AF1024 Structural Analysis with Finite Element Methods (FEM) 7.5 credits

Strukturanalys med finita elementmetoder (FEM)

This is a translation of the Swedish, legally binding, course syllabus.

Establishment

The course syllabus is valid from autumn term 2022.

Grading scale

A, B, C, D, E, FX, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed courses: AF1746, AF1747

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

The course will treat both theoretical and more applied aspects of FEM-modelling. In addition to knowledge in beam theory give the course also a necessary specialisation in structural mechanics. An important goal of the course is to teach students to use a commercial FEM program by analyzing practical problems.

After the course, the students should be able to:

· Explain and apply the basic theory behind the finite element method.

· Describe the common elements.

· use the finite element method to analyse real structures.

· Use a commercial FEM-program.

· explain in which cases a simple dynamic analysis is needed, and the principles behind such analysis.

Course contents

Structural mechanics:

· multiaxial strains and stresses, principal stresses

· dynamics: natural frequency, damping and resonance for simple systems

FEM theory:

· discretization, interpolation functions, elements, nodes and degrees of freedom

· internal and external work, virtual work

· assembling, stiffness matrix

· 2D bar element, 2D beam element, plane elements, solid elements, shell elements.

FEM modeling:

· choice of elements, boundary and support conditions

· modeling of loads and details

· modeling of concrete slabs

· modelling of bridges

Examination

- INL1 - Assignments, 3.5 credits, grading scale: P, F
- TEN1 - Written Exam, 4.0 credits, grading scale: A, B, C, D, E, FX, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

If the course is discontinued, students may request to be examined during the following two academic years.

Grading criteria are announced at the beginning of the course.

Other requirements for final grade

Examination (TEN1; 4.0 credits) grading scale A-F

INL1 - Written assignments 3.5 credits in grading scale P, F

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.