

# General syllabus for third-cycle studies in mathematics

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**Scope:** 240 higher education credits

**The Degree:** Degree of Doctor

**Study level:** Third-cycle

**Established by:** Programme syllabus established by the Faculty of Science and Technology Board on 11/08/2009, revised on 20/03/2014

**Enters into force:** 11/08/2009

**Responsible body:** Faculty of Science and Technology

### 1. Learning outcomes

#### *Learning outcomes for the degree in question*

(Higher Education Ordinance, Chapter 6, Sections 4 and 5)

#### **Knowledge and understanding**

For the degree of Doctor of Philosophy the third-cycle student shall

- demonstrate broad knowledge and systematic understanding of the research field as well as advanced and up-to-date specialised knowledge in a limited area of this field, and
- demonstrate familiarity with research methodology in general and the methods of the specific field of research in particular.

#### **Competence and skills**

For the degree of Doctor of Philosophy the third-cycle student shall

- demonstrate the capacity for scholarly analysis and synthesis as well to review and assess new and complex phenomena, issues and situations autonomously and critically
- demonstrate the ability to identify and formulate issues with scholarly precision critically, autonomously and creatively, and to plan and use appropriate methods to undertake research and other qualified tasks within predetermined time frames and to review and evaluate such work

- demonstrate through a dissertation the ability to make significant contribution to the formation of knowledge through his or her own research
- demonstrate the ability in both national and international contexts to present and discuss research and research findings authoritatively in speech and writing and in dialogue with the academic community and in society in general
- demonstrate the ability to identify the need for further knowledge and
- demonstrate the capacity to contribute to social development and support the learning of others both through research and education and in some other qualified professional capacity.

### **Judgement and approach**

For the degree of Doctor of Philosophy the third-cycle student shall

- demonstrate intellectual autonomy and disciplinary rectitude as well as the ability to make assessments of research ethics, and
- demonstrate specialised insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how this is used.

### ***Local learning outcomes for the degree in question***

### **Competence and skills**

To be awarded the degree of doctor the student shall

- demonstrate their ability in verbal and written presentations in English, and their ability to discuss research and research results in English.
- demonstrate the ability to conduct mathematical research projects.
- demonstrate the ability to analyse and solve mathematical research problems.

### **Judgement and approach**

To be awarded the degree of doctor the student shall

- demonstrate in-depth insight regarding the possibilities presented by the field of mathematics and the limitations, especially in relation to applications and contacts with other subject areas.

## **2. Entry requirements and prior knowledge required**

### ***General entry requirements***

To be admitted for studies at third-cycle level the applicant is required to have completed a second-cycle level degree, or completed course requirements of at least 240 credits, of which at least 60 credits are at second-cycle level, or have an equivalent education from abroad, or equivalent qualifications.

### ***Specific entry requirements***

To fulfil the specific entry requirements to be admitted for studies at third-cycle level in mathematics, the applicant is required to have completed at least 60 credits within the field of mathematics, of which at least 15 credits shall have been acquired at second-cycle level. Applicants who in some other system either within Sweden or abroad have acquired largely equivalent skills are also eligible.

## **3. Selection process**

### ***Selection process***

The selection among those applicants who meet the entry requirements will be conducted with reference to their ability to successfully perform third-cycle studies, and is based on the following assessment grounds:

- personal suitability
- previous study results and
- other merits

However, applicants must not be given preference over other applicants in the selection process solely based on the assessment that the applicant can receive accreditation for previous education or professional activities. (Higher Education Ordinance, Chapter 7, Section 41)

Decisions regarding admissions to studies at third-cycle level concluding in a doctoral degree are made in accordance with Umeå University's delegation of authority.

## **4. Contents and scheduling**

### ***4.1 General***

An individual study plan is to be established for each doctoral student which shall give details of financing, supervision, courses, thesis-related work, etc. For a degree of doctor to be awarded, the studies shall entail 240 credits. A doctoral student who is admitted for third-cycle studies that are to conclude with a doctoral degree can, if he/she so wishes, study for a licentiate degree as an intermediate goal.

Studies at third-cycle level that are to be concluded with a doctoral degree shall comprise a net study period of four years and consist of a course component of 100-120 credits and a doctoral thesis of 120-140 credits.

## **4.2 Contents**

### *4.2.1 Courses*

Third-cycle studies in mathematics that are to be concluded with a doctoral degree consist of a course component of 100-120 credits which is divided up so that mandatory courses constitute 17.5 credits, and the remainder of the credits are comprised of elective courses. All courses are to be relevant to the third-cycle study programme and adapted to the individual needs and interests of the student.

Mandatory courses for the doctoral degree:

Seminars and research presentation, 7.5 credits.

Courses that develop general skills amounting to 10 credits. 8 of these credits are to consist of courses within philosophy of science, ethics and conduct, oral presentation and a written presentation.

Elective courses for doctoral degrees:

Courses relevant to the third-cycle study programme comprising at least 82.5 credits. Of these, at least 60 credits shall have been acquired at second or third-cycle level within mathematical subject areas, including a general educative section comprising courses in mathematical analysis, algebra/discrete mathematics and geometry/topology.

### *4.2.2 Doctoral thesis*

The doctoral thesis may either take the form of a single coherent work (a monograph) or a compilation of a number of academic essays incorporating an introduction, a summary and discussion of the essays (compilation thesis) and is to comprise 120-140 credits.

The doctoral thesis shall be defended verbally in public. The thesis is assessed with the following grades: G (Pass) or U (Fail). When setting the grade, attention will be paid to both the content of the thesis and its defence.

## **5. Examination**

The degree of doctor can be awarded following the student's completion of third-cycle studies equivalent to 240 credits within mathematics, and where the applicant has received the grade of pass for the tests included in the studies in addition to writing and publicly defending a doctoral thesis approved by the Examining Committee. Degree certificates are issued following application to Student Services/Examina.

## **6. Other instructions**

The provisions that apply in respect of third-cycle studies can be found in:

- The Higher Education Ordinance: Chapter 5 Employment of doctoral students, Chapter 6 Courses and study programmes, and Chapter 7 Admission to courses and study programmes, Annex 2 Qualifications ordinance.
- Admission regulations for doctoral studies at Umeå University (Ref. no. FS1.1.2-25-14).



- Local system of qualifications at Umeå University (Ref. no. 500-2958-11).
- Regulations for doctoral studies at Umeå University (Ref. no. 500-953-13).
- Handbook for postgraduate students at the Faculty of Science and Technology at Umeå University.