

ME 605 Fracture, Fatigue and Failure Analysis (3-0-0-6)

Griffith's theory of brittle failures; Irwin's stress intensity factors; Linear elastic fracture mechanics: The stress analysis of crack tips, Macroscopic theories in crack extension, Instability and R-curves, Crack tip plasticity, K as a failure criterion, Mixed mode of fracture, Analytical and Experimental methods of determining K; Elastic plastic fracture mechanics: Crack tip opening displacement, J Integrals, Crack growth resistance curves, Crack tip constraint under large scale yielding, creep crack growth; Microscopic theories of fracture: Ductile and cleavage fracture, ductile-brittle transition, inter-granular fracture; Fatigue crack propagation: Fatigue crack growth theories, crack closure, Microscopic theories of fatigue crack growth; Application of theories of fracture mechanics in design and materials development

Textsbooks:

- [1] T. L. Anderson, *Fracture Mechanics Fundamentals and Applications*, CRC Press, 1994
- [2] D. Brock, *Elementary Engineering Fracture Mechanics*, Martinus Nijhoff Publishers, 1982.
- [3] S. T. Rolfe and J. M. Barson, *Fracture and Fatigue Control in Structures*, PHI, 1977