



Failure Analysis of Materials

MATSCEN 5952

Credit Hours:

3.00 - 3.00

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Failure analysis is the process of seeking the cause and mechanism of failure. Concepts for conducting failure analysis of materials, components, and systems will be introduced. Theoretical background will be reviewed on various failure modes along with case studies. Course will introduce the study of fracture surfaces (fractography) to determine fracture mode and fracture origin when possible.

Prerequisites and Co-requisites:

Prereq: Sr or Grad standing in MatScEn or WeldEng, or permission of instructor.

Course Goals / Objectives:

- Recognize fracture modes and identify fracture origins on failed components.
 - Organize and plan a failure analysis project.
 - Select appropriate analytical tools and testing methods to gather the information required to determine the root cause of a failure.
 - Identify similarities and differences between failures in different classes of materials.
 - Assess the quality of failure analysis documents and propose appropriate questions when conclusions not supported by data are reported.
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Course Topics:

- Introduction
 - Loading/Stress
 - Fracture Mechanics and Fatigue
 - How to Organize a Failure Analysis
 - Fracture/Fractography; Heat treating fracture and case studies; guest speaker
 - Intro to Corrosion; Aqueous/Galvanic/Pitting; Stress Corrosion and Embrittlement; Wear/Erosion; Guest speaker and case studies
 - Inspection, Metallography, and Microscopy; SEM-EDS; NDE; Case studies and guest speaker
 - Student projects and presentations
 - How to Organize a Failure Analysis
 - Methodologies Workshop
 - To Engineer is Human
 - Reporting & Litigation; Panel discussion
 - Failure Analysis of Materials: Polymers & Biomaterials; Ceramics, Glass, and Composites; Electronic Devices; Weld, Braze, Solder Joints; Wood based products. Includes case studies and guest speakers.
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Designation:

Elective