



Course Code MENG-454	Course Title Fatigue and Failure Analysis	ECTS Credits 6
Department Engineering	Semester Fall, Spring	Prerequisites MENG-252, MENG-310, MENG-340
Type of Course Elective	Field Engineering	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 4 th	Lecturer(s) Dr Vasileios Drakonakis
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites None

Objectives of the Course:

The main objectives of the course are to:

- Understand the general categories of fracture in different structural applications and in different materials.
- Comprehend the different categories of fracture under failure.
- Study the relation between fatigue and fracture, understand the related fatigue fracture mechanisms.
- Study in detail the several types of fatigue fracture in joints.
- Develop methodology and understand the fatigue analysis process.

Learning Outcomes:

After completion of the course students are expected to:

- Demonstrate basic knowledge on fracture mechanics.
- Comprehend fracture mechanisms under fatigue, and identify crack initiation mechanisms, and micro-cracking.
- Be able to recognize the several types of fatigue fracture in different components of a structure (such as joints).
- Be able to understand, develop, and implement the failure analysis process.

Course Contents:

- Introduction to Fatigue and Fracture
- Mechanical Behavior of materials, Ductile and Brittle Fracture
- Introduction to Fracture Mechanics
- Fatigue of Metals
- Fatigue and Fracture of Engineering Alloys
- Metallic Joints- Mechanically Fastened and Welded
- Fracture Control and Damage Tolerance Analysis
- Fatigue and Fracture of Ceramics and Polymers

- Fatigue and Fracture of Continuous Fiber Polymer Matrix Composites
- High Temperature Failures – Thermal Fatigue
- Wear Failures
- Environmentally-Induced Failures
- The Failure Analysis Process
- Defects Leading to Failure

Learning Activities and Teaching Methods:

Lectures, In-class examples and exercises, In-class Activities, Videos

Assessment Methods:

In-class Activities, Participation, Homework (Applied Exercises), Mid-Term Exam, Final Exam

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
F. C. Campbell	Fatigue and Fracture: Understanding the Basics	ASM International	2012	9781615039760

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
T. Dahlberg, and A. Ekberg	Failure Fracture Fatigue : An Introduction	Studentlitteratur AB	2002	9789144020969