HI1029 Algorithms and Data Structures 8.0 credits

Algoritmer och datastrukturer

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

Establishment

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Basic skills in programming.

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 students

- will have knowledge in the most common algorithm paradigms and data structures.
- have an idea of the efficiency of algorithms and know different complexity classes
- adapt known algorithms and construct own from given paradigms in the course
- have big practice to solve algorithmic problems

Course contents

Data structures: The modern computer languages already have classes for Array, List, Table, Stack, Queue, Tree, Set and Graph. We study how they are constructed and then build them up again from the ground.

Analysis of algorithms: All solutions to a programming problem do not have the same efficiency. The student practices to decide which technique is the best for a given problem.

Recursion is a technique you must have under control to build more complicated algorithms

Backtracking is an application of recursion. When you try to find out from a labyrinth you can land in an one way street and be forced to go back (backtrack) to the last crossroads.

Greedy algorithms: In a given situation choose the local best alternative and hope that it will give the global best result in the end.

Divide and conquer: To break down a big problem in a many small problems (divide).

The small problems will then be trivial to solve and combined (conquer) to solve the big problem.

Dynamic programming is a general method to solve optimization problems. You solve

parts of the problem only once and store the result in a table. When the same part of the problem comes up again you take the result from the table.

Sorting and searching are important applications, with solutions, often constructed from techniques given above.

Course literature

Koffman and Wolfgang, Data Structures: Abstraction and Design Using Java 2nd Edition, ISBN-13: 978-0470128701

Examination

- TEN1 - Examination, 4.0 credits, grading scale: A, B, C, D, E, FX, F

- LAB1 - Laboratories, 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.

For final grade both written exam (TEN1) and practical work (LABA) must be passed. The final grade is based on TEN1 with scale A, B, C, D, E, FX, F.

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.