



Department of

**Mechanical Engineering**

MERCER UNIVERSITY

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**Syllabus for MAE 527**  
***Solid Mechanics III***  
**Spring Semester 2018**  
**Meeting Days MW 4:00 – 5:15 pm**  
**Room EGC 203**

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

**Office:** Suite 105F, School of Engineering

**Hours:** MW 10-12, 2-3; F 11-12  
and by appointment

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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 graduate standing or consent of instructor

## Grading:

Homework	15%
Tests (2)	20% each
Project	15%
Final Exam	30%

## Course Standards:

1. **Homework** will generally be assigned weekly and will be due at the beginning of class one week after assigned. Late homework will not be accepted without a documented excuse. Your lowest homework grade will be dropped. Please, please, please don't wait until the night before it's due to start on the homework.
2. **Reading** assignments will be posted frequently. 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. **Tentative** dates for the tests are listed below; the actual test dates will be confirmed no less than one week in advance. No make-up tests will be given without a documented excuse.
4. **Project:** There will be one individual term projects. Details on the project will be forthcoming on or about the middle of the semester. The project will be due at the end of the semester.
5. **Final Exam:** There will be a comprehensive final exam.
6. The final exam is scheduled for **Friday, 4 May, 7:00 – 10:00 p.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 mobile 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. The instructor will refer you to the ACCESS and Accommodation Office to document your disability, determine eligibility for accommodations under the ADA/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 do 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 Katie Johnson, Director and ADA/504 Coordinator, at 301-2778 or visit the ACCESS and Accommodation Office website at <http://www.mercer.edu/disabilityservices>.
6. This syllabus is subject to change. Changes to the syllabus will be communicated via email and in-class announcement.

## **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 .....	Monday, Feb 19
Test 2 .....	Monday, Apr 9
Final .....	Friday, May 4 7:00 – 10:00 pm