1. Title of Course: MME 4316, Failure Analysis

2. Catalog Description:


5. Course Objectives: After completing this course, student should be able to:

1) Understand and explain at least three historically significant “failures”
2) Be able to name the key elements and order of a failure analysis investigation
3) Understand and apply the concept of toughness – How it is defined and tested in CVN, DTT, DWTT, and FT formats
4) Understand and apply at least three NDE techniques for volumetric flaw detection
5) Understand and apply fracture mechanic principles in cases of linear elastic, elastic-plastic, and sub-critical cracking.
6) Understand and interpret the principles of fatigue in fracture evidence macro- and microscopically
7) Distinguish the differences between ductile and brittle fracture
8) Understand and interpret hydrogen damage and environmentally-assisted cracking phenomena
9) Understand and interpret wear in all of its forms including governing and mechanistic aspects
10) Understand and interpret creep and creep rupture failures and other forms of chemical and microstructural alteration
11) Be able to use Deformation/Fracture Maps on at least one material system
12) Understand and interpret casting, forging, and welding defects

6. Topics covered: failure analysis history and methodology, fracture toughness, NDE, fracture mechanics, fatigue, SCC, hydrogen damage, ductile and brittle fracture, wear, elevated temperature service problems, casting and wrought defects, welding defects.

7. Class/Laboratory Schedule: Class: three 50-minute sessions per week + outside of class team failure analysis projects.

8. Contribution on of course to meeting the professional component: This course contributes to the engineering science and engineering design components.

9. Relationship to Program Objectives: Course contains topics fundamental to the interpretation of the deformation and fracture responses of material systems. Serves as a culmination of upper division topics in the degree program. Contributes to Program educational objective 1-3.
