FIK3620 Types, Semantics, and Programming Languages 7.5 credits

Typer, semantik och programmeringsspråk

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 FIK3620 valid from Spring 2016

Grading scale

Education cycle

Third cycle

Specific prerequisites

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

After the course, the student will be able to
- Construct type soundness proofs
- Analyze type rules
- Analyze small-step and big-step operational semantics
- Implement an interpreter and a type checker for a typed functional language
- Apply untyped and simply typed lambda calculus with extensions

Course contents

The course is divided into three separate modules, each covering different aspects on types, semantics, and programming language theory:
1. Operational semantics and the lambda calculus
   - Small-step and big-step operational semantics
   - Untyped lambda calculus
   - Fundamental typed functional programming
2. Typed lambda calculus with extensions
   - Type rules
   - Type soundness proofs
   - Semantics for let bindings, pairs, tuples, records, sums, and lists
   - References and exceptions
3. Subtyping and Polymorphism
   - Subtype polymorphism
   - Parametric polymorphism
   - Ad-hoc polymorphism
   - Structural and nominal type systems
   - Gradual typing

Disposition

The course consists of a number of seminars. During these seminars, the students present solutions to exercises and problems. Students will solve both theoretical problems and implement a working interpreter and type checker for a functional programming language.

Course literature

- Benjamin C. Pierce, "Types and Programming Languages", The MIT Press, 2002
- Selected research articles

Equipment

Each student needs a laptop of their own.

Examination

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.

See "Requirements for final grade" below.

Other requirements for final grade

The student receives grade P if the following is fulfilled:
1. Active participation in seminars
2. Approved oral presentations at the seminars
3. Approved solutions to theoretical exercises
4. Approved submission and presentation of a software implementation
If the student cannot participate in a seminar, the student can do complementary work at another occasion.

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.