

**AE/CHBE/ME/MSE 7772 – Fundamentals of Fracture Mechanics
Fall 2024**

Instructor:

Prof. Shuman Xia

Office: MRDC 4103

Office Phone: 404-385-4549

Email: shuman.xia@me.gatech.edu

Lectures: MW 12:30 pm -1:45 pm, Love 184

Office Hours:

Monday, 2:00 pm - 3:30 pm

Office hours are both in person in MRDC 4103 and online at

<https://gatech.zoom.us/j/92443768683>

Prerequisites: Mechanics of Materials

Textbook:

Fracture Mechanics - Fundamentals and Applications by T. L. Anderson, 3rd or 4th Edition

References:

A Course on Nonlinear Fracture Mechanics by J. W. Hutchinson

(<http://www.seas.harvard.edu/hutchinson/papers/353-5.pdf>)

Advanced Fracture Mechanics by M. F. Kanninen and C. H. Popelar

Course Outcomes:

The primary learning objective of the course is to thoroughly understand the basic concepts of linear-elastic fracture mechanics (LEFM) and elastic-plastic fracture mechanics (EPFM) for predicting fracture and crack growth in structural components that contain cracks or crack-like defects. The course will emphasize the fundamental underpinnings of fracture mechanics and its use in materials evaluation and life prediction for components. Micro-mechanisms of crack growth for metals and ceramics will also be covered.

Homework:

Homework will be posted on Canvas (<https://canvas.gatech.edu/>).

Exam Schedule:

On-campus students:

Midterm Exam: 12:30 pm - 1:45 pm, Wednesday, Oct 9

Final Exam: 11:20 am - 2:10 pm, Wednesday, Dec 11

DL students:

This course requires in-person proctoring for DL students, and GTPE handles the proctor nomination process. Please work with GTPE to nominate a proctor that meets Georgia Tech's requirements. You will have the following 3-day windows to schedule each exam with your proctor:

Midterm Exam: 75 min, Oct 9-11

Final Exam: 170 min, Dec 11-13

Percentage for Grade Calculation:

Homework: 25% of final grade

Midterm Exam: 30% of final grade

Final Exam: 45% of final grade

Course Outline:

Intro / Overview

Ch. 1

Fundamentals of LEFM

Ch. 2

Basic Concepts of EPFM

Ch. 3

Fracture Mechanisms in Ceramics and Metals

Ch. 5-6

Fracture Toughness Testing

Ch. 7

Fatigue and Stress Corrosion Cracking

Ch. 10-11