MAE 537
Mechanics of Composite Structures

Spring 2007
Schedule: Mon, Wed 3:00 - 4:15
Classroom: Daniels 327

Dr. Kara Peters
Office Hours: Mon, Wed 1:30 - 2:30
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Phone: 515-5226


Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>50%</td>
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<tr>
<td>Midterm</td>
<td>25%</td>
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<tr>
<td>Final Exam</td>
<td>25%</td>
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Test Dates: October 3, November 9

Exams: Both the midterm and final exam will be take-home exams (open notes and textbook allowed, no other materials allowed). The midterm exam will be handed out at the end of class on March 12 and must be returned at the beginning of class March 19. The final exam will be handed out on May 2 and will be returned by the end of the regularly scheduled course final exam time on May 4 at 4 PM.

Homework: Homework problem sets will be assigned approximately every two weeks. The students will have then have two weeks to complete each assignment.

Distance Education Students: Completed homework assignments and exams should be returned to the Engineering Online offices by fax (919.515.8415) or email (mike_myers@ncsu.edu). Generally it is best to contact me by email if you have questions about the course or need help with the homework, etc. You can also contact me at the phone number at the top of the page. I will not hold formal office hours for distance education students but will be available as needed.

Course Website: Electronic materials for the course will be posted on the course website, http://courses.ncsu.edu/mae537, on a regular basis. All homework assignments will also be posted on the website as assigned.

Academic Integrity: Students are expected to follow university guidelines available at http://www.ncsu.edu/policies/student_services/student_discipline/POL11.35.1.php. In addition, for all in class tests and final exam the students are expected to adhere to the university Honor Pledge stated here as follows: "I have neither given nor received unauthorized aid on this test or assignment."

Peters, MAE 537, Spring 2007
**Students with disabilities:** Reasonable accommodations will be made for all students with official documentation from Disability Services for Students. It is the responsibility of the student to contact the instructor as soon as possible so that arrangements can be made well in advance of the first assignment.

**Course Outline:**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Textbook Sections</th>
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<tbody>
<tr>
<td><strong>Introduction:</strong> terminology, fabrication processes</td>
<td>Chapters 1, 2</td>
</tr>
<tr>
<td><strong>Macro-mechanical Behavior of a Lamina:</strong> lamina stress-strain relations, symmetries, engineering constants, invariant properties of a lamina</td>
<td>Chapter 4</td>
</tr>
<tr>
<td><strong>Micro-mechanical Behavior of a Lamina:</strong> strength of materials approach, homogenization approach, interface properties</td>
<td>Chapter 3</td>
</tr>
<tr>
<td><strong>Strength of a Lamina:</strong> macro-mechanical approach, micro-mechanical approach</td>
<td>Chapters 6, 5</td>
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<tr>
<td><strong>Classical Laminate Theory:</strong> (macro-mechanical behavior of a laminate) general theory, special types of laminates</td>
<td>Chapter 7</td>
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<tr>
<td><strong>Bending, Buckling, and Vibration of Composite Plates:</strong> plate theory, boundary conditions, special laminates, sandwich composites</td>
<td>Additional notes, section 7.18</td>
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<tr>
<td><strong>Fracture of Laminates</strong></td>
<td>Selected topics from Chapter 9 and additional notes</td>
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<tr>
<td><strong>Additional Topics:</strong> laminated tubes, moisture effects, experimental testing of laminate properties, textile (woven) composites</td>
<td>Selected topics from Chapters 8, 10 and additional notes</td>
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</table>
Additional resources (not required):

General references on composites, classical laminate theory


Fracture of composites


Variational Mechanics Approach to Composites


Micromechanics of Composites

   Nemat-Nassar and Hori, *Micromechanics: Overall Properties of Heterogeneous Materials*

Anisotropic Elasticity