DD1350 Logic for Computer Science 6.0 credits

Logik för dataloger

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

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

Course syllabus for DD1350 valid from Autumn 2009

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

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 expose the students to mathematical logic and its use within theoretical computer science. The main focus of the course is on mastering the various proof techniques needed in other courses later in the curriculum.

After the course, the successful student will be able to:
- express informal statements in propositional and first-order predicate logic,
- argue for the correctness of a given proof calculus by relating appropriately its syntax and semantics,
- apply natural deduction for proving statements in first-order predicate logic,
- axiomatize abstract data types,
- perform proofs by well-founded and structural induction,
- perform proofs by co-induction,
- perform simple verifications based on temporal logic.

Course contents

A. Propositional logic
- Syntax and semantics
- Informal mathematical argumentation
- Application: Paradoxes and problem solving
- Boolean algebra
- Formal proof methods: Natural deduction, resolution
- Soundness, completeness and decidability

B. Predicate logic
- Syntax and semantics
- Proof methods: Natural deductio
- Completeness and decidability: Gödel's theorems
- Application: Program verification

C. First order theories
- Theories and axiomatisation
- Application: Algebraic data types

D. Proof by induction
- Well-founded induction
- Inductive definitions and structural induction
- Co-induction

E. Modal and temporal logic
- Syntax and semantics: Kripke structures
- Proof methods: Model checking
- Application: Parallel processes

Disposition

Lecutres: 30 h
Tutorials: 14 h
Laboratory assignments: 8 h

Specific prerequisites

For single course students: completed upper secondary education including documented proficiency in Swedish corresponding to Swedish B, English corresponding to English A. Furthermore: 7,5 hp in mathematics and 6 hp in computer science or programming technics.

Course literature

The course literature is announced at least 4 weeks before the course starts at course web page.

Examination

- LAB1 - Laboratory work, 2.0 credits, grading scale: P, F
- TEN1 - Examination, 4.0 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.

Lab assignment 1: Resolution and logic programming Lab assignment 2: Implementation of database query systems

Other requirements for final grade

Laboratory assignments (LAB1; 2 cr)
Examination (TEN1; 4 cr)

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.