AF2024 Finite Element Methods in Analysis and Design 7.5 credits

Finita elementmetoder i analys och design

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

Establishment

Course syllabus for AF2024 valid from Autumn 2021

Grading scale

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

Education cycle

Second cycle

Main field of study

The Built Environment

Specific prerequisites

Documented knowledge in Structural Mechanics and Structural Engineering equivalent to at least 3·times 7,5 ECTS corresponding to the content in courses AF1006, AF1005 and AF2003. And knowledge in MATLAB-programming corresponding to the content in course SF1516 Numerical Methods and Basic Programming.

Eng B/6 according to the Swedish upper secondary school system.

Language of instruction

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

Intended learning outcomes

The aim of this course is to give basic knowledge about the Finite Element Method including element formulations, numerical solution procedures and modelling details. The course will also give the students the ability to use commercial FE-packages for the solution of practical problems in Infrastructure and Civil engineering. After this course, the student will be able to:

— Understand the basic theory behind the finite element method

— Use the finite element method for the solution of practical engineering problems

— Use a commercial FE-package

The course is also aimed at providing the necessary theoretical and practical background for more advanced studies within the field of finite elements and structural mechanics.

Course contents

- Introduction to continuum mechanics

- Basic concepts: discretization, interpolation, elements, nodes and degrees-of-freedom

— Stiffness method, simple 1D elements (trusses and beams)

— Properties of stiffness matrices

— Assembly and solution procedures

— Stationary principles, basic elements for structural mechanics

— The isoparametric formulation

— Plate bending and shell elements

— Coordinate transformation and constraints

— Modelling details and loads

— Quality of FE-solutions

— Introduction to advanced finite element modelling

— Commercial FE-programs for analysis

— Modelling of pavement and geostructures

Examination

- ÖVN1 - Exercises, 3.5 credits, grading scale: P, F
- TEN1 - Examination, 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.

ÖVN1 (compulsory exercises 3,5 ECTS credits)

TEN1 (tentamen 4 ECTS credits)

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.