

# MA 527- Fracture Mechanics

<b>Course Code:</b>	MA-527
<b>UTAA Credit (Theoretical-Laboratory hours/week):</b>	3(3.0)
<b>ECTS Credit:</b>	6.0
<b>Department:</b>	Mechanical and Aeronautical Engineering
<b>Language of Instruction:</b>	English
<b>Level of Study:</b>	Graduate
<b>Offered Semester:</b>	Fall and Spring Semesters.

## Course Objectives

To introduce the Basic concepts: Failure criteria, mechanisms of fracture, stress intensity factor. Energy balance and stress intensity factor approaches to fracture. Plane strain and plane stress fracture toughness of materials. Fatigue crack growth. Elastic-plastic fracture, plastic zone models, J-integral. Fail-safe and safe-life design concepts, damage tolerances. Applications to practical problems.

## Course Content

The need for Fracture Mechanics. Fracture Mechanics vs. Strength of Materials in analysis of engineering components. Elastic stress/strain field in continuous medium. Elastic crack tip stress field. Stress intensity factors for practical geometries. Analysis of crack tip plastic zone. Plane stress vs. Plane strain fracture toughness. Energy methods. Environment assisted cracking. Cyclic stress and strain fatigue. Fatigue crack growth.

## Course Learning Outcomes

- 1-Gain knowledge of the fundamentals of fracture mechanics
- 2-Gain knowledge of the behavior of machine parts having cracks or crack like flaws
- 3-Gain knowledge of the effect of plain strain conditions on the fracture behavior of the material which is material property
- 4-Gain knowledge of the crack propagation and life evaluation of the machine parts having simple geometry and loading conditions.
- 5-Gain knowledge of the standard testing methods for fracture toughness of the materials