Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE7200 - Fracture mechanics of concrete

Credit Distribution: C:9 L:3 T:0 P:0 E:0 O:6 TH:0

Course Type: Theory

Description: The course provides an overview of fracture mechanics vis-Ã -vis metals, composites, quasi-brittle materials, and application to cementitious materials.

Course Content: 1. Overview of Linear Elastic Fracture Mechanics: Bond Stress and Energy, Stress Concentration and Energy theory, Strain Energy Release Rate Concept, Stress Intensity Factor, R-curves; 2. Non-Linear Elastic Fracture Mechanics: Crack Tip Plasticity, Crack Tip Opening Displacement, J-integral; 3. Crack Models: Fictitious Crack Model, Crack Band Model, Two Parameter Fracture Model, Size Effect Model, Size Effect in Concrete; 4. RILEM work of fracture and specifications; 5. Softening of Concrete and Evaluation of Fracture Process Zone; 6. Interface and Bond Model: R-curve Approach; 7. Mixed Mode Fracture; 8. Fatigue in Concrete Structures; 9. Finite Element Modeling of Fracture in Concrete; 10. Applications: Dams and Reinforced Concrete Members.

Text Books

NIL

Reference Books

- Broek, D., Elementary Engineering Fracture Mechanics, Martinus, Nijhoff Publishers, 1982.
- Anderson, T.L., Fracture Mechanics – Fundamentals and Applications, 2nd Edition, CRC Press, 1995.
- Shah, S.P., Swartz, S.E., and Ouyang, C., Fracture Mechanics of Concrete: Applications of Fracture Mechanics to Concrete, Rock, and Other Quasi-brittle Materials, John Wiley and Sons, 1994.
- Karihaloo, B.L., Fracture Mechanics and Structural Concrete, Longman Scientific and Technical, 1995.
- ACI 446.1 R-91, Fracture Mechanics of Concrete: Concepts, Models and Determination of Material Properties, American Concrete Institute.

Prerequisite: