

**SYLLABUS**  
**ME/MS582: Mechanical Behavior of Materials**

Professor Morgan  
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3-2791  
ENG 221

Office Hours: M 3:30-4:45 p.m.; Tu 2:30-4:15 p.m.

**Course Description:** (from course catalog): Fundamental concepts of modern materials behavior and materials engineering. Emphasis on analytical and numerical methods for predicting material properties and behavior, as well as some discussion of the relationships between solid structure and material properties. Topics include: constitutive relations, fracture, fatigue, plasticity, creep, damping, impact, and deformation. Elastic, plastic, and viscous behavior. Some discussion of the effects of processing—thermodynamics, kinetics—may be addressed. Specific examples from ceramics, metals, polymers, and composites are given, with emphasis changing for each offering.

**Course Format:** Semiweekly lectures with approximately six, semimonthly homework assignments (30%), one midterm (30%), presentation (15%), and a final exam (25%).

**Course Prerequisites:** ME309 and ME400, or equivalent

**Course Text and Readings:**

1. Roesler, J., Harders, H, Baeker, M. Mechanical Behaviour of Engineering Materials. Berlin: Springer, c 2007.
2. Readings distributed in class

**Reserve Texts (This Course):**

Dowling, NE. Mechanical behavior of materials: engineering methods for deformation, fracture, and fatigue. Englewood Cliffs, N.J.: Prentice Hall, c1993. TA404.8.D68 1993  
Courtney, TH. Mechanical behavior of materials. New York: McGraw-Hill, c1990. TA405.C859 1990.  
Hertzberg, RW. Deformation and Fracture Mechanics of Engineering Materials. 4<sup>th</sup> edition. New York: Wiley, c1989. TA417.6.H46 1989

**Course Policies:** *Academic Conduct.* This course adheres to the policies stated in the conduct code of the College of Engineering. *Homework.* Homework solutions must be neat and well-written. If you use computer programs to solve any of the homework problems, the code/script must be included with your solutions. If you include any graphs as part of your homework solutions, each graph must be clearly labeled, and the remainder of the solution should unambiguously refer to the graph/figure by its label and page number. Any reference materials, whether print materials or personal communication, must be cited. Late homework will receive a maximum of 50% credit and will be accepted only if an extension was given prior to the due date. *Presentation.* Each student will give a presentation covering a journal article in the general area of mechanical behavior of materials. The presentations will be 15 minutes long followed by

a 10-minute-long class discussion. Presentations will begin mid-way through the semester. The article must be approved by the instructor and emailed to the instructor one week before the presentation. Topics may include, for example, new composite materials, nano- and micro-scale testing, high-performance materials, biological materials and biomaterials, etc. *Exams.* One in-class midterm exam will be given. A comprehensive final exam will be given during the exam period.

**Schedule:**

<b>Week</b>	<b>Date</b>	<b>Topic</b>	<b>Reading (Suppl=Supplement)</b>
1	9/7	Introduction and Overview of the Structure of Materials	1
2	9/12	Scalars, Vectors, Tensors	A, Suppl
	9/14	Stress and Strain	2.1-2.2, Suppl
3	9/19	NO CLASS	
	9/21	Linear Isotropic and Anisotropic Elasticity	2.3-2.5
4	9/26	Plasticity and Failure	3.1-3.3
	9/28	Plasticity and Failure	3.3-3.5
5	10/3	Fracture Mechanics	4.1, 4.2, 5.1
	10/5	Fracture Mechanics	5.2
6	10/10	Fracture Mechanics	5.3
	10/12	Mechanical Behavior of Metals	6.1-6.2
7	10/17	Mechanical Behavior of Metals	6.3-6.4
	10/19	Mechanical Behavior of Metals	6.5
8	10/24	<b>MIDTERM</b>	
	10/26	Mechanical Behavior of Ceramics	7.1-7.3
9	10/31	Mechanical Behavior of Ceramics	7.4-7.5
	11/2	Mechanical Behavior of Polymers	8.1-8.3
10	11/7	Mechanical Behavior of Polymers	8.4-8.7
	11/9	Mechanical Behavior of Composites	9.1-9.3
11	11/14	Mechanical Behavior of Composites	9.4
	11/16	Fatigue	10.1-10.3
12		Fall Recess	
		Fall Recess	
13	11/28	Fatigue	10.4-10.5
	11/30	Fatigue	10.6
14	12/5	Creep	Suppl, 11.1
	12/7	Creep	11.2-11.4
15	12/12	REVIEW	
	TBD	<b>FINAL EXAM</b>	