

**Department: Civil & Environmental Engineering**  
**Level and Major: Graduate – General Course**

**Division: Civil engineering**

**Course Title: Fracture mechanics**

**Number of Credits: 3**

**Prerequisite (Corequisite): Structural analysis (I), Concrete Technology Lecturer: -**

### **Course Topic**

- introduction and familiarity
- math crack in the field of linear elastic environment ,A :stress intensity factor in two-dimensional geometric –in plane deformation –mode I-systemtric, breathing crack- mode II-antisymmetric –slippage crack-anti-plane strain –mode III-rupture crack displacement of the edges of the crack and calculate the deformations –solving the crack problems by using complex variable method
- linear elastic fracture mechanics (LEFM) –fracture toughness –energy release rate ,fracture energy\_ composite mode –critical for crack expansion –criteria for routing crack expansion –crack competition –Bifurcation
- elastic fracture mechanics –J-integral and energy methods
- plastic behavior around the tip of the crack (formable materials),geometric and the size of plastic area-dugdale model- application of J-integral and fracture criterion , models based on plasticity theory
- fracture mechanics of semi-brittle materials, fracture process zone ,stress softening ,equivalent continuous models ,equivalent elastic models, critical rupture criterion, resistance curve method (R-curve)
- computational fracture mechanics special finite elements for the around of crack tip, methods for calculating stress intensity coefficients ,energy release rate, J-integral and crack path, boundary element methods and Galerkin method
- fatigue of the crack ,Paris- law and the load with variable amplitude
- dynamics of crack expansion –dynamic crack intensity ,crack arrest
- applications\_ metals ,ceramics, polymers, stone mining, concrete structures ,dams, reservoirs, steel structures and fitting,s fault failure , bone fractures, Nano scale

Course Description:

Reading Sources:

Course Goals and objectives:

Evaluation:

Course topics:

The course aim st:o