SF1552 Numerical Methods, basic course 6.0 credits

Numeriska metoder, grundkurs

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

Establishment

Course syllabus for SF1552 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

Active participation in CK1310 Python Programming for Chemical Sciences

Language of instruction

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

Intended learning outcomes

An overall goal of the course is to provide the student with insight into how numerical methods, analysis, and programming techniques can be used to make reliable and effective 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 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 metods.

- 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 problem. The course addresses 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 results.

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 equations

- 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
- 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.

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.