Course Title	Course Code:	Credit Houtrs:
Introduction to Fracture Mechanics	AE-465	3-0

Textbooks:

- Prashant Kumar, “Elements of Fracture Mechanics “, Tata McGraw Hill
- K. R. Y. Simha and K.R.V. Simha, “Fracture Mechanics for Modern Engineering Design”, Sangam Books Limited

Reference Materials:

- Source::https://archive.nptel.ac.in/content/storage2/courses/112106065/downloads/Video%20content%20EFM.pdf
- K. Ramesh, e-Book on Engineering Fracture Mechanics, IIT Madras. URL: http://apm.iitm.ac.in/smlab/kramesh/book_4.htm

Course Objective:

This course aims to equip students with a fundamental understanding of Engineering Fracture Mechanics, addressing key concepts such as modes of loading, LEFM, and EPFM. It explores the origins of fracture mechanics through notable failures, crack growth mechanisms, and energy release rates. Students will learn about stress intensity factors, Griffith Theory, and the role of photoelasticity, as well as methods for evaluating fracture toughness and modeling plastic zones at crack tips.

Course Outline:

- Tension Test, Bending, and Torsion Review
- Handling Combined Stresses and Principal Stresses
- Definition of Failure and Yield Criteria
- Buckling as a Failure Mode
- Need and Data for Fatigue Testing
- Notable Spectacular Failures Discussion
- Boston Molasses and Liberty Ship Failures
- Ductile-Brittle Transition Temperature Relevance
- Applications of Fracture and Prevention
- Introduction to Photo elasticity and Crack Severity

- LEFM and EPFM Classification
- Modes of Loading: Mode-I, Mode-II, Mode-III
- New Fracture Mechanics Testing Methods
- Crack-Growth Curves and Residual Strength
- Stress Corrosion Cracking and Hydrogen Embrittlement
- Creep, Corrosion Fatigue, and Liquid Metal Embrittlement
- Validation of Griffith’s Approach and Theoretical Strength, Nano Composites Features and Benefits