

Mechanics of Materials

EGM 3520 Section 2251

Class Periods: M/W/F, Period 7, 1:55 pm – 2:45 pm

Location: NEB 202

Academic Term: Spring 2026

Instructor:

Chase Hartquist

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Phone: (352) 392-0961

Office: NEB 265

Office Hours: M/W/F, 2:45-3:45 pm, NEB 265

Teaching Assistant/Peer Mentor/Supervised Teaching Student:

Graduate and undergraduate assistants and their office hours will be communicated through Canvas.

Course Description

Introduction to stress and strain, 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

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.

Materials and Supply Fees

None

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 | Low |
| 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 |

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|---|--|
| 5. An ability to function effectively on a team whose members together provide leadership, create a collaborative 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 covered or assessed in the course.

Required Textbooks and Software

- Title: Mechanics of Materials
- Authors: Beer, F.P.; Johnston, Jr., E.R.; DeWolf, J.T.; and Mazurek, D.F.
- Edition: 7th, Publisher: McGraw Hill, Publication Date: 01/24/2014
- ISBN Number: 9780073398235

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

Recommended Materials

None

Required Computer

Recommended Computer Specifications: <https://it.ufl.edu/get-help/student-computer-recommendations/>
 HWCOE Computer Requirements: <https://www.eng.ufl.edu/students/advising/fall-semester-checklist/computer-requirements/>

Course Schedule (Tentative)

| Date | Topics | Sections Covered | Assignments |
|-------------|---|-------------------------|--------------------|
| 1/12 | Syllabus, Statics Review | Statics Review, 1.1 | ----- |
| 1/14 | Axial, Bending, and Bearing Stresses | 1.1, 1.2 | HW1: Statics PDF |
| 1/16 | Stress Components, Pin Supports | 1.3, 1.4 | HW2: 1.7, 1.10 |
| 1/19 | NO CLASS: Holiday | ----- | ----- |
| 1/21 | Design Considerations | 1.5 | HW3: 1.32, 1.35 |
| 1/23 | Strain, Axial Deformation | 2.1 Quiz 1 | HW4: 1.43, 1.55 |
| 1/26 | Axial Deformation, Statically Indeterminate | 2.1, 2.2 | HW5: 2.3, 2.14 |
| 1/27 | Temperature Effects | 2.3 | HW6: 2.25, 2.27 |
| 1/30 | 3D Hooke's Law | 2.4-2.8 | HW7: 2.33, 2.39 |
| 2/2 | Stress Concentrations | 2.10, 2.11 | HW8: 2.68, 2.77 |
| 2/4 | Plastic Deformation | 2.12 | HW9: 2.95, 2.97 |
| 2/6 | Torsional Stresses | 3.1 Quiz 2 | HW10: 2.102, 2.105 |
| 2/9 | Gears, Statically Indeterminate Problems | 3.2, 3.3 | HW11: 3.10, 3.17 |
| 2/11 | Design of Shafts | 3.4-3.7 | HW12: 3.36, 3.41 |
| 2/13 | Pure Bending | 4.1, 4.2 | HW13: 3.70, 3.74 |
| 2/16 | Chapters 1-3 Review | | ----- |
| 2/17 | Exam 1 (Tuesday from 8:20-10:10 pm ET, Location: FLG 0260/0270 for last names A-K/L-Z) | | |
| 2/18 | Pure Bending | 4.1, 4.2 | ----- |
| 2/20 | Bending Deformation | 4.2, 4.3 | HW14: 4.10, 4.11 |
| 2/23 | Composite Beams, Stress Concentrations | 4.4, 4.5 | HW15: 4.9, 4.16 |
| 2/25 | Elastoplastic Beams | 4.6, 4.7 Quiz 3 | HW16: 4.33, 4.40 |
| 2/27 | Transverse Loading | 5.1 | HW17: 4.68, 4.71 |
| 3/2 | Shear/Bending (V/M) Moment Diagrams | 5.2 | HW18: 5.4, 5.9 |

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|-------------|--|-------------------|-------------------------|
| 3/4 | Design of Beams | 5.3 | HW19: 5.52, 5.59 |
| 3/6 | Shear Flow in Beams | 6.1 | HW20: 5.69, 5.76 |
| 3/9 | Shear Stresses in Beams | 6.1, 6.2 | Quiz 4 HW21: 6.4, 6.7 |
| 3/11 | Horizontal Shear Flow & Stress | 6.3, 6.4 | HW22: 6.15, 6.23 |
| 3/13 | Stress Transformations | 7.1 | HW23: 6.30, 6.40 |
| 3/16 - 3/20 | Spring Break | | |
| 3/24 | Mohr's Circle | 7.2, 7.3 | HW24: 7.7, 7.14 |
| 3/26 | Mohr's Circle | 7.3, 7.4 | Quiz 5 HW25: 7.31, 7.41 |
| 3/28 | Failure Criteria | 7.5 | HW26: 7.66, 7.77 |
| 3/30 | Pressure Vessels, Plane Strain | 7.6, 7.7 | ----- |
| 4/1 | Exam Review: Chapters 4-6 | | ----- |
| 4/2 | Exam 2 (Thursday from 8:20-10:10 pm ET, Location: FLG 0260/0270 for last names A-K/L-Z) | | |
| 4/3 | Measurement of Strain | 7.8, 7.9 | HW27: 7.87, 7.92 |
| 4/6 | Combined Loading | 8.1, 8.3 | HW28: 7.137, 7.145 |
| 4/8 | Combined Loading | 8.3 | HW29: 8.37, 8.38 |
| 4/10 | Beam Deflections | 9.1 | HW30: 8.43, 8.47 |
| 4/13 | Statically Indeterminate Beams | 9.2 | Quiz 6 HW31: 9.2, 9.10 |
| 4/15 | Singularity Functions | 9.3 | HW32: 9.20, 9.21 |
| 4/17 | Superposition | 9.4 | HW33: 9.46, 9.53 |
| 4/20 | Column Buckling | 10.1, 10.3 | HW34: 9.66, 9.89 |
| 4/22 | Exam Preparation | Final Exam Review | HW35: 10.11, 10.26 |
| 4/24 | Reading Day | | |

Important Dates

02/17/2026 Exam 1 (8:20-10:10 pm ET, Location: FLG Florida Gymnasium 0260/0270 for last names A-K/L-Z)
04/02/2026 Exam 2 (8:20-10:10 pm ET, Location: FLG Florida Gymnasium 0260/0270 for last names A-K/L-Z)
04/30/2026 Final Exam (3:00-5:00 pm ET, <https://registrar.ufl.edu/courses/final-exam>)

Evaluation of Grades

| Assignment | Percentage of Final Grade |
|------------------------|---------------------------|
| Homework Sets (Weekly) | 10% |
| Quizzes (6) | 15% |
| Exam 1 | 25% |
| Exam 2 | 25% |
| Final Exam | 25% |
| | 100% |

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

1. Homework (weekly assignments) 10%

A schedule of homework problems and their due dates will be provided on Canvas. For grading purposes, your 2 lowest homework assignments will be dropped.

Homework is to be submitted electronically on Canvas by 11:00 pm ET on the due date. No late assignments will be accepted. Working in groups is permitted. However, copying homework is NOT permitted. To assist the graders, homework should 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, websites or generative AI to complete homework is considered cheating and a violation of the UF honor policy.

Homework in this class is **VERY IMPORTANT**. The problem-solving skills that you develop by doing the homework are similar to the skills that you will need in the real world of engineering practice. Students are encouraged to develop a rigorous problem-solving procedure, rather than memorize how to solve a certain type of problem. TAs have been instructed to look for problem solving process and explanations, not just answers.

2. Quizzes (6) 15%

Quizzes will be given in the first 12 minutes of class on assigned days. For grading purposes, your 1 lowest quiz score will be dropped. The purpose of the quizzes is to periodically assess your understanding of course topics in a short format in a lower stress environment than exams.

3. Exams (3) 25% Each

Exams 1 and 2 will be conducted in the evenings from 8:20-10:10 pm ET on assigned days and will occur at the same time as the other sections of Mechanics of Materials. Exams 1 and 2 will be held in FLG Florida Gymnasium 0260 (last names A-K) and 0270 (last names L-Z). The Final Exam will be conducted during Finals Week as per the assigned date and time announced by the Registrar's office (<https://registrar.ufl.edu/courses/final-exam>).

Grading Policy

An example numerical grading scheme is shown below. This information is a general guide; the course instructor reserves the right to adjust the final numerical grading demarcations. Course grades will be "elevated" (curved) if necessary – this decision will not be made until the end of the semester once all exams and homework assignments are graded. Additional information may be found at:

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

| Percent | Grade | Grade Points |
|-------------|-------|--------------|
| 93.4 - 100 | A | 4.00 |
| 90.0 - 93.3 | A- | 3.67 |
| 86.7 - 89.9 | B+ | 3.33 |
| 83.4 - 86.6 | B | 3.00 |
| 80.0 - 83.3 | B- | 2.67 |
| 76.7 - 79.9 | C+ | 2.33 |
| 73.4 - 76.6 | C | 2.00 |
| 70.0 - 73.3 | C- | 1.67 |
| 66.7 - 69.9 | D+ | 1.33 |
| 63.4 - 66.6 | D | 1.00 |
| 60.0 - 63.3 | D- | 0.67 |
| 0 - 59.9 | E | 0.00 |

Academic Policies and Resources: Attendance Policy, Class Expectations, Make-Up Policy

Class attendance is strongly encouraged but is not mandatory. Excused absences for homework submission and quizzes must be consistent with university policies in the undergraduate catalog and require appropriate documentation. Homework extensions and make-up quizzes/exams will be provided for excused absences in which notification is provided and approved before the assignment due date. <https://go.ufl.edu/syllabuspolicies>
<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx><https://go.ufl.edu/syllabuspolicies>

Commitment to a Positive Learning Environment

The Herbert Wertheim College of Engineering values varied perspectives and lived experiences within our community and is committed to supporting the University's core values.

If you feel like your performance in class is being impacted, please contact your instructor or any of the following:

- Your academic advisor or Undergraduate Coordinator
- HWCOE Human Resources, 352-392-0904, student-support-hr@eng.ufl.edu
- Pam Dickrell, Associate Dean of Student Affairs, 352-392-2177, pld@ufl.edu

Students Requiring Accommodations

Students with disabilities who experience learning barriers and would like to request academic accommodations should connect with the disability Resource Center by visiting <https://disability.ufl.edu/students/get-started/>. It is important for students to share their accommodation letter with their instructor and discuss their access needs, as early as possible in the semester.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy

UF students are bound by The Honor Pledge which states, “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://sccr.dso.ufl.edu/process/studentconduct-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.

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.ua.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. Summaries of results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

Software Use and Copyrighted Materials

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 with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>.

Campus Resources

Health and Wellness

U Matter, We Care: Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor are available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <https://counseling.ufl.edu> or 392-1575. You can also call the University Police Department at 392-1111 or dial 9-1-1 for emergencies.

Sexual Discrimination, Harassment, Assault, or Violence: If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the Office of Title IX Compliance (<https://titleix.ufl.edu/>), located at Yon Hall, Room 427, 1908 Stadium Road, 352-273-1094, title-ix@ufl.edu.

Sexual Assault Recovery Services (SARS): Contact the Student Health Care Center at 392-1161.

University Police Department: <http://www.police.ufl.edu/> or 392-1111 (dial 9-1-1 for emergencies).

Academic Resources

E-learning technical support: 352-392-4357 (select option 2) or e-mail Learning-support@ufl.edu; <https://lss.at.ufl.edu/help.shtml>.

Career Connections Center: Career assistance and counseling. Reitz Union, 392-1601; <https://career.ufl.edu>.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources; <http://cms.uflib.ufl.edu/ask>.

Teaching Center: General study skills and tutoring. Broward Hall, 392-2010 or 392-6420; <https://teachingcenter.ufl.edu/>.

Writing Studio: Help brainstorming, formatting, and writing papers. 302 Tigert Hall, 846-1138; <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/>; <https://care.dso.ufl.edu>.

On-Line Students Complaints: <https://distance.ufl.edu/getting-help/>.