DD1351 Logic for Computer Scientists 7.5 credits

Logik för dataloger

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

Establishment

The official course syllabus is valid from autumn semester 2025 according to the decision of Director of First and Second Cycle Education: HS-2025-0536. Date of decision: 2025-03-14

Grading scale

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

Education cycle

First cycle

Main field of study

Technology

Specific prerequisites

Knowledge and skills in programming, 6 credits, equivalent to completed course DD1337/DD1310-DD 1319/DD1321/DD1331/DD1333/DD100N/ID1018.

Knowledge in discrete mathematics, 3 credits, equivalent to completed course SF1671/SF1610/SF1630/SF1662/SF1679.

Active participation in a second-cycle course offering where the final examination is not yet reported in LADOK is considered equivalent to completion of the course.
Being registered for a course counts as active participation.

The term 'final examination' encompasses both the regular examination and the first re-examination.

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 should be able to:

- use logic to express formal properties of data structures, algorithms and computer systems
- use the Prolog logic programming language
- conduct proofs to derive conclusions from given premises
- use different proof techniques, such as natural deduction, induction, Hoare logic for programme verification and temporal logic for system verification
- formulate logical formulae to give a precise mathematical (model-theoretic) meaning to various mathematical and computer science statements
- discuss important properties of evidence systems, such as soundness, completeness and decidability
- justify and apply methods of automatic deduction such as performing simple proofs with model checking

in order to

- master the proof techniques that are needed in future courses in the education
- obtain a broader perspective on programming.

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, Gödel'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
- HEM1 - Homework and quizzes, 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.