DD1352 Algorithms, Data Structures and Complexity 9.0 credits

Algoritmer, datastrukturer och komplexitet

Course syllabus for DD1352 valid from Spring 10

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

Grading scale: A, B, C, D, E, FX, F
Education cycle: First cycle
Main field of study: Information Technology, Technology

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 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 main content

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.

Language of instruction

Language of instruction is specified in the course offering information in the course and programme directory.

Eligibility

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.

Literature

Kann (editor): Algorithms and Complexity.

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

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.

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).