

MME 4317/MME 5310/MASE 6340

Advanced Failure Analysis

Spring 2024

This course will consist of a blend of failure analysis, fracture mechanics, nondestructive evaluation (NDE) and numerous engineering case studies. Other topics of importance are listed below. A moderate knowledge of mechanical behavior of materials will be assumed.

Proposed Course Outline

TOPIC AREAS*

1. Introduction
2. Field Failure Investigations
3. Fracture Modes and Mechanisms (Review)
4. Fracture Mechanics
5. Fracture Properties of Selected Materials Systems
6. Embrittlement (Beyond the conventional)
7. Elevated Temperature Failure Scenarios
8. Fabrication Defects (welds, castings, forgings, etc.)
9. Interpretative and Quantitative Fractography
10. Applications of NDE
11. Fracture of Non-Metallic Materials
12. Failure of Non-Load Bearing Components
13. Litigation & Serving as an Expert Witness

*Please note that the order of these topics may change over the course of the semester.

Grade:

| | |
|--------------------------|-------|
| 1. Assignments & Quizzes | 20% |
| 2. Mid-Term Exam | 25% |
| 3. Final Exam | 25% |
| 4. Project | 30%** |

**This is a group project, which should entail a thorough failure analysis. A PowerPoint presentation will be required as well as a technical paper suitable for publication in the Journal of Failure Analysis & Prevention.

List of books & references in the Library (Reserve Section) In Library use only-three hours max.

1. **Case Studies in Failure Analysis**
2. **Analysis of Metallurgical Failures**
3. **Avoidance of Failure**
4. **Why Metals Fail**
5. **Failure Analysis: The British Engine Technical Reports**
6. **Source Book in Failure Analysis**
7. **Understanding How Components Fail**

8. **Metals Handbook Vol. 11 Failure Analysis and Prevention-9th Edition**
9. **Failure Analysis-Case Histories & Methodology**
10. **Metallurgy of Failure Analysis**

Office Hours: MW 12:30-01:30 pm and every other Friday starting January 28 from 1:00-3:00pm or by appointment

Make-up Exam Policy- If you miss a regularly scheduled exam, you may take a make-up exam in accordance with the following:

1. All make-up exams will be given on Dead Day at a time that will be announced. There will be no exceptions!
2. You can only take one make-up exam. So, do not miss more than one exam during the semester.
3. Every effort will be made to construct make-up exams to cover the appropriate material that was designated for the regularly scheduled exams. The length and difficulty should be comparable, although the exam structure may be different!

Can I work in a group?

- I encourage you to work together in groups to solve homework problems. Discussing problems in groups is a very effective way to learn difficult concepts. However, copying another person's work is cheating and will be treated as such.
- You must work alone when completing quizzes and exams.
- Your work must be **professional!** If you would be embarrassed to hand your homework to your supervisor, please do not hand it to us. Work that is deemed unprofessional will be returned ungraded.

When can I see you if I need help?

- I will make every effort to be in my office during my office hours. However, please feel free to stop by my office at any other time. If I am in the office, I will be happy to speak with you.
- Please feel free to call me (747-6930 or e-mail me at my UTEP e-mail account).
- If you are having trouble getting in touch with me, please leave me a message to make an appointment so that we can meet at a mutually agreeable time.
- Contact the TA for this class. He will post his office hours as well.

Cheating/Plagiarism: Cheating is unethical and not acceptable. Plagiarism is using information or original wording in a paper or reference without giving credit to the source of that information or wording: it is also not acceptable. Do not submit work under your name that you did not do yourself. You may not submit work for this class that you did for another class. If you are found to be cheating or plagiarizing, you will be subject to disciplinary action, per the UTEP catalog policy. Refer to <http://www.utep.edu/dos/acadintg.htm> for further information.

Disabilities: I will make any reasonable accommodation for students with limitations due to disabilities, including learning disabilities. Please see me personally before or after class in the first two weeks or make an appointment to discuss any special needs you might have. If you have a documented disability and require specific accommodations, you will need to

contact the Center for Accommodations & Support Services (CASS) in the East Union Bldg., Room 106 within the first two weeks of classes. The CASS Office can also be reached in the following ways:

Web: <http://www.onthemove.utep.edu>

Phone: (915) 747-5148

Fax: (915) 747-8712

E-Mail: cass@utep.edu

COVID-19 Precautions: Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org