DD2371 Theory of Automata 6.0 credits

Automatteori

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

Establishment

Course syllabus for DD2371 valid from Spring 2009

Grading scale

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

Education cycle

Second cycle

Main field of study

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 successful student will be able to perform the following constructions:

1. Determinize and minimize automata;

2. Construct an automaton for a given regular expression;

3. Construct a pushdown automaton for a given context-free language;

4. Construct a Turing machine deciding a given problem,

5. Prove whether a language is or isn't regular or context-free by using the Pumping Lemma;

6. Prove that a given context-free grammar generates a given context-free language;

7. Prove undecidability of a given problem by reducing from a known undecidable problem,

8. Apply the fundamental theorems of the course: Myhill-Nerode, Chomsky-Schützenberger, and Rice's theorems.

For passing the course, a student has to be proficient at problems of type 1-5; for the highest grade he/she has to be equally proficient at the remaining types of problems.

Course contents

- Part I. Finite Automata and Regular Languages: determinisation, regular expressions, state minimization, proving non-regularity with the pumping lemma, Myhill-Nerode relations.
- Part II. Pushdown Automata and Context-Free Languages: context-free grammars and languages, normal forms, 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, reduction, other models of computability.

Course literature

Dexter Kozen: Automata and Computability, Springer, 1997.

Examination

- TEN1 - Examination, 6.0 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.

Other requirements for final grade

Examination (TEN1; 6 university credits).

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.