	Chapter
Introduction and Mathematical Preliminaries.....	1
Scalar and vector field operators and theorems	
Index notation and Cartesian tensors	
Coordinate rotation	
Algebra and calculus of Cartesian tensors	
Traction, Stress, and Equilibrium	2
State of stress	
Equilibrium	
Stress Transformation	
Deformation	3
Strain and displacement	
Strain transformation	
Compatibility	
Material Behavior.....	4
Generalized Hooke's law	
Material symmetry	
Thermoelasticity	
Formulation, Uniqueness, and Solution Strategies.....	5
Displacement formulation	
Force formulation	
Solution strategies	
Extension, Bending, and Torsion	6
Two Dimensional Elasticity	7
Governing equations in plane stress and plane strain	
Cylindrical coordinates	
Examples	
Selected Topics	