

Principles of Fracture Mechanics
EGM 6570 Class Numbers 25543,25865,25866,25867

Academic Term: Spring 2021

Class period: MWF 6th period (12:50-1:40 PM) used for exams and synchronous class activities

Lecture Videos <https://ufedge.video.ufl.edu/Mediasite/Channel/spring2021egm6570>

- Students should watch each lecture video on or before the day shown in the course schedule given below.
- Since the videos were made in 2013, corresponding syllabus can be found at: <https://mae.ufl.edu/sankar/Courses/egm6570/course-outline-2013.htm>
- *It may become necessary to modify this syllabus during the semester. In this event, students will be notified and the revised syllabus will be posted on the course web site.*

Instructor:

B.V. Sankar

sankar@ufl.edu

Office Hours: MWF 8th period (3-4 PM) or by appointment. ZOOM link available in CANVAS

Grader: TBA

Catalog Description

Introduction to the mechanics of fracture of brittle and ductile materials. Linear elastic fracture mechanics; elastic-plastic fracture; fracture testing; numerical methods; composite materials; creep and fatigue fracture. (3 credits)

Course Pre-Requisites / Co-Requisites

EGM 5533 Advanced Mechanics of Materials or EGM 6611 Continuum Mechanics.

Course Objectives

To teach the basic principles of Fracture Mechanics including the stress intensity approach and energy balance approach using brittle fracture as a vehicle for understanding. Extension to plasticity effects, composite materials, fatigue fracture will be indicated. Computational tools will be discussed.

Materials and Supply Fees

N/A

Required Textbooks and Software: None

Recommended Materials (for extra reading if desired)

Fundamentals and Applications, Third Edition, 2005, CRC Press, by T.L. Anderson.

Other books I have used are:

Principles of Fracture Mechanics, R.J. Sanford, Prentice Hall, 2003 (ISBN 0-13-092992-1).

Introduction to Fracture mechanics, Kare Hellan, McGraw-Hill 1984.

Advanced Fracture Mechanics, M.F. Kanninen and C.H. Popelar, Oxford University Press, 1985.

In addition, some notes will be posted.

Course Schedule

Topics

- **Introduction**

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- Review of Theory of Elasticity
- Crack-tip stress field
- Energetics of cracks
- Crack-tip Plasticity
- Fracture of composites
- Fatigue crack growth
- Computational Fracture Mechanics

Course Schedule

Lecture	Date	Day	Chapter	Topics	HW/Quiz/Exam
1	11-Jan	MON			
2	13-Jan	WED			
3	15-Jan	FRI			
-	18-Jan	MON		Martin Luther King Holiday	
4	20-Jan	WED			
5	22-Jan	FRI			
6	25-Jan	MON			
7	27-Jan	WED			
8	29-Jan	FRI			
9	1-Feb	MON			
10	3-Feb	WED			
11	5-Feb	FRI			
12	8-Feb	MON			
13	10-Feb	WED			
14	12-Feb	FRI			
15	15-Feb	MON			
16	17-Feb	WED			
17	19-Feb	FRI			
18	22-Feb	MON			
19	24-Feb	WED			
20	26-Feb	FRI			
21	1-Mar	MON			
22	3-Mar	WED			
23	5-Mar	FRI			
24	8-Mar	MON			
25	10-Mar	WED			
26	12-Mar	FRI			
27	15-Mar	MON			
28	17-Mar	WED			
29	19-Mar	FRI			
30	22-Mar	MON			
-	24-Mar	WED		Recharge Day	
31	26-Mar	FRI			
32	29-Mar	MON			
33	31-Mar	WED			

34	2-Apr	FRI			
35	5-Apr	MON			
36	7-Apr	WED			
37	9-Apr	FRI			
38	12-Apr	MON			
39	14-Apr	WED			
40	16-Apr	FRI			
41	19-Apr	MON			
-	21-Apr	WED		Final Exam	

Online Course Recording

Almost all the lectures have been recorded and available through Mediasite.

https://ufedge.video.ufl.edu/Mediasite/Catalog/catalogs/fall2018_egm5533

Some our class sessions may be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Attendance Policy, Class Expectations, and Make-Up Policy

It is extremely important that students watch the lecture videos on or before the suggested date in the course schedule. Not watching videos in a timely manner results in poor or mediocre performance. Excused absences at the quizzes and exams must be consistent with university policies in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>) and require appropriate documentation.

Evaluation of Grades

Home problems (10%), two midterm exams (30% each), final exam (30%)

Grading Policy

%	93.0	90.0	86.5	83.0	80.0	76.5	73.0	70.0	66.5	63.0	60.0	0 - 59.9
Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
Grade Points	4	3.7	3.3	3	2.7	2.3	2	1.7	1.3	1	0.7	0

More information on UF grading policy may be found at:

<http://gradcatalog.ufl.edu/content.php?catoid=10&navoid=2020#grades>

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.

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 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://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-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
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, 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 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

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.
<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://care.dso.ufl.edu>.

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