DD2372 Automata and Languages 6.0 credits

Automater och språk

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

Establishment

Grading scale

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

Education cycle

Second cycle

Main field of study

Computer Science and Engineering

Specific prerequisites

Language of instruction

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

Intended learning outcomes

The overall aim of the course is to provide students with a profound understanding of computation and effective computability through the abstract notion of automata and the language classes they recognize. Along with this, the students will get acquainted with the important notions of state, nondeterminism and minimization.

After the course, the students will be able to:

1) Account for the main classes of automata and structural representations (regular expressions and grammars) and the corresponding language classes: Construct an automaton or a grammar from an informal language description [for grade E].

2) Relate the various classes by means of language-preserving transformations; apply the transformations for solving concrete problems: Apply the transformations on concrete examples [E], define new transformations [C], prove the transformations to be language-preserving [A].

3) For each language class, explain the main characterisation theorems; apply the theorems for solving concrete problems: Explain the easier theorems on concrete examples [E], explain the more difficult theorems on concrete examples [C], apply the theorems to prove various language properties [A].

Course contents

Part I. Finite Automata and Regular Languages: determinisation, model checking, regular expressions, state minimization, proving non-regularity with 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, proving non-context-freeness with the pumping lemma, pushdown automata.

Part III. Turing Machines and Effective Computability: Turing machines, recursive sets, universal Turning machines, decidable and undecidable problems, Rice's theorem, other models of effective computability.

Course literature

Hopcroft, Motwani and Ullman "Introduction to Automata theory, Languages and Computation", 3rd Edition, Addison-Wesley, 2007, ISBN: 0-321-47617-4.

Examination

- HEMA - Exercises, 2.5 credits, grading scale: P, F
- TENA - Examination, 1.5 credits, grading scale: A, B, C, D, E, FX, F
- LABA - Laboratory work, 2.0 credits, grading scale: P, 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.

In this course all the regulations of the code of honor at the School of Computer science and Communication apply, see: https://www.kth.se/en/csc/utbildning/hederskodex/.

Other requirements for final grade

Laboratory work (LAB1), home assignments including workshop (HEMA), and examination (TENA).

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.