

Course Name:
Fracture mechanics

Course Number:
20117

Credit:
3

Course Content (outline):

1. Introduction
2. Linear elastic mathematic crack
2D stress intensity factor
Mode I, II and, III
Displacement of crack tip and calculation of deformations
Complex variable method
3. Linear Elastic Fracture Mechanics (LEFM)
Fracture Toughness, energy release rate, fracture energy, compound mode, crack initiating criteria, bifurcation
4. Elastic fracture mechanics, J-integral and energy methods
5. Plastic behavior of crack tip (ductile materials)
Size and geometry of plastic zone, Dugdale model, J-integral applications and fracture criteria, plasticity models
6. Semi- brittle fracture mechanics
Fracture Process Zone, stress softening, equivalent continuum model, equivalent elastic model, critical opening criteria, R-curve method
7. Computational fracture mechanics
Special finite element for crack tip, stress intensity factor calculations, energy release rate, J- integral, boundary element method, and Galerkin method
8. Crack fatigue- Paris rule
9. Dynamic of initiating of crack- dynamic crack intensity
10. Applications in ceramics, concrete structures, and etc.

References:

- Broek, D., Elementary Engineering Fracture Mechanics, 4th edition. Kluwer, 1991.
- Bazant, Z.P. and Planas, J., Fracture and Size Effect in Concrete and Other Quasibrittle Materials, CRC Press, 1998.
- Perez, N., Fracture Mechanics, 2004.
- Anderson, T.L., Fracture Mechanics, 2006.
- Gdoutos, E.E., Fracture Mechanics, 2005.