



# General syllabus for third-cycle studies in Computing Science

**Scope:** 240 higher education credits

**The Degree:** Degree of Doctor

**Study level:** Third-cycle

**Established by:** General syllabus established by the Faculty of Science and Technology Board on 10/12/2019

**Enters into force:** 1 January 2020

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

## 1. Field of Study

Computing Science in the sense of this syllabus is the scientific field that studies the theoretical and practical aspects of computation and how it can be made use of in science, technology, and society. The goal is to strengthen the basis for practical applications on the one hand, and to understand the fundamental limitations of computational devices on the other hand. While the division between Computing Science and related fields such as Mathematics and Informatics is not always sharp, research qualifies as Computing Science if it creates new knowledge about computation, its limitations, and possibilities. This separates Computer Science from research that merely uses the computer as a tool, studies its societal impact, or the like.

Holders of a doctoral degree in Computing Science are expected to have acquired good overall expertise of the subject, and deep knowledge in their particular area of specialisation. The latter is demonstrated by the ability to conduct research that makes significant contributions to the field as outlined above. To make it possible for the student to reach this depth, admission to third-cycle studies is restricted to areas of specialisation in which high quality supervision by senior researchers can be provided.

## 2. Learning outcomes

The learning outcomes for the degree of doctor in Computing Science are those specified by the Higher Education Ordinance, Chapter 6, Sections 4 and 5 (see Appendix A), where the terms research field and area of specialisation are to be interpreted in accordance with the preceding section. These learning outcomes are complemented by a gender and equal opportunities perspective which is integrated in the content and organisation of the programme. It provides the student with additional insights into how the sustenance of inequality by traditional structures and perspectives can be counteracted.

### 3. Entry requirements and prior knowledge required

To be admitted for studies at third-cycle level the applicant is required to meet the general entry requirements and the specific entry requirements that the board of the Faculty of Science and Technology Board has prescribed, and shall be considered as otherwise possessing that required to benefit from the studies. (Higher Education Ordinance, Chapter 7, Section 35)

#### General entry requirements

To fulfil the general entry requirements, the applicant must have qualifications equivalent to a completed degree at second-cycle level, or completed course requirements of at least 240 ECTS credits including at least 60 ECTS credits at second-cycle level. The board of the Faculty of Science and Technology may, in the case of a specific applicant, consent to an exemption from the general entry requirements, if there are special reasons to do so. (Higher Education Ordinance, Chapter 7, Section 39)

#### Specific entry requirements

To fulfil the specific entry requirements to be admitted for studies at third-cycle level in Computing Science, the applicant is required to have completed at least 90 ECTS credits in Computing Science, or in subjects considered to be directly relevant for the specialization in question. Applicants who otherwise have acquired skills that are deemed equivalent to these are also eligible.

### 4. Selection process

#### Selection process

A selection process involving applicants who meet the entry requirements will be conducted with reference to their ability to benefit from 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.

### 5. Contents and scheduling

#### 5.1 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 ECTS credits. A doctoral student can, if desired, pursue a licentiate degree



as an intermediate goal. The requirements for obtaining a licentiate degree are detailed in the relevant general syllabus.

Studies at third-cycle level that are to be concluded with a doctoral degree shall comprise a net study period of four years. They consist of a course component of 50–70 ECTS credits and an academic thesis of 170–190 ECTS credits.

## 5.2 Contents

Studies towards the degree of doctor in Computer Science consist of courses and thesis work. The course part consists of a fixed set of mandatory courses and a variable number of courses individually determined according to the doctoral student's needs. The mandatory courses convey generic skills, provide an overview of the field as such and its scientific methods, and take up questions regarding gender issues and equal terms as integral parts. Depending on the specialization and the doctoral students' previous knowledge, the admission decision shall specify additional mandatory course requirements if such is deemed necessary to guarantee that the student achieves a good overall expertise of the subject, and deep knowledge in their particular area of specialization.

The character of the education is highly international. Doctoral students participate in international collaborations, and must present their research results in international contexts.

### 5.2.1 Courses

The following courses are mandatory for all doctoral students in Computing Science:

*Courses developing general competence:*

- *Introduction to Doctoral Studies at the Faculty of Science and Technology*, 1 ECTS credit
- *Writing Science*, 5 ECTS credits
- *Oral Presentation*, 1 ECTS credit
- *Philosophy of Science*, 2 ECTS credits
- *Introduction to Research Ethics*, 2 ECTS credits
- *Work, Technology, and Gender*, 5 ECTS credits

*Courses developing competence in Computing Science:*

- *Computing science research methodology, peer reviewing, and publication*, 7.5 ECTS credits
- *Doctoral Student Days in Computing Science – presentation and discussion of research work in progress*, 7.5 ECTS credits

Additional mandatory courses for the individual doctoral student can be specified in the admission decision.

The remaining course requirements are satisfied via elective courses which broaden or deepen the doctoral student's expertise in the subject (comprising at least 15 ECTS credits) or provide additional generic skills.

### 5.2.2 Doctoral thesis

The doctoral thesis comprises at least 170 ECTS credits. It may either take the form of a single coherent work (a monograph) or a compilation consisting of an introduction, a number of scientific papers, and a summary and discussion of the papers which includes a description of the author's contributions to each paper (compilation thesis). In both cases the number of ECTS credits of the thesis is to be indicated. Further, the thesis shall contain a popular scientific description aimed at readers outside academia.



The doctoral thesis shall be defended orally in public, resulting in an assessment with one of the following grades: G (Pass) or U (Fail). When setting the grade, the grading committee shall pay attention to both the content of the thesis and its defence.

## 6. Examination

The degree of doctor is awarded upon completion of third-cycle studies equivalent to 240 ECTS credits within Computing Science, provided that the applicant has received the grade *Pass* in all mandatory parts. In particular, this includes the public defence of the doctoral thesis and its approval by the grading committee. Degree certificates are issued following application to Student Services/Examina.

## 7. 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.
- Local system of qualifications at Umeå University.
- Regulations for doctoral studies at Umeå University.
- Handbook for postgraduate students at the Faculty of Science and Technology at Umeå University.

# Appendix A

## *Learning outcomes for the degree of doctor*

(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.