



Department of

**Mechanical Engineering**

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

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**Syllabus for MAE 427**  
***Solid Mechanics III***  
**Spring Semester 2012**  
**Meeting Days TTh 9:25 – 10:40 am**  
**Room EGC 110**

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**Instructor:** Dr. Richard Kunz, Associate Professor  
Department of Mechanical Engineering

**Office:** Suite 105F, School of Engineering  
**Hours:** MWF 9:00 am – 10:00 am  
TTh 11:00 am – 12:00 noon, 1:00 pm – 2:00 pm  
and by appointment

**Phone:** 301-4061

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**Website:** [http://faculty.mercer.edu/kunz\\_rk/](http://faculty.mercer.edu/kunz_rk/)

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**Textbook:**

**Required:**

- *Advanced Mechanics of Materials and Applied Elasticity*, A. C. Ugural and Saul K. Fenster, 5<sup>th</sup> ed., Prentice-Hall, 2012. ISBN 978-0-13-707920-9

**Reference:**

- \**Advanced Strength and Applied Stress Analysis*, R. G. Budynas, McGraw-Hill, 1999.
  - \**Advanced Mechanics of Materials*, A. P. Boresi and O. M. Sidebottom, Wiley, 1985.
  - *Advanced Mechanics of Materials*, R. Solecki and R. J. Conant, Oxford, 2003.
  - *Intermediate Mechanics of Materials*, M. Vable, Oxford, 2008
- \*Available in Tarver Library

**Catalog Description:**

Three-dimensional stress at a point, compatibility equations, strain energy, plane stress, plane strain, mechanical behavior of materials, beam bending, torsion of prismatic bars, elastic foundations, elastic stability, energy methods.

**Course Objectives:**

- Reinforce fundamental concepts of stress, strain, strain energy, deformation, equilibrium, and material behavior as related to solid bodies under load.
- Understand both the “strength of materials” approach and the “continuum mechanics” approach to the formulation and solution of problems in solid mechanics.
- Develop the governing equations for solid bodies in equilibrium under loads resulting in small deformations and rotations.
- Apply the fundamental concepts to selected topics in solid mechanics

## Prerequisites:

MAE 310, MAE 320

## Grading:

Homework	15%
Tests (2)	25% each
Final Exam	35%

## Course Standards:

1. **Homework** will generally be assigned on Thursday and will be due at the beginning of class the following Thursday. Late homework will not be accepted without a documented excuse. Your lowest homework grade will be dropped.
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. No make-up tests will be given without a documented excuse.
4. **Final Exam:** There will be a comprehensive final exam.
5. The final exam is scheduled for **Saturday, 5 May, 9:00 – 12:00 a.m.**

## 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, come to my office during posted office hours, 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 for a disability should inform the instructor at the close of the first class meeting or as soon as possible. If you are not registered with Disability Services, the instructor will refer you to the Disability Support Services office for consultation regarding documentation of your disability and eligibility for accommodations under the ADA/504. In order to receive accommodations, eligible students must provide each instructor with a "Faculty Accommodation Form" from Disability Services. Students must return the completed and signed form to the Disability Services Coordinator on the 3<sup>rd</sup> floor of the Connell Student Center. Students with a documented disability who do not

wish to use academic accommodations are also strongly encouraged to register with Disability Services and complete a Faculty Accommodation Form each semester. For further information, please contact Carole Burrowbridge, Disability Services Coordinator, at 301-2778 or visit the website at [http://www.mercer.edu/stu\\_support/swd.htm](http://www.mercer.edu/stu_support/swd.htm)

## Tentative Course Coverage

The following lists topics that may be addressed during the course. We will start with a brief introduction and review of elementary concepts in solid mechanics, followed by relatively complete coverage of Chapters 1 and 2; parts of Chapter 3 (primarily Sections 3.1 – 3.9); and parts of Chapter 4 (primarily 4.1 – 4.12). The remainder of the course will deal with selected topics from Chapters 5, 6, 8, 10, 12, and 13 (not necessarily in that order),

	<b>Chapter</b>
Introduction/Review	
Analysis of Stress .....	1
Strain and Stress-Strain Relations .....	2
Two-Dimensional Problems in Elasticity .....	3
Failure Criteria .....	4
Bending of Beams .....	5
Torsion .....	6
Axisymmetric Problems .....	8
Energy Methods .....	10
Plastic Behavior of Materials.....	12
Plates and Shells.....	13

### Test Dates (Tentative)

Test 1 .....	Thursday, Feb 16
Test 2 .....	Thursday, Apr 5
Final .....	Saturday, May 5 9:00 – 12:00 am