



COURSE SYLLABUS

Brottmekanik

Fracture Mechanics

7.5 credits (7,5 högskolepoäng)

Course code: MT2572

Main field of study: Mechanical Engineering

Disciplinary domain: Technology

Education level: Second cycle

Specialization: AIN - Second cycle, has only first cycle course/s as entry requirements

Subject area: Mechanical Engineering

Language of instruction: English

Applies from: 2021-01-18

Approved: 2020-10-01

Discontinued: 2023-11-09

1. Decision

This course is established by Dean 2020-10-01. The course syllabus is approved by Head of Department of Mechanical Engineering 2020-10-01 and applies from 2021-01-18.

2. Entry requirements

Admission to the course requires 4 credits completed from the course Solid Mechanics, Advanced course.

3. Objective and content

3.1 Objective

The purpose of the course is to make it possible for students to get more knowledge in the field of Solid Mechanics in order to work professionally as engineer. The contents will include fracture mechanics theory and stress fields and "energy release rate" around crack tips as well as crack growth due to fatigue.

3.2 Content

The course covers the following overall

Topics:

1. Introduction - failure mechanism
 - fundamental equations in Solid Mechanics
- Failure and damage mechanisms
 - Different examples
2. Stress intensity factors and Fracture criteria
 - Three Mode
 - Stress intensity fracture
 - fracture toughness
3. Plastic zones at the tip of the crack
 - "The Irwin approach"
 - "The Dugdale Model"
4. Energy considerations
 - Energy balance
 - fracture energy
 - Energy Release G
 - Stable and unstable growth
5. Determination of stress Intensity Factors KI
 - Energy method
 - reciprocity relation
6. Crack propagation due to fatigue
 - Range of Stress Intensity Factors
 - Crack growth
 - "Paris' law"

plus a project to use the Finite element method (FEM) in fracture mechanics.

4. Learning outcomes

The following learning outcomes are examined in the course:

4.1 Knowledge and understanding

On completion of the course, the student will be able to:

- understand the mechanical behavior of materials or constructions at fracture risk,
- plan and prioritize testing with the help of fracture mechanics.
- analyze and assess strength / longevity at constructs that contain material defects,
- dimension constructions with fracture mechanics theory

4.2 Competence and skills

On completion of the course, the student will be able to:

- Show ability to critically, independently and creatively identify, formulate and deal with complex problems
- Show ability to analyze and evaluate different technical solutions.
- Show ability to clearly present and discuss drawn conclusions and the knowledge and argument they are based on.

4.3 Judgement and approach

On completion of the course, the student will be able to:

- clarify what material characteristics are required in different fracture situations, use theory and Finite Elements methods to analyze construction with defects.

5. Learning activities

The course can be read individually or in groups. All course participants are expected to participate actively at scheduled times teaching and practice.

Lectures introduce theory and examples around problem solving in different design contexts.

Independent presentation and exercises and problem solving provides an opportunity for application of the theory.

Article search provides an overview of relevant up to date information in the field. A web-based course platform used where course participants can get the course information and submit the exercises and report.

6. Assessment and grading

Modes of examinations of the course

Code	Module	Credits	Grade
2105	Written examination	4.5 credits	AF
2115	Project assignment	3 credits	GU

The course will be graded A Excellent, B Very good, C Good, D Satisfactory, E Sufficient, FX Fail, supplementation required, F Fail.

At the grade FX and UX, respectively, in consultation with course manager / examiner able to within six weeks supplement the grade to E and G for the current course.

The course-PM for each course revision should include the assessment criteria and make explicit in which modes of examination that the learning outcomes are assessed.

An examiner can, after consulting the Disability Advisor at BTH, decide on a customized examination form for a student with a long-term disability to be provided with an examination equivalent to one given to a student who is not disabled.

7. Course evaluation

The course evaluation should be carried out in line with BTH:s course evaluation template and process.

8. Restrictions regarding degree

The course can form part of a degree but not together with another course the content of which completely or partly corresponds with the contents of this course.

9. Course literature and other materials of instruction

Course literature:

Tore Dahlberg and Anders Ekberg (2002): Failure

Fracture Fatigue, an introduction ISBN 9-44-02096-1.

Reference books:

T. L. Anderson (1995): Fracture Mechanics,

Fundamentals and Applications, second edition,

ISBN 0-8493-4260-0.

Fred Nilsson (2001): Fracture Mechanics - from Theory to Applications, ISBN 91-972860-3-6.

10. Additional information

This course replaces the course MT2567

Översättning/Translation