



DEPARTMENT OF PHILOSOPHY, LINGUISTICS AND THEORY OF SCIENCE

LOG221 Proof theory, 7.5 credits

Bevisteori, 7,5 högskolepoäng

Second Cycle

Confirmation

This course syllabus was confirmed by Department of Philosophy, Linguistics and Theory of Science on 2020-01-13 and was last revised on 2022-12-22 to be valid from 2023-01-16, spring semester of 2023.

Field of education: Science 100%

Department: Department of Philosophy, Linguistics and Theory of Science

Position in the educational system

The course can be part of the following programme: 1) Logic, Master's (120 credits) programme (H2LOG) and 2) Computer Science, Master's Programme (N2COS) and can also be given as a freestanding course.

Main field of studies

Logic

Specialization

A1F, Second cycle, has second-cycle course/s as entry requirements

Entry requirements

For admission to the course successful completion of at least 7.5 credits of Logical theory (LOG111) or Logic in Computer Science (DAT060 or DIT201), or the equivalent, is required. English 6 or equivalent is also required.

Learning outcomes

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

Knowledge and understanding

- describe central concepts, methods and constructions in proof theory,

- contrast proof theory with other disciplines in logic,
- describe the relationship between the logical calculi natural deduction, Hilbert systems and sequent calculus,
- demonstrate knowledge of proof theoretic semantics,

Competence and skills

- formulate and present proofs of the most important results in the course - elimination, Herbrand's Theorem, interpolation - as well as of lemmas that are used in the proofs,
- carry out advanced derivations in the formal proof systems that are introduced in the course,
- apply results and techniques of proof theory to other disciplines,

Judgement and approach

- critically discuss, analyse and evaluate results in the course as well as their applications,
- show awareness of the relationships between on the one hand proof theory and constructive mathematics, and on the other hand proof theory and semantics.

Course content

The course treats derivations and proofs as mathematical objects, and study these from a formal, syntactic point of view, unlike model theory that can be said to be the semantic theory of the corresponding phenomena.

Among the many proof formalisms that have been constructed, studied and implemented we focus on two central classes of systems: natural deduction and sequent calculus. The most fundamental theorems, whose proofs are implemented in detail are cut elimination and normalisation for propositional logic and predicate logic, but also for stronger systems, such as formalised arithmetic.

Philosophical and linguistic aspects of proof theory, as its connection with semantics and anti-realism, will also be addressed.

Form of teaching

Teaching is given in the form of lectures, seminars, exercises, individual assignments and group assignments.

Language of instruction: English

Assessment

The course is assessed individually through a written essay or project report, and oral presentation. In addition, there may also be compulsory home work assignments during

the course. Marking teacher may request supplementation of the examined student performance.

When a student, who has failed the same examined 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 of Higher Education Ordinance).

If a student has received a recommendation from the University of Gothenburg regarding pedagogical support for students with disabilities, the examiner may decide, in the case where this is compatible with the learning outcomes for the course, and provided no unreasonable resources are required, to give the student an adjusted examination or an alternative form of examination.

In the case where a course has been discontinued or has undergone major changes, the student shall normally be guaranteed at least three examination sessions (including the regular examination session) during a period of at least one year on the basis of the course's former structure.

Grades

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

Course evaluation

Students who are currently taking the course or have completed it will be given the opportunity to express their views and share their experiences in an anonymous course evaluation. A compilation of the course evaluation and the course coordinator's reflections on it will be made available to the students within reasonable time after the end of the course. The next time the course is taught the compilation and any measures based on it will be presented to the students.

Additional information

The course requires access to a computer (or the equivalent) with Internet connection.

The course may not be included in a degree together with the course LOG220.