2004-02-27

TILLÄMPAD LOGIK DV1 (4p) – Applied Logic

The course aims to present algorithmic and proof-theoretic methods of logic and show how they are applied in contemporary computer science.

Contents

Constructive logic and type theory: Lambda calculus and functional programming. Algorithmic interpretation of logical connectives. Intuitionistic logic. Martin-Löf type theory. Program extraction from proofs. Integrated program logics. Other methods of program verification.

Proof theory and automatic theorem proving: Proof search in the tableaux calculus. The completeness theorem and termination of proof search. Systems for automated theorem proving. The resolution method.

Decidable and undecidable axiom systems. Complete theories. Quantifier elimination. Algorithms for propositional logic. Binary decision diagrams. Modal logics. Possible worlds semantics. Computational Tree Logic. Model checking. Reasoning about knowledge in multiagent systems.

Literature

M R A Huth and M F Ryan. *Logic in Computer Science: Modelling and reasoning about systems.* Cambridge University Press 2000.

R M Smullyan. *First-Order Logic.* Dover Publishing 1995.

E Palmgren. *Constructive Logic and Type Theory.* Lecture notes 2004, 35 to 45 pages.

Level and prerequisites. The course is at C-level in mathematics. Prerequisites are 40 course points in mathematics and/or theoretical computer science, including a basic logic course such as Logik och bevisteknik DV1, or Logik MN1, and a basic course in discrete mathematics. Knowledge of a functional programming language (ML, Haskell or LISP) is helpful. The course may be studied as a complement to Logik MN2.

Course start and examination. March 22, 8.15 – 10.00, in room 1311 MIC, Polacksbacken, Uppsala. Written exam on May 26. Obligatory exercises may be assigned during the course.

Instructors. Professor Erik Palmgren, tel. 018-471 32 85, e-post: palmgren@math.uu.se. Course assistant: Fredrik Dahlgren.
Webpage of the course: www.math.uu.se/~palmgren/tillog .

Kursansvarig institution: Matematiska institutionen.