



COURSE SYLLABUS

Brottmekanik

Fracture Mechanics

7.5 credits (7,5 högskolepoäng)

Course code: MT2567

Main field of study: Mechanical Engineering

Disciplinary domain: Technology

Education level: Second cycle

Specialization: A1N - Second cycle, has only first cycle course/s as entry requirements

Subject area: Mechanical Engineering

Language of instruction: English

Applies from: 2020-01-20

Approved: 2019-10-01

Discontinued: 2021-12-06

1. Decision

This course is established by Dean 2019-08-28. The course syllabus is approved by Head of Department of Mechanical Engineering 2019-10-01 and applies from 2020-01-20.

2. Entry requirements

Admission to the course requires completed course Solid Mechanics Application, 7.5 credits.

3. Objective and content

3.1 Objective

The aim of the course is to provide the basic knowledge to the students in order to work professionally as an engineer. This includes applying fracture mechanics theory to calculate the stress fields and energy release rates around the crack tip as well as to estimate the 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 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 Finitel 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,
- dimensional constructions with fracture mechanics theory

4.2 Competence and skills

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

- Ability to identify and formulate problems,
- Critical Thinking,
- Analytical Thinking, Support
- Communication and Engineering Skills.

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
2005	Written examination	4.5 credits	AF
2015	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

Tore Dahlberg and Anders Ekberg (2002): Failure Fracture Fatigue, an introduction ISBN 91-44-02096-1.

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 MT2561