DD1318 Programming and Scientific Computing 9.0 credits

Programmeringsteknik och tekniska beräkningar

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

The official course syllabus is valid from spring semester 2025 according to the decision of Director of First and Second Cycle Education: J-2024-2196.
Date of decision: 2024-10-08

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Language of instruction

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

Intended learning outcomes

After passing the course, the student shall be able to

- follow the rules in the syntax of the programming language
- apply and account for rules for good programming style (such as usability, error handling, structuring, flexibility)
- design programmer-friendly programs with appropriate names and comments, consistent language and typography
- discover and correct programming errors
- modify given programs
- transfer data between file and program
- identify the need of and use control structures (conditional statements and loops)
- divide a larger problem into manageable parts and design functions for these
- use the data structures that are embedded in the programming language, as well as choose data structures that fit for the current problem
- use classes as well as design own classes
- review others' programs
- handle matrices and use matrix operations
- use built-in functions from libraries for technical computations and visualisation
- differentiate and integrate functions numerically
- solve scalar equations numerically
- solve large linear equation system
- use the least squares method
- solve optimisation problems numerically
- write and plot functions of complex numbers
- plot curves
- plot surfaces
- make frequency analysis FFT, of vectors/sound and matrices/images

in order to have the possibility to:

- use programming to solve problems
- apply the problem solving methodology also in other fields than programming
- discuss software development with experts
- utilise the computer as aid for mathematical computations and visualisation in other courses.

Course contents

Fundamental computer concepts.

Programming in a modern programming language. Data structures and classes. Problem-solving through division into sub-problems. Program structuring. Several smaller programming assignments as well as one larger, individual programming assignment with strong emphasis on structuring and specification of included modules.

Technical computations for the solution of mathematical problems. Two and three-dimensional graphical presentation.

Examination

- LAB1 - Computer labs, 1.5 credits, grading scale: P, F
- LAB2 - Computer test, 1.5 credits, grading scale: P, F
- LAB3 - Programming Assignments, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- LAB4 - Computer labs, 3.0 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.

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.