



## DEPARTMENT OF PHILOSOPHY, LINGUISTICS AND THEORY OF SCIENCE

### **LOG211 Model theory, 7.5 credits**

Modellteori, 7,5 högskolepoäng

*Second Cycle*

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#### **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**

Admission to the course requires successful completion of

- at least 7.5 credits of Logical theory (LOG111) or Logic in Computer Science (DAT060 or DIT201), and of
- Set theory (LOG121),

or the equivalent.

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 and demonstrate an understanding of central concepts, methods and constructions in model theory,
- contrast model theory with other disciplines in logic,
- describe the relationship between the expressive power of logical languages and their ability to characterise structures,

*Competence and skills*

- formulate and present proofs of the most important results in the course as well as of lemmas that are used in the proofs,

*Judgement and approach*

- critically discuss, analyse and evaluate results in the course as well as their applications,
- demonstrate the ability to work over disciplinary borders and apply model theoretic results in for example mathematics and computer science.

**Course content**

Model theory is the study of first-order structures on the basis of the relationship with logical languages. Sometimes, model theory is described as the sum of universal algebra and logic. Questions that are studied concern, among other things, the expressive power of logical languages in terms of the ability to classify structures, and what sort of models can be constructed. The course also brings up two alternative ways to characterise first-order logic, one characterisation uses game theoretic concepts and the other characterise first-order logic in terms of model theoretic properties, Lindström's characterisation.

The course covers central results and concepts in model theory, including:

- Elementary extensions and the Tarski-Vaughts test
- Quantifier elimination
- Compactness and omitting types
- Back-and-forth equivalence and games for elementary equivalence
- omega-categoricity and the random graph
- Saturated models
- Lindström's categorisation of first-order logic

**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 in written form. In addition to the final written examination, there may also be compulsory home work assignments during the course.

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 LOG210.