

Course syllabus

Algoritmer, datastrukturer och komplexitet

Algorithms, Data Structures and Complexity

EDAF05, 5 credits, G2 (First Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED C/D

Date of Decision: 2023-04-18

General Information

Main field: Technology.

Compulsory for: D2, Pi3

Elective for: C4-pv, E4, F4, F4-pv, I4, L4-gi

Language of instruction: The course will be given in Swedish

Aim

Algorithms and data structures are fundamental in computer science. Data structures are used to model reality and the choice of data structures affects the efficiency of algorithms. One aim with this course is to give the students knowledge of advanced data structures for some of the abstract models included in previous courses and also of a number of data structures used to represent further models, such as graphs. Another aim is to give improved knowledge of algorithms, particularly graph algorithms. The course will also give the students knowledge of techniques for analysing algorithms with respect to performance.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to describe data structures which can be used to represent graphs
- be able to describe a number of different problem solving strategies, such as divide and conquer and greedy algorithms

- master a number of techniques for analysing algorithm performance
- be familiar with concepts such as lower bounds, complexity classes and undecidable problems

Competences and skills

For a passing grade the student must

- from a given problem, be able to identify algorithms and data structures which can be used to implement a solution
- be able to implement the data structures included in the course in an object-oriented language
- be able to apply different problem solving strategies on new problems
- be able to apply techniques for analysing the time complexity of algorithms and be able to use the notations for asymptotic time complexity

Judgement and approach

For a passing grade the student must

- be able to evaluate proposed solutions and data representations for given problems with respect to suitability and efficiency
- understand that there are problems for which it is unknown whether or not efficient algorithms exist

Contents

Graphs and graph algorithms. Data structures for graphs. Problem solving strategies such as divide and conquer, greedy algorithms and brute force. Techniques for analysing the time complexity of algorithms. Introduction to the complexity classes P and NP, computability and the Church-Turing thesis.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: To pass the course it is required to pass the compulsory course items and to pass the oral exam. The final grade of the course is based on the result of the oral exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Parts

Code: 0122. **Name:** Examination.

Credits: 3. **Grading scale:** TH. **Assessment:** Approved examination **Contents:** Oral examination

Code: 0222. **Name:** Compulsory Course Items.

Credits: 2. **Grading scale:** UG. **Assessment:** Approved compulsory course items **Contents:** Laboratory work and a hand-in assignment.

Admission

Admission requirements:

- Completed the compulsory course items from EDAA01 or passed the written exam in this course
- EDA011 Programming, First Course or EDA016 Programming, First Course or EDA017 Programming, First Course or EDA501 Programming, First Course or EDAA01 Programming - Second Course or EDAA20 Programming and Databases or EDAA45 Introduction to Programming or EDAA50 Programming, First Course or EDAA55 Programming, First Course or EDAA65 Programming, First Course

The number of participants is limited to: No
The course overlaps following course/s: EDA027, EDA690

Reading list

- Jonas Skeppstedt: Algorithms: a concise introduction. Amazon, 2020, ISBN: 9781723831362.

Contact and other information

Examinator: Jonas Skeppstedt, jonas.skeppstedt@cs.lth.se
Course homepage: <http://cs.lth.se/edaf05>