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

On 04/21/2020, the Head of the EECS School has decided to establish this official course syllabus to apply from the autumn semester 2020, registration number J-2020-0585.

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

Completed courses in all of the following areas:

- Programming equivalent to DD1310/DD1311/DD1312/DD1314/DD1315/DD1316/DD1318/DD1331/DD1337/DD100N/ID1018.
- Computer science equivalent to DD1338/DD1320/DD1321/DD1325/DD1327/ID1020.

- Discrete mathematics equivalent to SF1671/SF1630/SF1662/SF1679.
- Algebra and geometry equivalent to SF1624.
- Calculus in one variable equivalent to 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. This applies only to students who are first-time registered for the prerequisite course offering or have both that and the applied-for course offering in their individual study plan.

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.