

**Course Name:** 

Fracture Mechanics

Course Number: 20-117	Credit: 3
Program: Graduate	Course Type: Technical Selective
Prerequisite: -	Corequisite: -

## **Course Description (Objectives):**

The objective of this course is to familiarize students with the behavior of materials under various loading conditions and to understand their fracture mechanisms. Students will learn about different types of failure, the influencing factors, and the criteria for evaluating material strength.

## **Course Content (outline):**

- Chapter 1: Introduction and Overview
- Chapter 2: Mathematical Cracks in the Field of Linear Elasticity
- Chapter 3: Linear Elastic Fracture Mechanics
- Chapter 4: Elastic Fracture Mechanics *J*-Integral and Energy-Based Methods
- Chapter 5: Plastic Behavior around the Crack Tip (Ductile Materials)
- Chapter 6: Fracture Mechanics of Semi-Brittle Materials
- Chapter 7: Computational Fracture Mechanics
- Chapter 8: Fatigue Cracks Paris Law and Variable Amplitude Loading
- Chapter 9: Crack Propagation Dynamics Dynamic Stress Intensity, Crack Arrest
- Chapter 10: Applications Metals, Ceramics, Polymers, Rocks, Mining, Concrete Structures, Dams, Tanks, Steel Structures and Connections, Fault Fractures, Bone Fractures, Nanoscales

## **References:**

- Broek, D., Elementary Engineering Fracture Mechanics, 4th edition. Kluwer, 1991.
- Bazant, Z.P. and Planas, J., Fracture and Size Effect in Concrete and Other Quasi-brittle Materials, CRC Press, 1998.
- Perez, N., Fracture Mechanics, 2004.
- Anderson, T.L., Fracture Mechanics, 2006.
- Gdoutos, E.E., Fracture Mechanics, 2005.