ME-629

Fundamentals of Fracture with Fundamental Papers

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Cursus	Sem.	Type
Mechanics		Opt.

Language of teaching	English
Credits	2
Session	
Exam	Written & Oral
Workload	60h
Hours	**32**
Courses	24
Project	8
Number of positions	

Frequency

Only this year

Summary

The principles of fracture mechanics, from the energy balance approach of Griffith through modern computational approaches, will be introduced using key papers. Phase-field modeling and atomistic processes in fracture, as well as experimental developments, will complement theory.

Content

The field of fracture mechanics has advanced significantly over the past 100 years. Over this time, core papers have emerged that serve as milestones for advances in the field. This course aims to present the key developments that have occurred using these milestone papers as the basis for discussion. Beginning with fundamental concepts like energy balance introduced by Griffith, we will then move forward into
the foundations of modern linear elastic fracture mechanics, treating foundational analytical and computational methods as they emerge, roughly chronologically. Cohesive and mixed-mode fracture will be discussed, as well as key experimental advances. We will conclude with presentation of state-of-the-art computational methods, including the phase-field model and atomistic processes in fracture.
For 10 weeks students will be assigned a paper to read and discuss. Following this series of discussions, students will then take four weeks to prepare a project, to be presented at a poster session during the last week of classes. Evaluation is based on the presentation of the project in the poster session and attendance and participation in the discussion sessions.

Note

Visiting scholar Dmitry Garagash will teach several sessions of this unique class. A series of 10 lectures of 2 hours will be used to offer a broad exposure to the fundamentals of fracture. Students will then prepare a project over the course of 4 weeks, to be presented in a final poster session.

Keywords

Fracture mechanics, Elasticity

Learning Prerequisites

Important concepts to start the course

Solid Mechanics, Continuum Mechanics, Finite-Element Methods

Resources

Bibliography

Papers cited