AE6165 Principles of Fracture and Fatigue

Catalog Data: AE 6165. Principles of Fracture and Fatigue

3-0-3.Prerequisite: Undergraduate deformable bodies course or consent of instructor.

Brittle and ductile fracture. Linear elastic fracture mechanics. Determination of stress intensity factors. Analytics of fracture mechanics. Elastic-plastic fracture mechanics. The J-integral. Energy release rate. Elements of applied fracture mechanics. Mechanics of fatigue. Fatigue crack growth. Environmental effects.

Textbook: K. Hellan *Introduction to Fracture Mechanics,* McGraw-Hill, 1984.

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Lecture Topics:

1. Brittle fracture
    a. Griffith criterion
    b. Multiaxial brittle fracture criteria
2. Ductile fracture
    a. Void growth and coalescence
    b. Ductile fracture criteria
3. Linear elastic fracture mechanics
    a. Airy stress function method
    b. Complex variable methods
    c. Other methods in fracture mechanics analysis
    d. Fracture toughness
4. Elastic-Plastic Fracture Mechanics
    a. Crack tip yielding
    b. The HRR field
    c. J-integral and Crack Opening Displacement
5. Fatigue
    a. The stress-life and strain-life approaches in fatigue
    b. Fatigue crack growth under constant amplitude loading
    c. Effects if mean stress
    d. Environmental effects in fatigue (stress corrosion)

Computer Usage: None

Laboratory Projects: None