



Department of

Mechanical Engineering

Mercer University

Syllabus for MAE 661
Laminated Composite Materials
Spring Semester 2008
Meeting Day: Wednesday
6:00 –9:00 pm
Room EGC 217

Instructor: Richard K. Kunz, Ph.D., P.E.
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Department of Mechanical and Industrial Engineering

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Textbook:

Required

Mechanics of Composite Materials, Robert M. Jones, 2nd ed., Taylor and Francis, 1999 (ISBN: 1-56032-712-X)

References

- *Mechanics of Composite Materials*, Autar K. Kaw, 2nd ed., CRC Press, 2006
- *Engineering Mechanics of Composite Materials*, I. M. Daniel, O. Ishai, Oxford University Press, 2006.
- *Introduction to Design and Analysis with Advanced Composite Materials*, S. R. Swanson, Prentice-Hall, 1997
- *Mechanics of Composite Materials with MATLAB*, G. Z. Voyiadjis, P. I. Kattan, Springer, 2005.
- *Finite Element Analysis of Composite Materials*, E. J. Barbero, CRC Press, 2008

Catalog Description:

The structure and mechanical properties of composite laminates.

Course Objectives:

Introduce fundamental concepts in the analysis and design of laminated composite structures, with specific focus on:

- Classical lamination theory
- Considerations of stiffness and strength of composite structures
- Design considerations and applications

Provide the necessary background to apply the general principles of solid mechanics and structural analysis to laminated composite structures

Prerequisites:

EGR 252: Probability and Statistics for 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 that are assigned in class are due at the start of the next class.
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 90-minute tests during the semester. Problems will be similar to the homework and problems worked in class. All tests will be closed notes and closed book. A calculator is recommended. No make-up tests will be given without a documented excuse.
4. **Final Exam:** There will be a comprehensive final exam. It will be closed notes and closed book. It will consist of problems similar to those on the tests.
5. The final exam will be given **Wednesday, 30 April, 6:00 – 9:00 pm**

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 and pagers 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 3rd 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

Tentative Course Coverage

	Chapter
Introduction to Composite Materials	1
Constituents	
Material forms	
Processing	
Applications	
Macromechanical Behavior of a Lamina	2
Orthotropic material properties	
Transformation of coordinates	
Lamina strength criteria	
Micromechanical Behavior of a Lamina.....	3
Simple models for stiffness and strength	
Macromechanical Behavior of a Laminate	4
Classical Lamination Theory	
Thermal effects	
Special laminates	
Laminate strength	
Delamination, Matrix Cracking, and Durability.....	6
Interlaminar stresses	
Edge effects	
Fatigue and fracture	
Analysis of Laminated Beams	7
Composite I beams	
Shear in composite beams	
Torsion of rods	
Design Examples.....	7
Sandwich structures	
Composite pressure vessels	