EML 3011C: Mechanics and Materials I: Spring 2009
CEB 105: MW 2:00 – 3:15; F 2:00 – 5:00

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Course Objectives:

The objective of this course is to introduce engineering mechanics to students with an emphasis on engineering problem solving and the synthesis of calculus and physics.

This course directly supports the following six program objectives.

1. Develop creativity and intellectual curiosity in graduates.
2. Understand and apply mathematics and physics to reason scientifically and solve quantitative problems.
3. Use the engineering design process by which mathematical and scientific facts and principles are applied.
4. Communicate in precise language, correct sentences, and concise, coherent paragraphs--each communication evincing clear, critical thinking.
5. Demonstrate commitment to progressive and continued educational development.
6. Ensure that each student completes a broad curriculum embracing the humanities, social sciences, basic and applied sciences, and engineering.

At the completion of this course the student should have improved understanding of the following:

- Force Equilibrium: draw Free Body Diagrams (FBD) for rigid bodies, beams, 2-D and 3-D structures, frames and machines, and set up equilibrium equations (forces and couples) for them.
- Determine and draw diagrams for internal forces and bending moments (axial forces, shears, moments, & torque) in a structural member.
- Understand the concept of stress and strain (true strain and true stress), shear and normal components of strain and their relation to deformation vectors and displacements.
- Understand the stress-strain behavior for both ductile and brittle materials, identify the following quantities on a stress-strain curve: Elastic modulus, yield stress, ultimate tensile strength, ductility, and toughness.
- Determine the deformations and/or normal stress in a member due to application of forces or/and change in temperature.

- Analyze a statically indeterminate structure.
- Analyze and design circular members in torsion.
- Determine the maximum elastic internal bending moment for a beam.
- Determine longitudinal stress and hoop stress for a thin walled pressure vessel.
- Calculate stresses in a member subjected to combined loading.
- Find stresses and strains on arbitrary planes using transformations and Mohr's circle
- Quantify when yielding and/or fracture will occur under combined stresses
- Relate stress intensity to external loads and geometry
- Understand the physical nature of fatigue

Textbook:
Required:

R.C. Hibbeler, Statics and Mechanics of Materials, Prentice-Hall (2004). ISBN: 0-13-028127-1

Supplemental (optional) texts:

Gere & Timoshenko, Mechanics of Materials, 4th ed., PWS Publishing Co., ISBN: 0-534-95102-3

Norman Dowling, Mechanical Behavior of Materials, Prentice-Hall, Inc., ISBN: 0-13-579046-8

Topics:

1. General Principles: Vectors (Review; Chs 1, 2)
2. Force System Resultants (Review; Ch 3)
3. Equilibrium (Review; Ch 4)
4. Structural Analysis: Trusses and Frames (review, Ch 5)
5. Geometric Properties and Distributed Loadings (Review, Ch 6)
6. Internal Loadings: Shear and Moment diagrams (Ch 7)
7. Stress and Strain (Review, Ch 8)
8. Mechanical Properties of Materials (Ch 9)
9.. Axial Load (Ch 10)
10. Torsion (Ch 11)
11. Bending (Ch 12)
12. Transverse Shear (Ch 13)
13. Combined Loadings (Ch 14)
14. Stress and Strain Transformation: Mohr's circle (Ch 15)
15. Design of Beams (Ch 16)
16. Yielding and Fracture under Combined Stresses (notes)
17. Fracture of Cracked Members (notes)
18. Fatiuge of Materials: Introduction and Stress-Based Approach (notes)

Attendance Policy: The universities require attendance in all classes.

Grading:

Midterm Exam I	25%
Midterm Exam II	25%
Final Exam	30%
Quizzes	10%
Homework	5%
Participation	5%

Homework Instructions:

IF THE FOLLOWING ARE NOT FOLLOWED SPECIFICALLY THEN NO CREDIT WILL BE RECEIVED FOR HOMEWORK

Neatness and completeness are CRITICAL! Analysis that cannot be understood, interpreted, or checked by others, is of no value. While a correct answer is the goal of any problem solution, we are equally interested in the *path* that you took to obtain the solution. A correct answer that does not follow from the analysis that precedes it will not be accepted as correct.

Solve each problem on a separate sheet by itself. Put your name, the title of the homework assignment, and the problem number on the top of each page. If you are using more than one page for a problem, write "continued" next to the problem number. Use only *one side* of paper. Draw a box around the solution at the end of the problem. If the problem has multiple parts, summarize them at the bottom within one box.

When grading your work, it is very important that all of your work is clearly described in your solution. In the case of an incorrect final answer, this can help the instructor determine where the conceptual or computational error is in the solution.

The important elements of a good problem-solving technique are:

i. Correct problem set-up.
ii. Correct analysis.
iii. Correct numbers and units.
iv. Correct interpretation of the answer (both units and direction).
v. Free-Body Diagrams (FBD) & Sketches: Accurate free-body diagrams and sketches and are a must and are emphasized in all work. The free-body diagram is a foundation to good problem solving techniques. Poorly drawn free-body diagrams are usually followed by a very poor problem solution. Drawing complete free-body diagrams will greatly assist you in learning the material for this course and in solving problems throughout your career as an engineer.

The class schedule will have a list of homework assignments and due dates. Students will be responsible to submit the designated homework problems on the day they are due. Submitting a wrong set of problems will invalidate the homework and a grade of "0" will be given.

Homework will be due at the beginning of the class period on the date that it's due. NO LATE HOMEWORK will be accepted.

Homework should be solved separately, discussion with other students is recommended, but copying from each other is NOT allowed. A grade of "0" will be assigned for the two parties of the copied homework.

Quizzes

Quizzes will be ~ weekly; typically on the same date that the homework is due. Quiz problems will be similar to the homework being submitted. Additional questions may come from contemporary topics on papers posted on Blackboard. These papers will be assigned for review. Quizzes are closed book, closed notes. There are NO makeup quizzes under any circumstances. The lowest quiz grade will be dropped.

Exams

The problems on the exams will be similar to the homework problems and problems solved in class.

All exams will be closed book and closed notes. The instructor will provide a formula sheet. Your approach to the problem is important. You will be graded upon the approach as well as correct numerical manipulations.

The final examination will be comprehensive with an emphasis on the material covered after the first midterm examination. You must be prepared to answer questions on every topic covered in the course for the final examination.

There are NO makeup exams except under extenuation circumstances.

Cheating will not be tolerated. Students caught cheating on the exam will be awarded a letter grade "F" and reported for the Dean's office according to the Honor Code as follows.

Honor Policy:
Students are expected to uphold the Student Code of Conduct, Academic Honor Code published in their University Bulletin and/or Student Handbook. Florida A&M Student Code of Conduct published in the Student Handbook 2000-2003, Re: 100.18 Academic Dishonesty, p. 138

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to ". . . be honest and truthful and . . . [to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at http://www.fsu.edu/~dof/forms/honorpolicy.pdf.

ADA Policy:

AMERICANS WITH DISABILITIES ACT:
Students with disabilities needing academic accommodation should:
(1) Register with and provide documentation to the Student Disability Resource Center; and
(2) Bring a letter to the instructor indicating the need for accommodation and what type.
This should be done during the first week of class. This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FAMU students with disabilities, contact the

Office of Special Programs
Student Union #101
599-3541, FAX 561-2169
http://www.famu.edu/students/services/services.html

For more information about services available to FSU students with disabilities, contact:

Student Disability Resource Center
97 Woodward Avenue, South
Florida State University
Tallahassee, FL 32306-4167
(850) 644-9566 (voice)
(850) 644-8504 (TDD)
sdrc@admin.fsu.edu
http://www.fsu.edu/~staffair/dean/StudentDisability/

Syllabus Change Policy:

Except for changes that substantially affect implementation of the evaluation (grading) statement, this syllabus is a guide for the course and is subject to change with advance notice.

Learning Outcomes:
The department's learning outcomes can be found at
http://www.eng.fsu.edu/outcomes.

ABET format syllabi - course outcomes mapped to course objectives which are then mapped to the departmental outcomes can be found at
http://www.eng.fsu.edu/me/ugradpro/abet/Appendix/CourseSyllabi/reqme_in.html