DEPARTMENT OF PHILOSOPHY, LINGUISTICS AND THEORY OF SCIENCE

LOG110 Logical theory, 15 credits

Logisk teori, 15 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Philosophy, Linguistics and Theory of Science on 2016-03-16 to be valid from 2016-08-29, autumn semester of 2016.

Field of education: Science 100%

Department: Department of Philosophy, Linguistics and Theory of Science

Position in the educational system

The course is included in the degree programme Logic, Master's programme, 120 credits (H2LOG) and can also be offered as a freestanding course or contract education.

The course can be part of the following programme: 1) Logic, Master's Programme (H2LOG)

Main field of studies	*Specialization*
Logic	A1N, Second cycle, has only first-cycle course/s as entry requirements

Entry requirements

For admission to the course, a Degree of Bachelor, or equivalent, in either philosophy, mathematics, linguistics, or computer science (or an equivalent subject) is required.

Learning outcomes

On successful completion of the course the student will be able to:

Knowledge and understanding

- describe and demonstrate an understanding of basic model theory and proof theory including completeness theorems, for propositional logic, first-order logic,

intuitionistic logic, and second-order logic.
- describe the relationship between intuitionistic and classical logic from both a model theoretic and proof theoretic perspective.
- describe the relationship between second-order logic, first-order logic, and propositional logic.
- describe and discuss Gödel's first and second incompleteness results as well as Gödel-Rosser's theorem.

Competence and skills
- formulate and present proofs of the most important results in the course including completeness, incompleteness and normalisation theorems, as well as of lemmas used in the proofs.
- apply methods and results of the course in independent problem-solving.

Judgement and approach
- critically discuss, analyse and evaluate the results in the course as well as their applications.

Course content
The course starts with a comprehensive presentation of syntax, semantics and proof systems for propositional logic; and continues with classical first-order predicate logic. Detailed proofs of the completeness theorems for both propositional and predicate logic are included.

Basic results, such as the compactness theorem and Löwenheim-Skolem's theorem, together with more advanced results and concepts, for example, model completeness, form the model theoretical part of the course.

As examples of other logics, second-order and intuitionistic logic are presented together with completeness results.

Basic proof theory is introduced and lead up to a proof of normalisation for natural deduction, both for classical and intuitionistic logic.

Gödel's incompleteness theorems and basic recursion theory are also included.

Form of teaching
Teaching is given in the form of lectures, seminars, exercises and individual assignment or group assignments. Compulsory attendance can apply to certain course components, which is indicated in the course schedule.

Language of instruction: English

Assessment

The course is assessed individually in written form. In addition to written examinations, there may also be compulsory homework assignments during the course.

If a student, who has failed the same examined course component twice, wishes to change examiner before the next examination, a written application shall be sent to the department responsible for the course and shall be granted unless there are special reasons to the contrary (Chapter 6, Section 22, Higher Education Ordinance).

In cases where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed access to at least three examination sessions (including the regular examination) during a period of at least one year from the last time the course was given.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).
For the grade Pass with distinction (VG) on the whole course, Pass with distinction is required on a minimum of 7.5 credits of the course and the grade Pass on the rest.

Course evaluation

The programme coordinator is responsible, in collaboration with the course coordinators, for systematically and regularly acquiring and compiling the students' evaluation of the course. Conclusions, and any actions taken, are presented to the students who carried out the evaluation, and are made available for students starting the course.