



DD2350 Algorithms, Data Structures and Complexity 9.5 credits

Algoritmer, datastrukturer och komplexitet

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

Establishment

The official course syllabus is valid from the autumn semester 2021 in accordance with Head of School decision: J-2021-0624. Decision date: 15/04/2021

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

Knowledge and skills in programming, 6 higher education credits, equivalent to completed course

DD1337/DD1310/DD1311/DD1312/DD1314/DD1315/DD1316/DD1318/DD1321/DD1331/DD100N/ID1020/ID1021

Knowledge in basic computer science, 6 higher education credits, equivalent to completed course DD1338/DD1320/DD1321/DD1325/DD1327/DD2325/ID1020/ID1021.

Knowledge in discrete mathematics, 3 higher education credits, equivalent to completed course SF1671/SF1610/SF1630/SF1662/SF1679.

Knowledge in algebra and geometry, 7.5 higher education credits, equivalent to completed course SF1624/SF1672.

Knowledge in one variable calculus, 7.5 higher education credits, equivalent to completed course SF1625/SF1673.

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course.

Registering for a course is counted as active participation.

The term 'final examination' encompasses both the regular examination and the first re-examination.

Language of instruction

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

Intended learning outcomes

After completion of the course, students should be able to:

- develop and implement algorithms with data structures and analyse them with respect to correctness and efficiency,
- compare alternative algorithms and data structures regarding efficiency and reliability,
- define and translate central concepts such as P, NP, NP-completeness and undecidability,
- compare problems with respect to complexity by means of reductions,
- handle problems with high complexity

in order to

- independently construct computer programs that use time and memory efficiently,
- in professional life identify and attack problems that are unrealistically resource demanding or not possible to solve on a computer.

Course contents

Design principles of algorithms: Decomposition, greedy algorithms, dynamic programming, local and exhaustive search. Algorithm analysis. Approximation algorithms and heuristics. Applications with algorithms for problems on sets, graphs, arithmetic and geometry. Implementation of algorithms.

Data structures: Review of hash tables and heaps; balanced trees, Bloom filters. Use and implementation of data structures. Computability and complexity: The concept of reduction, the complexity classes P (polynomial time) and NP (non-deterministic polynomial time). NP-complete problems, undecidable problems. Coping with computationally intractable problems. Terminology in Swedish and English.

Examination

- MAS2 - Individual master's test, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- MAS1 - Individual master's test, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Theory examination, 2.5 credits, grading scale: P, F
- LAB1 - Laboratory assignments, 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.

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.

Additional regulations

A student who, at the beginning of the course, has not completed 7.5 higher education credits of discrete mathematics, equivalent to SF1610/SF1630/SF1662/SF1679, must take SF1688 in parallel with DD2350.