AF102U 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

Course syllabus for AF102U valid from Autumn 2017

Grading scale

P, F

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

The students should be approved in courses that correspond to the following courses:

HF1903 Mathematics 1 7.5 credits

HF1004 Mathematics 2 with mathematical statistics 7.5 credits

HS1003 Structural Mechanics 1 7.5 credits

HS1004 Structural Mechanics 2 7.5 credits

HS1008 Structural Design in Civil Engineering 7.5 credits

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 FEM modeling aspects. The course also provides the necessary knowledge above the beam theory in structural mechanics. An important goal of the course is to teach students to use a commercial FEM program by analyzing practical problems.

After completing the course the students shall be able to

- explain the basic theory behind the finite element method.

- derive 2D beam element and 4-node plane element.

- describe plate, shell and solid elements.

- use the finite element method to analyse real structures.

- use a commercial FE 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

derivation of 2D beam element and 4-node plane element

description of the properties of plate, shell and 3D solid elements

FEM modeling:

choice of elements, boundary and support conditions

modeling of loads and details

modeling of concrete slabs

modelling of bridges

Course literature

Egen litteratur

Examination

- INLA - Assignment, 7.5 credits, grading scale: P, 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.

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.