

**Description:**

The course covers topics of fundamentals of the theory of linear elastic fracture mechanics (LEFM), crack-tip opening displacement (CTOD), J-integral, R-curve, Mixed-mode fracture and fracture toughness testing.

First, basic concepts regarding linear elastic fracture mechanics will be introduced. Then, the elastic-plastic fracture mechanics (EPFM) for metals and will be discussed. Special emphasis will be on such topics as fracture toughness testing, application to structures, and fatigue crack propagation.

The last part of the course will be dedicated to self-study seminars presented by the students on specific topics developed from journal papers.

**Prerequisite:** ME 5690 or consent of instructor.

**Outline:**

1. Introduction
2. Linear Elastic Fracture Mechanics
3. Elastic-Plastic Fracture Mechanics
4. Fracture Mechanisms in Metals
5. Fracture Toughness Testing
6. Application to Structures
7. Fatigue Crack Propagation

**Instructor:** Dr. Daniel Kujawski

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**Office Hours:** Monday, Wednesday 11:30 - 12:30 PM, and Thursday 3:30 - 4:20 PM  
or by appointment.

**Textbook:** **Fracture Mechanics - Fundamentals and Applications**, T. L. Anderson, 3rd Edition, 2005, CRC Press.

**Reference:** **Fatigue of Materials**, S. Suresh, 2nd Edition, 1998, Cambridge University Press.  
**Mechanical Behavior of Materials**, Norman E. Dowling, 3rd Edition, 2007, Prince-Hall, Inc.

**Workload:** Homework problems will be assigned to go along with the lecture topics. There will be a self-study research project where each student will be assigned a topic to study and to present orally to the class. A list of topics will be circulated or you may propose a topic that is interesting to you.

**Grading:**

Homework	- 15%
Two tests (20% each)	- 40%
Research project	- 15%
Final Exam	- 30%

The following schedule is subject to revision.

<u>Week</u>	<u>Date</u>	<u>Day</u>	<u>Lecture Topic</u>
1	1-11	R	Introduction
2	1-18	R	
3	1-25	R	
4	2-1	R	
5	2-8	R	<i>Test #1</i>
6	2-15	R	
7	2-22	R	
8	3-1	R	
	<i>Spring break</i>		
9	3-15	R	<i>Test # 2</i>
10	3-22	R	
11	3-29	R	
12	4-5	R	
13	4-12	R	<i>Project presentations</i>
14	4-19	R	
<b>15</b>	<b>4-26</b>	<b>R</b>	<b><i>Final Exam, 5:00-7:00 PM</i></b>

You are responsible for making yourself aware of and understanding the policies and procedures in the Graduate (pp. 25-27) Catalog that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with me if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.