



## FACULTY BOARD OF HUMANITIES

### Logic, Master's Programme, 120 credits

Logik, masterprogram, 120 högskolepoäng

Programme code: H2LOG

*Second cycle / Avancerad nivå*

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#### 1. Confirmation

This programme syllabus was confirmed by the Faculty Board of Humanities on 09-09-2015 (G 2015/234) and was last revised on 31-08-2020 (GU 2020/2106) by the Dean of the Faculty to be valid from 25-08-2021, Autumn semester 2021.

*Responsible Department/equivalent:* Department of Philosophy, Linguistics and Theory of Science

#### 2. Purpose

The purpose of the Master's Programme in Logic is to provide a new generation of students with thorough theoretical knowledge, and the ability to apply it, within a central intellectual field, which gets its theoretical interest and practical value from a unique combination of humanities, mathematics and information science. For the Faculty of Arts this is a commitment to promote and further develop the field of *mathematical humanities*.

The main goal is that students, after successful completion of the programme, will have a coherent training and thorough understanding of the theoretical fundamentals of the subject of logic itself, its general role in the sciences and humanities, as well as its applications in fields like philosophy, linguistics, mathematics and computer science. Students will be well prepared for a career of research and development in logic and its applications, both in academia and industry.

The programme starts with a number of core courses, common for all students, which provide a solid foundation in the fundamentals of theoretical logic and its applications, and then follow elective courses, tailored to the background, interests and career plans for individual students.

The pedagogical basis of the programme is: (i) the interdisciplinarity of the subject; (ii) the varying backgrounds of the students; (iii) a personal mentor for every student and a personalized curriculum; (iv) intense collaborative work, crossing traditional academic subject boundaries; (v) using practical exercises as a means of theoretical understanding; (vi) usage of modern, technology-supported, instruction methods, promoting student activity and fostering independent work; (vii) a pronounced and firm connection to ongoing research activities.

### 3. Entry requirements

Admission to the programme requires, besides fulfilling basic entry requirements, successful completion of

- at least 60 credits in total in the subject areas mathematics, logic, computer science or formal linguistics, or
- at least 90 credits in philosophy or linguistics, and additionally, or as part of the 90 credits, at least 30 credits in total in the subject areas mathematics, logic, computer science or formal linguistics,

or equivalent knowledge.

Applicants must prove their knowledge of English: English 6 / English B from Swedish Upper Secondary School or the equivalent level of an internationally recognized test, for example TOEFL, IELTS.

Selection procedure and criteria are regulated elsewhere.

### 4. Higher education qualification and main field of study

This programme leads to a Degree of Master of Arts (120 credits) with a major in Logic (Filosofie masterexamen med huvudområdet Logik).

### 5. Outcomes

#### General outcomes for Degree of Master (120 credits)

##### *Knowledge and understanding*

For a Degree of Master (120 credits) the student shall

- demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

##### *Competence and skills*

For a Degree of Master (120 credits) the student shall

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
- demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

***Judgement and approach***

For a Degree of Master (120 credits) the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

**Local outcomes**

After completion of the programme, the graduate is expected to be able to:

***Knowledge and understanding***

- [P1] demonstrate knowledge and understanding of the core subjects within the field of logic, their interrelations, and the relation between logic and neighbouring academic fields and current research and development,
- [P2] demonstrate deeper knowledge of central concepts, methods, questions and theories in the field of logic and its applications in philosophy, linguistics, computer science and mathematics,
- [P3] demonstrate deeper and specialized knowledge in at least one sub-field of logic, and its applications,

***Competence and skills***

- [P4] demonstrate the ability to critically discuss, analyze, and evaluate results and questions in logic and its applications, based on awareness of the research tradition of the field,
- [P5] demonstrate the ability to critically, independently and creatively identify and formulate research questions, to plan and, using adequate methods, undertake advanced tasks within predetermined time frames and thus contribute to the formation of knowledge as well as the ability to evaluate this work,
- [P6] demonstrate the ability in speech and writing, both nationally and internationally, to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences,
- [P7] demonstrate the skills required to apply methods of logic to new fields,
- [P8] demonstrate the skills required for participation in research and development work or independent work in some other qualified capacity,
- [P9] demonstrate the skills required for work in multi-disciplinary groups,

***Judgement and approach***

- [P10] demonstrate awareness of how the field of logic relates to the general development of scientific knowledge, its limitations and its role in society, and also to demonstrate awareness of ethical aspects of research and development work,

- [P11] demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning, and
- [P12] demonstrate the ability to, unrestricted by traditional academic subject boundaries, move between the different fields related to logic.

## 6. Content and structure

The first semester consists of a 15 credit course on Fundamental Logical Theory, that runs for the whole semester. In parallel with this, there is a 7.5 credit course on Set Theory and a 7.5 credit course on Modal Logic. A seminar series, Colloquium in Logic, on applications of logic, methodology and history of logic will run through both years (examined during the third semester), which is an opportunity for interaction between students in different years of the programme. The students will also be invited, and encouraged, to attend the research seminar in logic.

The second semester starts with two obligatory 7.5 credit courses in parallel: Model Theory and Proof Theory. Thereafter comes the first opportunity for individual specialization through two elective courses (see list of options below). These can be individual reading courses, courses at partner departments or regular classes at the department, given by regular faculty or visiting researchers. Courses are chosen by the student in consultation with his or her individual mentor, to ensure that they are well suited to the student's background, plans for the master thesis, and further career plans. For "individual reading courses", students are encouraged to work together in groups which focus on a common sub-field. This is to enhance the learning opportunities.

The third semester consists of, over and above the obligatory colloquium course, three elective courses (see list below), and is devoted to further specialization, but also complementary courses, all to build a personal competence profile. The choice of courses should be guided by whether the student aims for an academic career with postgraduate studies, or plan for a more "applied" career.

The fourth semester is devoted to the 30 credit master thesis work. Match-making between potential supervisors, students and project proposals is done towards the end of the third semester, to enable immediate start with the thesis work the last semester.

Elective courses within the main area of logic:

- Recursion theory
- Category theory
- Formal theories of truth
- Games and decisions
- History of logic
- Philosophy of mathematics
- Philosophy of logic
- Automata theory and mathematical linguistics
- Knowledge representation and inference
- Logic for web technologies
- Models of arithmetic
- Advanced set theory
- Advanced philosophical logic

Elective courses within other areas at the department:

- Programming for Natural Language Processing (within the MLT programme)
- Formal semantics (within Linguistics)
- Computational semantics (within the MLT programme)
- Philosophy of language (at the second cycle in theoretical philosophy)

Elective courses at other departments may include:

- Topology (Mathematical Sciences)
- Algebraic structures (Mathematical Sciences)
- Functional programming (Computer Science and Engineering)
- Types for programs and proofs (Computer Science and Engineering)
- Artificial intelligence (Computer Science and Engineering)

There are no obligatory placement periods, but when appropriate, work with the master thesis project can be placed at a company or with a research group outside the department. In such cases there is always a placement supervisor from the department who ensures that the work follows goals and regulations from the university.

## 7. Guaranteed admission

A student admitted to the programme, and who follows the programme at the prescribed pace of study, is subject to limited guaranteed admission. Guaranteed admission is in place for all obligatory courses. Later semesters, the student is guaranteed an appropriate number of elective courses, though not necessarily admission to his or her first choices.

## 8. Other information

Teaching in the programme is in English.

Course evaluations involving students are done for every course, and are used in continuous development of the programme. Each semester there is a follow-up in cooperation with the director of studies and student representatives. Overall quality assurance, and development of courses and the programme as a whole, is discussed by all involved teachers at a yearly programme conference, with participation by the international advisory board.