- **Course Number and Title:** M E 457. Engineering Failure Analysis
- **Catalog Description:** Introduction to failure theories and causes. Topics include general procedures for failure analysis, ductile and brittle modes of failure, elements of fracture mechanics, fractography, and failures in various engineering applications due to fatigue, wear, corrosion, design or processing defects. Crosslisted with M E 557.
- **Credit Hours:** 3 Credits (3)
- **Prerequisite(s) / Corequisite(s)** Prerequisite(s): CHME 361
  Corequisite(s): None
- **Required:** Elective for BSME or BSAE Degree
- **Course Availability:** N/A
- **Instructor (Usual):** Dr. Vimal Chaitanya (See https://mae.nmsu.edu/people/faculty.html)
- **Textbook:**
  1. ASM Handbook Volume 11 and 12 (In the reference section of the Library)
  2. Analysis of Metallurgical Failures by Colangelo and Heiser, John Wiley & Sons
  3. Metal Failures: Mechanisms, Analysis, Prevention by McEvity, John Wiley & Sons
  4. Metallurgy of Failure Analysis by A.K. Das, Tata McGraw-Hill Publishing Company
  5. Failure Analysis of Engineering Materials by Brooks and Choudhury, McGraw-Hill
- **Course Learning Objectives:**

  After completing this course, a student should be able to:

  1) Systematically conduct failure analysis, identify cause(s) of failure, suggest remedial steps to prevent failures and/or improve performance for a variety of engineering applications involving metals, polymers, ceramics and composites.
  2) Use skills and knowledges in any industry and engineering applications such as in aerospace, mechanical, microelectronics, construction, chemical, automotive, energy, and medical areas.
- **Topics Covered:**
  - General Procedures for Failure Analysis
  - Mechanical Aspects of Failure
  - Tools for Failure Analysis including Non-destructive Techniques
  - Elements of Elastic and Plastic Deformation
  - Fractography
  - Modes of Fracture (Ductile and Brittle)
  - Elements of Fracture Mechanics
  - Failure due to Fatigue

- Failure due to Wear
- Failure due to Environmental Effects
- Failure due to Processing Defects
- Failure in Engineering Ceramics
- Failure in Engineering Polymers
- Case Studies of Failures in Various Services