



Department of

Mechanical Engineering

Mercer University

Syllabus for MAE 661
Laminated Composite Materials
Spring Semester 2017
Meeting Days TR 6:00 – 7:15 pm
Room EGC 209

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

Office: EGC 105F

Hours: MTWR 11:00 am – 12:00 pm, 1:00 pm – 2:00 pm
and by appointment

Phone: 478-301-4061

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Textbook:

Required

Introduction to Composite Materials Design, 2nd ed., Ever J. Barbero, CRC Press, 2011 (ISBN: 978-1-4200-7915-9)

References

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

MAE graduate standing or consent of instructor

Grading:

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

Course Standards:

1. **Homework** will be assigned approximately weekly and will generally be due at the beginning of class one week after the date assigned. There will be a substantial penalty for late homework.
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. There will be no class the week of March 6-10 (Spring Break).
4. **Tests:** There will be two in-class 75-minute tests during the semester. **Tentative** test dates are 14 February and 28 March. Firm dates for the tests will be announced a minimum of one week prior.
5. **Final Exam:** There will be a comprehensive final exam during final exam week. **Tentative** date and time for the final exam is **Monday, 1 May, 7:00 – 10:00 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 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 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 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.....	1
Materials.....	2
Fiber reinforcements	
Fiber forms	
Matrix materials	
Manufacturing Processes	3
Micromechanics.....	4
Basic concepts	
Models for stiffness	
Models for strength	
Ply Mechanics	5
Stress and strain	
Stress-strain relations for an orthotropic lamina	
Stress and strain transformations	
Macromechanics	6
Classical Lamination Theory (CLT)	
First-Order Shear Deformation Theory (FSDT)	
Common laminate types	
Laminate Strength	7
Lamina failure criteria	
Laminate first ply failure	
Laminate strength	
Beams	10
Plates and Stiffened Panels.....	11
Design Examples	
Sandwich structures	
Composite pressure vessels	