SF1551 Numerical Methods, basic course 7.5 credits

Numeriska metoder, grundkurs

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

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

Establishment

Course syllabus for SF1551 valid from Autumn 2024

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed course SF1625 Calculus in one variable or equivalent

Completed course DD1310 Programming technigues and Matlab

Language of instruction

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

Intended learning outcomes

A general aim with the course is to give the student the understanding of how numerical methods, analysis, and programming techniques can be used to make reliable and efficient simulations of technical and scientific processes based on mathematical models.

After completing the course, the student should be able to:

- given a mathematical model for a technical or scientific problem, identify and classify the mathematical subproblems that need to be solved, rewrite them in a form suitable for treatment with numerical methods and select appropriate numerical methods.

- describe key concepts and basic ideas used in the numerical methods included in the course and be able to use these concepts and ideas to describe advantages and limitations of the method.

- describe, apply, implement, and evaluate the numerical methods included in the course.

- estimate the reliability of numerical results and investigate properties of numerical methods using analytical procedures included in the course.

- present, discuss and summarize problem statements, solution approaches, and results when solving problems.

Course contents

Simulation of technical and scientific processes given a mathematical model. The course adresses how to structure the problem, rewrite the problem in a form that is suitable for numerical treatment, select the appropriate numerical method, implement the method, visualize and present a solution, and estimate the reliability of the result. The course ends with a project within programme specific area

The course deals with:

- numerical methods for linear systems of equations, non-linear systems of equations, interpolation, the least squares method, optimization, integration, and differential equation.

- basic ideas and concepts such as algorithm, computational cost, iteration, local linearization, interpolation, extrapolation, discretization, order of accuracy, convergence, complexity, condition, and stability.

Examination

- LAB1 - Computer assignments, 1.5 credits, grading scale: P, F
- LAB2 - Computer assignments, 1.5 credits, grading scale: P, F
- PRO1 - Project work, 1.5 credits, grading scale: P, F

- TEN1 - Written exam, 3.0 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.

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.