

Mechanics of Materials Fall 2019

EGM 3520 Section 2607

Class Periods: Monday/Wednesday/Friday, Period 5, 11:45 am – 12:35 pm

Location: WEIL 270

Professor

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Office Hours: Monday/Wednesday/Friday 10:00 – 11:15 am, NEB 133

Teaching Assistants

Office hours for TAs will be communicated through Canvas.

Course Description

Introduction to stress and strain at a point, stress-strain-temperature relations and mechanical properties of materials. Analysis of systems subjected to axial load, torsion load and bending. Design concepts, indeterminate structures and applications.

Course Pre-Requisites

EGM 2511 (not EGM 2500) and MAC 2313

Engineering Mechanics: Statics and Analytical Geometry/Calculus III

Required Textbooks and Software

Mechanics of Materials, Eighth Edition

Beer, F.P.; Johnston, Jr., E.R.; DeWolf, J.T.; and Mazurek, D.F.

The seventh edition of this textbook is likely sufficient, but it is the student's responsibility to confirm that problems assigned from the eighth edition are consistent with those in the seventh edition.

Course Objectives

The purpose of this course is to provide students with the means to analyze and design load bearing structures including machines. Upon completion of this course, each student should have:

1. A basic understanding of engineering mechanics and the ability to apply this understanding to analyze and solve a given problem.
2. A basic understanding of material properties and mechanical deformation.
3. The ability to apply advanced science and engineering principles in the design and analysis of structures to support loads within a given limit of safety.

Assessment Methods

Your grade for this course will be determined based on your performance on homework, quizzes, and exams as follows:

Homework 10%

Your 2 lowest homework assignments will be dropped.

Homework is to be submitted electronically on Canvas prior to class (unless otherwise instructed).

Working in groups is permitted. However, copying homework is NOT permitted. Written homework must adhere to the following format: Each problem should be on a single sheet of paper, with a clear problem statement, appropriate free-body diagram, and the solution with reasonable significant digits

inside a box. Use of solution manuals or websites to complete homework is considered cheating and a violation of the honor policy, and will be fully enforced.

Homework in this class is VERY IMPORTANT. The problem solving skills you develop in doing the homework are skills that are difficult to test on an exam. They are much more like the skills you will need in the real world than those you develop during exam preparation. TAs have been instructed to look for problem solving process and explanations, not just answers.

Quizzes 15%

Quizzes will be given in the first 15 minutes of class on assigned days. Your worst 1 quiz will be dropped. The purpose of the quizzes is to assess your understanding of course topics in a format that can be considered as practice for the exams.

Exams 25% Each (3)

Exams will be two hours in length given on the assigned days. Exams will be scheduled at the same time as the other sections of Mechanics of Materials (except the final exam).

Grading Scale

An example numerical grading scheme is shown below. This information should only be used as a general guide as the course instructor reserves the right to adjust the final numerical grading demarcations. Course grades will be “elevated” if necessary – this decision will not be made until the end of the semester once all exams and homework assignments are graded.

100–93 = A, 92.9–90 = A-, 89.9–87 = B+, 86.9–83 = B, 82.9–80 = B-, 79.9–77 = C+, 76.9–73 = C
72.9–70 = C-, 69.9–67 = D+, 66.9–63 = D, 62.9–60, 60-0 = F

Additional information regarding letter grades and associated grade points may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Professional Component (ABET)

EGM 3520 supports several program outcomes enumerated in the Mission Statement of the Department of Mechanical & Aerospace Engineering (MAE). Specific MAE program outcomes supported by this course include being able to work professionally in the area of mechanical systems including the design and realization of such systems.

Relation to Program Outcomes (ABET)

Outcome	Coverage*
1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	High
2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Low
3) An ability to communicate effectively with a range of audiences	
4) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Low
5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

*Coverage is given as high, medium, or low. An empty box indicates that this outcome is not addressed by this course.

Attendance Policy, Class Expectations, and Make-Up Policy

Class attendance is highly recommended, but is not mandatory. Excused absences for homework submission, quizzes and exams must be consistent with university policies in the undergraduate catalog

and requires appropriate documentation. Homework extensions and make-up quizzes/exams will be provided for excused absences in which notification is provided before the assignment date.

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter, which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluations

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.aa.ufl.edu/students/>. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

University Honesty Policy

UF students are bound by The Honor Pledge, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code.” On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor in this class.

Software Use

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy

There are federal laws protecting your privacy regarding grades earned in courses and on individual assignments. For more information, please see:

<http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Campus Resources

Health and Wellness

U Matter, We Care

If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center

<http://www.counseling.ufl.edu/cwc> or 352-392-1575; or contact the University Police Department: 352-392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)

Contact the Student Health Care Center at 352-392-1161.

University Police Department

Contact UFPD at 352-392-1111 (or 9-1-1 for emergencies) or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support

Call 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. You may also find answers to common problems at <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center

Located in the Reitz Union and offers career assistance and counseling. Call 352-392-1601 or <https://www.crc.ufl.edu/>.

Library Support

Information on various ways to receive assistance using the libraries or finding resources. <http://cms.uflib.ufl.edu/ask>.

Teaching Center

Located in Broward Hall and provides general study skills and tutoring. Call 352-392-2010 or 352-392-6420 or <https://teachingcenter.ufl.edu/>.

Writing Studio

Located at 302 Tigert Hall. Provides help brainstorming, formatting, and writing papers. Call 352-846-1138 or <https://writing.ufl.edu/writing-studio/>.

On-Campus Student Complaints

https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints

<http://www.distance.ufl.edu/student-complaint-process>.

<u>Date</u>	<u>Topics</u>	<u>Sections Covered</u>	<u>Homework Collected</u>
8/21	Syllabus, Statics	1.1	-----
8/23	Introduction to Stresses	1.2	HW0 (opt.): Handout 0
8/26	Stress Components	1.3, 1.4	-----
8/28	Factor of Safety, Design	1.5, Quiz 1	-----
8/30	Axial Strain, Hooke's Law	2.1	HW1: 1.32, 1.38, Handout 1
9/2	-----	Labor Day Holiday	-----
9/4	-----	Hurricane Dorian	-----
9/6	Axial Deformation, Ductility	2.1	HW2: 2.4, Handout 2
9/9	Statically Indeterminate	2.2, 2.3	HW3: 2.16, 2.20, Handout 3
9/11	3D Hooke's Law	2.4 – 2.8	-----
9/13	Torque and Torsion Stress	3.1, Quiz 2	HW4: 2.46, 2.68, Handout 4
9/16	Angle of Twist	3.2	-----
9/18	Gears, Indeterminate Problems	3.3 – 3.5	HW5: 3.9, 3.38, Handout 5
9/20	Power Transmission	3.3 – 3.5	HW6: 3.41, 3.51, Handout 6
9/23	Transverse Loading	5.1	-----
9/25	Chapter 1-3 Review	Exam 1 on 9/26	-----
9/27	V-M Relationships	5.2	-----
9/30	Singularity Functions	5.4	-----
10/2	Pure Bending	4.1, 4.2	HW7: 5.4, 5.102, Handout 7 HW8 (due 10/3 mid.): 4.3, 5.7, Handout 8
10/4	-----	Homecoming	-----
10/7	Bending Strain, Curvature	4.2, 4.3	-----
10/9	Composites	4.4, Quiz 3	-----
10/11	Design of Beams for Bending	5.3	HW9: 4.12, 4.39, Handout 9
10/14	Shear Flow in Beams	6.1	-----
10/16	Shear Stresses in Beams	6.1, 6.2	HW10: 5.77, 6.4, Handout 10
10/18	Horizontal Shear Flow	6.3, 6.4	HW11: 6.5, 6.10, Handout 11
10/21	Principal Stresses	7.1	-----
10/23	Mohr's Circle	7.2, 7.3	HW12: 6.32, 6.34, Handout 12
10/25	3D Mohr's Circle	7.3, 7.4	HW13: 7.32, 7.40, Handout 13
10/28	Chapters 4-6 Review	Exam 2 on 10/29	-----
10/30	Failure Criteria	7.5	-----
11/1	Pressure Vessels	7.6	HW14: 7.68, 7.96, Handout 14
11/4	Strain Rosettes	7.8, 7.9	-----
11/6	Combined Loading 1	8.1	-----
11/8	Quiz Assessment Day	8.3, Quiz 4	HW15: 7.103, 7.144, 7.154, Handout 15
11/11	-----	Veterans Day Holiday	-----
11/13	Combined Loading 2	8.3	-----
11/15	Beam Deflections	9.1	HW16: 8.33, 8.37, Handout 16
11/18	Statically Indeterminate Beams	9.2	HW17: 8.51, Handout 17
11/20	Singularity Functions	9.3, Quiz 5	-----
11/22	Method of Superposition	9.4	HW18: 9.3, 9.21, Handout 18
11/25	Column Buckling	10.1	HW19 (due 11/26 mid.):
11/27	-----	Thanksgiving Holiday	----- 9.66, 10.19, Handout 19
11/29	-----	Thanksgiving Holiday	-----
12/2	Design of Columns	10.4, Quiz 6	-----
12/4	Chapters 7-10 Review	-----	-----
		Exam 3*	-----
		*During final exam period	

Any changes to the course schedule and homework problems will be communicated in-class and electronically