DD2350 Algorithms, Data Structures and Complexity 9.5 credits

Algoritmer, datastrukturer och komplexitet

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 the autumn semester 2022 in accordance with the decision from the head of school: J-2022-0576.Decision date: 21/03/2022

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

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.

Specific prerequisites

Knowledge and skills in programming, 6 credits, equivalent to completed course DD1337/DD1310-DD1318/DD1321/DD1331/DD100N/ID1018.

Knowledge in foundations of computer science, 6 credits, equivalent to completed course DD1338/DD1320-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.

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

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course.
Being registered for a course counts 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 passing the course, the student shall 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 be able to design computer programs that use time and memory efficiently and thereby can contribute to economically and environmentally sustainable development
- 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, persistent data structures 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

- LAB1 - Laboratory assignments, 4.0 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
- MAS2 - 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

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.

The master's tests are constituted by individual assignments that are reported both in writing and orally

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.