DD1352 Algorithms, Data Structures and Complexity 9.0 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

Course syllabus for DD1352 valid from Autumn 2014

Grading scale

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

Education cycle

First cycle

Main field of study

Information Technology,Technology

Specific prerequisites

For single course students: completed upper secondary education including documented proficiency in Swedish corresponding to Swedish B, English corresponding to English A. Furthermore: 15 hp in mathematics and 12 hp in computer science or programming techniques.

Language of instruction

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

Intended learning outcomes

After the course the student should be able to

- develop and implement algorithms with data structures and analyze them with respect to correctness and efficiency,
- compare alternative algorithms and data structures with respect to efficiency and reliability,
- define and translate the concepts P, NP, NP-completeness and undecidability,
- compare problems with respect to complexity using reductions,
- explain how problems of high complexity can be handled

so that they will be able 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

Principles for construction of algorithms: Decomposition, greedy algorithms, dynamic programming, local and total search. Algorithm analysis. Approximation, algorithms and heuristics. Selected applications to sets, graphs, arithmetic, and geometry.

Data structures: Repetition of hash tables and heaps; balanced trees and bloom filters. Use and implementation of data structures.

Computability and complexity: Reduction. Complexity classes P (polynomial time) and NP (non-deterministic polynomial time). NP-complete problems. Undecidable problems. Coping with untractable problems.

Terminology in Swedish and English.

Course literature

Kleinberg-Tardos: Algorithm Design, 2005, Pearson, ISBN978-0321372918 +

Algorithms and Complexity, a supplement to Algorithm Design, Pearson Custom Publishing, ISBN 978-1847764126.

Examination

- LAB1 - Laboratory Assignments, 3.0 credits, grading scale: P, F
- MAS1 - Master's test, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- MAS2 - Master's test, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- TEN2 - 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.

In this course all the regulations of the code of honor at the School of Computer science and Communication apply, se: http://www.kth.se/csc/student/hederskodex.

Other requirements for final grade

Examination (TEN12; 3 university credits).
Laboratory assignments (LAB1; 3 university credits.).
Master's test (MAS1; 1,5 university credits) and (MAS2; 1,5 university credits).

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.