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# General syllabus for third-cycle studies in computing science

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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 01/12/2010; revised on 20/03/2014
**Enters into force:** 01/12/2010
**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*

**Knowledge and understanding**

For the degree of Doctor of Philosophy the third-cycle student shall, in particular,

- demonstrate broad knowledge within the field of computing science and in-depth specialist knowledge within at least one of the subject's current fields of research.
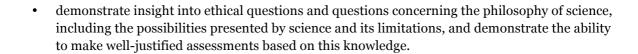
**Competence and skills**

For the degree of Doctor of Philosophy the third-cycle student shall, in particular, demonstrate the ability to

- identify and formulate relevant research questions in computing science,
- conduct computing science research and, within this context, identify the need for additional knowledge and acquire this knowledge,
- in an international context, present his/her research results both verbally and in writing, and
- describe the practical applications and public benefits of his/her research also for non-specialists.

**Judgement and approach**

For the degree of Doctor of Philosophy the third-cycle student shall, in particular,

- demonstrate insight into ethical questions and questions concerning the philosophy of science, including the possibilities presented by science and its limitations, and demonstrate the ability to make well-justified assessments based on this knowledge.

## 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 ECTS credits, of which at least 60 ECTS credits are at second-cycle level, or have an equivalent education from overseas, or equivalent qualifications.

Applicants who meet the general entry requirements that applied prior to 1 July 2007, i.e. at least 120 ECTS credits or the equivalent, meet the current general entry requirements up to and including 30 July 2015.

### *Specific entry requirements*
To fulfil the specific entry requirements to be admitted for studies at third-cycle level within the subject of computing science, the applicant is required to have completed courses at second-cycle level degree equivalent to 60 ECTS credits in computing science, or in a subject considered to be directly relevant for the specialisation in question.

The entry requirements above are also deemed to be fulfilled by applicants who in some other system in Sweden or abroad have acquired largely equivalent skills.

## 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 ETCS credits. A doctoral student 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 60-90 ECTS credits and a doctoral thesis of 150-180 ECTS credits.

### 4.2 Contents

*4.2.1 Courses*
Doctoral studies in computing science shall comprise a course component of 60-90 ETCS credits, of which 23 ECTS credits are comprised of mandatory courses *that develop general skills,* and the remaining course credits are comprised of elective courses.

*Mandatory courses for doctoral degrees that develop general skills:*
- Computing science research methodology, publication and presentation techniques, 7,5 credits
- Doctoral Student Days in Computing Science – individual presentations of ongoing research in seminar format, 7,5 credits
- 8 credits of courses within philosophy of science, ethics and conduct, oral presentation, and written presentation.

*Elective courses for doctoral degrees:*
Courses comprising at least 37 credits in subjects considered relevant for study, including at least 15 credits at second-cycle level within the field of computing science.

*4.2.2 Doctoral thesis*
The doctoral thesis 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  (compilation thesis). In both cases the thesis is to contain a popular scientific description aimed at readers outside of academia. The thesis is to comprise 150-180 ECTS 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 ECTS credits within computing science, 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. FS 1.1.2-25-14).

- 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.