DD1351 Logic for Computer Scientists 7.5 credits

Logik för dataloger

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

Establishment

On 04/21/2020, the Head of the EECS School has decided to establish this official course syllabus to apply from the autumn semester 2020, registration number J-2020-0868.

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Completed course in programming equivalent to DD1310/DD1311/DD1312/DD1314/DD1315/DD1316/DD1318/DD1331/DD1337/DD100N/ID1018 and discrete mathematics equivalent to SF1671/SF1630/SF1662/SF1679.

Active participation in a course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course. This applies only to students who are first-time registered for the prerequisite course offering or have both that and the applied-for course offering in their individual study plan.

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 students should be able to:

- specify general properties of mathematical-computational structures and prove these by means of natural deduction in propositional logic and predicate logic,
- specify inductive definitions of data structures and prove these with structural induction,
- specify and prove system properties by means of temporal logic,
- specify and prove program properties by means of Hoare logic,
- apply methods for automatic deduction and carry out simple proofs with model checking,
- apply and explain basic concepts in logic programming: unification, backtracking, intersection, negation and different programming techniques such as generate-test

in order to

- master the proof techniques that are needed in future courses in the education.

For higher grades, the student should furthermore be able to:

- argue for the correctness of a certain proof technique: soundness and completeness,
- argue for the suitability of proof techniques to automatic deduction: decidability.

Course contents

A. Propositional logic

- Informal mathematical argumentation
- Formal proof techniques: natural deduction
- Syntax and semantics
- Soundness, completeness and decidability

B. Predicate logic

- Syntax and semantics, Kripke structures
- Proof techniques: natural deduction
- Soundness, completeness and undecidability, GÃ¶del's theorems

C. Prolog

- Resolution and logic programming: unification, backtracking, negation, intersection and box diagrams

D. Inductive proof

- Mathematical and complete induction
- Inductive definitions and structural induction

E. Temporal logic

- Syntax and semantics
- Proof techniques: model checking

F. Hoare logic

- Program semantics and specification
- Program verification
- Syntax and semantics: Kripke structures
- Proof techniques: model checking

Examination

- LAB2 - Laboratory work, 2.0 credits, grading scale: P, F

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

- LAB1 - Laboratory work, 1.5 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.

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.