



# DD1352 Algorithms, Data Structures and Complexity

## 9.0 credits

### Algoritmer, datastrukturer och komplexitet

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Course syllabus for DD1352 valid from Autumn 12

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

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

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).