DD2352 Algorithms and Complexity 7.5 credits

Algoritmer 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 spring semester 2023 in accordance with the decision by the head of the school: J-2022-2559.Date of decision: 11/10/2022

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/SF1662/SF1679/SF1688, must take one of these courses in parallel with DD2352.

Specific prerequisites

Knowledge in basic computer science, 6 credits, equivalent to completed course DD1338/DD1320-DD1328/DD2325/ID1020/ID1021.

Knowledge and skills in programming, 6 credits, equivalent to completed course DD1310-DD1319/DD1321/DD1331/DD1337/DD100N/ID1018.

Knowledge in calculus in one variable, 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 should be able to

- develop and implement algorithms and reductions, and analyse them with respect to correctness and efficiency
- compare alternative algorithms considering efficiency
- define and explain central concepts such as P, NP, NP-completeness and undecidability
- compare problems with respect to complexity by means of reductions

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 problems that are unrealistically resource demanding or not possible to solve on a computer.

Course contents

Design principles of algorithms: Divide and conquer, greedy algorithms, dynamic programming. Algorithm analysis. Probabilistic algorithms. Approximation algorithms. Selected applications in sets, graphs, arithmetic and geometry. Implementation of algorithms.

Computability and complexity: Reductions. The complexity classes P (polynomial time), NP (non-deterministic polynomial time), PSPACE (polynomial space) and BPP (probabilistic polynomial time with bounded error). NP completeness and NP hardness reductions. Undecidable problems.

Examination

- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, F
- MAS1 - Test, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- MAS2 - Test, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN1 - Examination, 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.

Labs and mastery tests are examined both orally and in writing. The exam is written.

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.