ME 293 (JAN) 3:0 Fracture Mechanics

Overview of Fracture Mechanics. Energy concepts in Fracture Mechanics. Griffith Energy balance: Irwin-Orowan extension, Stability of crack growth; Linear Elastic Fracture Mechanics; Asymptotic crack tip fields; Stress Intensity Factor; Small Scale Yielding; Plastic Zone estimates; Fracture toughness; Analytical methods to determine stress intensity factor; Westergaard method, Green's functions and Weight functions; Fatigue crack growth; Similitude, Empirical crack growth laws; Crack closure; Fatigue Threshold; Variable amplitude loading; Interface Fracture Mechanics; Thermal stresses in multi-layers; Interface crack tip fields; Crack kinking, deflection and substrate penetration; Interface debonding and channel cracks in films. Nonlinear Fracture Mechanics. J integral. Plastic crack tip fields; J integral testing; Engineering approach to plastic fracture.

Instructor: R.Narasimhan

References

1. T.L.Anderson, Fracture Mechanics, : Fundamentals and Applications, CRC Press, 3rd Edition.
2. M.F.Kanninen and C.H.Popelar, Advanced Fracture Mechanics, Oxford publishers.
3. D.Broek, Elementary Engineering Fracture Mechanics, Martinus Nijhoff publishers.

Pre-requisites

ME-242 : Solid Mechanics or equivalent course is desirable or instructor's permission.

Additional information

This course is intended for doctoral and master's students interested in Mechanics of Solids, and Fracture behavior of materials.

Course objectives

After taking this course, the students will be able to:

1. Understand key concepts related to mechanics of fracture of both elastic and inelastic materials.
2. Apply fracture and fatigue concepts for design of structural components.
3. Will be able to pursue research in the areas of Fracture and Fatigue.

Course website: