

# Mechanical Behavior of Materials

EMA 4223 Section 0593

**Class Periods:** Tuesdays, Period 2 (8:30-9:20AM) | Thursdays, Period 2-3 (8:30-10:25AM)

**Location:** Tuesdays – FLG 0260 | Thursdays – TUR L005

**Academic Term:** Spring 2020

## Instructor:

Amanda R. Krause, pronouns – she/her/hers

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(352) 294-6609

Office Hours: TBA and appointment

## Teaching Assistants:

Please contact through the Canvas website

TBA

## Course Description

Plastic deformation and fracture of metals, ceramics and polymers.

## Course Pre-Requisites / Co-Requisites

Pre-requisite: EGM 3520

## Course Objectives

At the end of the course, the student should be able to predict the stress distribution in, and failure mode of, materials subjected to flexural or tensile stresses in uniform or cyclic loading conditions. The student will be able to estimate the time under load for materials that exhibit creep and/or viscoelastic behavior. The student will be able to determine the failure mode and stress levels for plastic deformation, and fracture behavior in materials that fail in a brittle manner.

## Materials and Supply Fees

None

## Professional Component (ABET):

This course includes 4 credits of engineering topics.

## 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	Medium
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	Medium
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	Low

informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
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.	Low

\*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: Mechanical Behavior of Materials
- Authors: M.A. Meyers and K.K. Chawla
- Publication Year: 2009, Edition: 2
- ISBN: 978-0-521-86675-0

### **Recommended Materials**

- Title: Deformation and Fracture Mechanics of Engineering Materials
- Author: R.W. Hertzberg, R.P. Vinci, J.L. Hertzberg
- Publication date: 2013, Edition: 5th
- ISBN: 978-0-470-52780-1

### **Course Schedule**

Week 1: (1/7 – 1/9)	Elastic Properties	Sections: 2.1-2.6, 2.8, 2.11
Week 2: (1/14 – 1/16)	Elastic Properties	Sections: 2.9, 2.11, 2.12-13
Week 3: (1/21 – 1/23)	Plasticity: Yield Criteria	Sections: 3.2, 3.5-7, 4.2
Week 4: (1/28 – 1/30)	Plasticity: Dislocations	Sections: 4.4.1, 4.4.6-8, 6.2.2-5
Week 5: (2/4 – 2/6)	<b>Review and Exam 1</b>	
Week 6: (2/11 – 2/13)	Plasticity: Dislocations in motion	Sections: 4.4.8-14, 5.4
Week 7: (2/18 – 2/20)	Strengthening Mechanisms	Sections: 5.4, 6.3, 10.2-10.5
Week 8: (2/25 – 2/27)	Time-Dependent Deformation	Sections: Chapter 13
Week 9: (3/3 – 3/5)	Spring Break	
Week 10: (3/10 – 3/12)	<b>Review and Exam 2</b>	
Week 11: (3/17 – 3/19)	Fracture	Sections: 7.1-6, 7.10
Week 12: (3/24 – 3/26)	Fracture	Sections: 7.6-8, 8.1-2
Week 13: (3/31 – 4/2)	Fracture	Sections: 8.2-4, 9.2, 9.6-7
Week 14: (4/7 – 4/9)	Fatigue	Sections: 14.1-8
Week 15: (4/14 – 4/16)	<b>Review and Exam 3</b>	
Week 16: (4/21)	Composites	Sections: Overview of Chapter 15

## ***Attendance Policy, Class Expectations, and Make-Up Policy***

Excused absences must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

**Class Attendance:** Attendance is expected and all class notes are the responsibility of the student. In class assignments will count as a record of attendance. Thus, the penalty for unexcused absences is a lower grade.

### **Class Expectations:**

**Test Makeup Policy:** Any tests missed will count as zero unless a written excuse is submitted before the test. The make-up test will have to be taken at the earliest possible date. Emergencies that arise will have to be documented by the appropriate authority.

**Homework Assignments:** Homework will be completed individually and will be due at 8:30am on the due date. Homework turned in 24 hours late will receive a reduction in grade by 10 percent. No late homework will be accepted for credit after 24 hours on the day following the due date. (For example, homework due on Tuesday at 8:30pm will not be collected after Wednesday at 8:30am.)

**Quizzes:** Quizzes will be conducted individually and will be announced ahead of time.

### ***Evaluation of Grades***

<b>Assignment</b>	<b>Total Points</b>	<b>Percentage of Final Grade</b>
Homework + Quizzes	10 each	25%
Exam 1	100	25%
Exam 2	100	25%
Exam 3	100	25%
		100%

### ***Grading Policy***

<b>Percent</b>	<b>Grade</b>	<b>Grade Points</b>
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

More information on UF grading policy may be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.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 Evaluation***

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](https://gatorevals.aa.ufl.edu/public-results/) of course evaluation results are available to students at <https://gatorevals.aa.ufl.edu/public-results/>.

### ***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://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 or TAs in this class.

### ***Commitment to a Safe and Inclusive Learning Environment***

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

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

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, [rbielling@eng.ufl.edu](mailto:rbielling@eng.ufl.edu)
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, [taylor@eng.ufl.edu](mailto:taylor@eng.ufl.edu)
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, [nishida@eng.ufl.edu](mailto:nishida@eng.ufl.edu)

### ***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 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](mailto: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 is 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:** <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 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**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, [title-ix@ufl.edu](mailto:title-ix@ufl.edu)

**Sexual Assault Recovery Services (SARS)**

Student Health Care Center, 392-1161.

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

Academic Resources

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

**Career Resource Center**, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

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

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

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

**Student Complaints Campus:** [https://www.dso.ufl.edu/documents/UF\\_Complaints\\_policy.pdf](https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf).

**On-Line Students Complaints:** <http://www.distance.ufl.edu/student-complaint-process>.