DD2373 Automata and Languages 7.5 credits

Automater och språk

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

Establishment

The official course syllabus is valid from the spring semester 2024 in accordance with the decision by the head of the school: J-2023-1556.Date of decision: 07/06/2023

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

Knowledge in algorithmic complexity, 6 higher education credits, equivalent to completed course DD2350/DD2352.

Knowledge in discrete mathematics, 6 higher education credits, equivalent to completed course SF1688/SF1610/SF1630/SF1662/SF1679.

Course from Upper Secondary School equivalent to the Swedish upper secondary course English B/6.

Language of instruction

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

Intended learning outcomes

After passing the course, the student shall be able to

1) give an account of the main classes of automata and structural representations (regular expression and grammars) and the equivalent language classes, and design an automaton or a grammar from an informal language description

2) relate the different classes by means of language-preserving transformations, apply the transformations to solve concrete problems and apply the transformations on concrete examples

3) for each language class, explain the main characterisation theorems, apply the theorems to solve concrete problems and explain simple theorems on concrete examples.

For higher grades, the student should also be able to

• define new language-preserving transformations [C] and show that the transformations are language-preserving [A]

• for each language class, explain more difficult theorems on concrete examples [C] and apply the theorems to prove different language properties [A].

Course contents

Part I. Finite automata and regular languages: determinisation, model checking, regular expressions, state minimization, the pumping lemma, Myhill-Nerode Theorem, regular inference.

Part II. Pushdown automata and context free languages: context-free grammars and languages, parsing, Chomsky-Schützenberger Theorem, modelling the behaviour of programs with recursion, the pumping lemma, pushdown automata.

Part III. Turing machines and efficient computability: Turing machines, recursive sets, universal Turing machines, decidable and undecidable problems, Rice's theorems, other models for effective computability.

Examination

• HEM1 - Home assignments, 2.5 credits, grading scale: P, F

• LAB1 - Laboratory work, 2.5 credits, grading scale: P, F

• TEN1 - Home exam, 2.5 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.

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.