

## 19SC730 FRACTURE MECHANICS OF CONCRETE 3-0-0 3

### Course Objectives:

- Understand basic concepts in fracture mechanics
- Estimate life of a structure containing a defect
- To apply fracture mechanics concept to model concrete behavior

Introduction to fracture mechanics, Introduction to LEFM and EPFM, Fatigue Crack Growth Model, Crack Growth and Fracture Mechanisms, Elastic strain energy, Fracture strength by Griffith, Energy release rate, Review of theory elasticity, Westergaard solution for stress and displacements for Mode I, Relation between K and G, Crack Initiation and Life Estimation

Application to concrete: Computational models - Fictitious crack model, Crack Band Model, Two parameter fracture model, Size effect model, Softening of concrete and Evaluation of fracture process zone, Size effect in concrete

### TEXT BOOKS/ REFERENCES:

1. Broek, D., *Elementary Engineering Fracture Mechanics*, Martinus, Nijhoff Publishers, The Hague.
2. Anderson, T.L., (1995), *Fracture Mechanics- Fundamentals and Applications*", 2<sup>nd</sup> Edition, CRC Press, Boca Raton.
3. Shah, S.P., Swartz, S.E., and Ouyang, C., (1994), *Fracture Mechanics of concrete: Applications of Fracture Mechanics to Concrete, Rock, and other Quasi-brittle Materials*", John Wiley and Sons, NY, Singapore.
4. Karihaloo, B.L., (1995), *Fracture Mechanics and Structural concrete*", Longman Scientific and Technical, USA.
5. ACI 446.1 R-91, *Fracture Mechanics of concrete: Concepts, Models and Determination of Material properties*", ACI.