

AE 837 - ADVANCED MECHANICS OF DAMAGE TOLERANCE

Fall 2019

Instructor:	Dr. Nicholas A Smith	Time:	TR 4:10 – 5:35 pm
Department:	Aerospace Engineering	Place:	210 Wallace Hall
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How to use this syllabus: This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves. Any changes to the syllabus will be uploaded to Blackboard and e-mailed to all students (at their e-mail address listed on Blackboard, make sure this is up-to-date).

Academic Honesty: Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm.

Course Description: An extension of AE 737. Includes the development of the mathematical foundations of linear elastic and plastic fracture mechanics, and computational fracture mechanics.

Definition of a Credit Hour: Success in this 3 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 135 hours.

Measurable Student Learning Outcomes: Upon successful completion of this course, students will be able to

- Derive stress intensity factors from general elasticity
- Calculate the energy release rate
- Analyze environmental effects on crack extension
- Perform computational fracture mechanics using advanced software

Course Textbook:

- T.L. Anderson, *Fracture Mechanics - Fundamentals and Applications*, 3rd ed., 2005.

Other References: The notes used in this course provide a very good base, but sometimes supplemental material is beneficial. The following texts are recommended as additional references:

- S.T. Rolfe and J.M. Barsom, *Fracture and Fatigue Control in Structures*
- M.F. Kanninen and C.H. Popelar, *Advanced Fracture Mechanics*
- V.V. Bolotin, *Mechanics of Fatigue*

Prerequisites: AE 731, AE 733 or equivalent.

Grading Policy: Homework (15%), Midterm 1 (30%), Midterm 2 (30%), Final Project (25%). Final grades follow a traditional scale of:

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
93-100	90-93	87-90	83-87	80-83	77-80	73-77	70-73	67-70	63-67	60-63	0-60

Per department policy, final course grades will not be disclosed before the official notifications by the University.

Homework: Homework may be submitted either electronically before the class period it is due or in class on the due date. It is anticipated that there will be a total of 8 Homework assignments, each worth 100 points. Tentative homework due dates are given in the course schedule. Late homework will not be accepted.

Exams: There will be two major midterm exams during the semester. Exams will be closed-book and closed-notes, but there will be an equation sheet provided. Anticipated exam dates are given in the course schedule.

Final Project: More details on the final project will be given after the first mid-term exam. The final project is intended to serve as a cumulative application of all material used in this course, so be sure that you demonstrate the principles you have learned. In this final project you will be required to perform computational fracture analysis on a real-life part (or test specimen) of your choosing. You will use the principles developed in this class to provide an analytical validation of your computational methods. The final project will be due on Dec 6 by 5:00 pm.

Important Academic Dates: Classes begin August 19, there are official University holidays on Sept 2 (Labor Day), Oct 12-15 (Fall Break), Nov 27-Dec 1 (Thanksgiving Break).

Disabilities: If you have a physical, psychiatric/emotional, or learning disability that may impact on your ability to carry out assigned course work, I encourage you to contact the Office of Disability Services (DS). The office is located in Grace Wilkie Annex, room 150, (316) 978-3309 (voice/tty) (316-854-3032 videophone). DS will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. All information and documentation of your disability is confidential and will not be released by DS without your written permission.

Counseling & Testing: The WSU Counseling & Testing Center provides professional counseling services to students, faculty and staff; administers tests and offers test preparation workshops; and presents programs on topics promoting personal and professional growth. Services are low cost and confidential. They are located in room 320 of Grace Wilkie Hall, and their phone number is (316) 978-3440. The Counseling & Testing Center is open on all days that the University is officially open. If you have a mental health emergency during the times that the Counseling & Testing Center is not open, please call COMCARE Crisis Services at (316) 660-7500.

Diversity and Inclusive: Wichita State University is committed to being an inclusive campus that reflects the evolving diversity of society. To further this goal, WSU does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, gender identity, gender expression, marital status, political affiliation, status as a veteran, genetic information or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Executive Director, Office of Equal Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0138;

Tentative Course Schedule:

Week	Date	Topics	Assignment/Exam
Week 1	Aug 20	Elasticity Review	
Week 2	Aug 27	Complex Variables	Homework 1 Due
Week 3	Sep 3	Linear Elastic Fracture Mechanics	Homework 2 Due
Week 4	Sep 10	Exam Review	Homework 3 Due, Exam 1
Week 5	Sep 17	Energy Approach to Fracture Mechanics	
Week 6	Sep 24	Elastic-Plastic Fracture	Homework 4 Due
Week 7	Oct 1	Fracture Mechanisms	Homework 5 Due
Week 8	Oct 8	Fracture Toughness	Homework 6 Due
Week 9	Oct 15	Exam Review	Exam 2
Week 10	Oct 22	Fatigue Crack Extension	
Week 11	Oct 29	Fatigue Crack Extension	Homework 7 Due
Week 12	Nov 5	Environmentally Assisted Crack Extension	Homework 8 Due
Week 13	Nov 12	Computational Fracture Mechanics	
Week 14	Nov 19	Computational Fracture Mechanics	
Week 15	Nov 26	Special Topics	
Week 16	Dec 3	Special Topics	Final Projects Due

telephone (316) 978-3186.

Intellectual Property: Wichita State University students are subject to Board of Regents and University policies (see http://webs.wichita.edu/inaudit/ch9_10.htm) regarding intellectual property rights. Any questions regarding these rights and any disputes that arise under these policies will be resolved by the President of the University, or the Presidents designee, and such decision will constitute the final decision.

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Title IX: Title IX of the Educational Amendments of 1972 prohibits discrimination based on sex in any educational institution that receives federal funding. Wichita State University does not tolerate sex discrimination of any kind including: sexual misconduct; sexual harassment; relationship/sexual violence and stalking. These incidents may interfere with or limit an individuals ability to benefit from or participate in the Universitys educational programs or activities. Students are asked to immediately report incidents to the University Police Department, (316) 978- 3450 or the Title IX Coordinator (316) 978-5177. Students may also report incidents to an instructor, faculty or staff member, who are required by law to notify the Title IX Coordinator. If a student wishes to keep the information confidential, the student may speak with staff members of the Counseling and Testing Center (316) 978-3440 or Student Health Services (316)978-3620. For more information about Title IX, go to: <http://www.wichita.edu/thisis/home/?u=titleixf>