



Faculty of Health, Science and Technology

Curriculum for Doctoral Studies in Computer Science

- Study plan for doctoral students

December 10, 2015.

Please note that this document is a translation of the approved regulation. Legally binding is the Swedish-language source document “Studieplan för utbildning på forskarnivå I Datavetenskap” (Dnr: HNT2015/51).

KAU.SE

Curriculum Approval

The curriculum was approved by the Faculty Board of Economic Sciences, Communication and IT on 8 May 2008.

Revised by the Faculty Board of Health, Science and Technology on 10 December 2015, and effective from the date of approval.

General stipulations for PhD programmes are provided in the *Higher Education Act* and in the *Higher Education Ordinance*. The PhD programme is offered to the extent permitted by available funding.

1. General Information

The discipline Computer Science comprises the theories and academic subject areas that form the basis of the design and analysis of software-based systems. Examples of subareas covered are:

- Computability and complexity
- Database systems
- Data communication
- Data structures and algorithms
- Data safety
- Distribution systems
- Methods for the description, analysis and synthesis of software
- Operative systems
- Computer language and compilers

Research in computer science at Karlstad University is primarily focused on data communication and data safety. The department cooperates with other departments and universities at home and abroad on doctoral study programmes and projects.

In accordance with Karlstad University's equal opportunities policy, gender issues are addressed throughout the programme. Doctoral students are also introduced to multi-disciplinary approaches and involved in interdisciplinary experiences.

2. Aims and Objectives

The general objectives of third-cycle education in terms of knowledge and understanding, skills and abilities, and judgement and approach are specified as follows in the *Higher Education Ordinance, annex 2*:

Degree of Licentiate

Knowledge and understanding

For a Degree of Licentiate, the third-cycle student shall demonstrate knowledge and understanding in the field of research including current specialist knowledge in

a limited area of this field as well as specialised knowledge of research methodology in general and the methods of the specific field of research in particular.

Competence and skills

For a **Degree of Licentiate**, the third-cycle student shall

- *demonstrate the ability to identify and formulate issues with scholarly precision critically, independently and creatively, and to plan and use appropriate methods to undertake a limited piece of research and other qualified tasks within predetermined time frames in order to contribute to the formation of knowledge as well as to evaluate this work*
- *demonstrate the ability in both national and international contexts to present and discuss research and research findings in speech and writing and in dialogue with the academic community and society in general, and*
- *demonstrate the skills required to participate independently in research and development work and to work autonomously in some other qualified capacity.*

Judgement and approach

For a **Degree of Licentiate**, the third-cycle student shall

- *demonstrate the ability to make assessments of ethical aspects of his or her own research*
- *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.*

Degree of Doctor

Knowledge and understanding

For a **Degree of Doctor**, 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 a **Degree of Doctor**, the third-cycle student shall

- *demonstrate the capacity for scholarly analysis and synthesis as well as 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, independently 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 a 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 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 a Degree of Doctor, the third-cycle student shall

- *demonstrate intellectual independence 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 it is used.*

Subject Specific Objectives

The aim of doctoral studies in computer science is that students acquire the subject expertise and creative ability required for independent research and development work in the academia or industry at home or abroad. To achieve this, students develop broad knowledge in the field of computer science, expert knowledge in a subarea, methodological skills and research experience.

3. Admission Requirements

Applicants to doctoral studies must meet the general admission requirements as well as the specific admission requirements and be judged to have the ability otherwise required to pursue the programme successfully (*Higher Education Ordinance, Ch.6*).

3.1 General eligibility

A person who has earned a master's degree of at least 240 ECTS credits of which at least 60 ECTS credits are earned for studies at master's level, or who in some other way in the country or abroad has acquired largely equivalent knowledge, has general eligibility for admission. If there are special reasons for doing so, the faculty board may grant an individual applicant exemption from the general eligibility (*Higher Education Ordinance, Ch.6*).

3.2. Special eligibility

A person who has

- a Master's degree (60 credits) in computer science
- a Master's degree (120 credits) in computer science
- Master of Science degree in computer technology

has special eligibility for admission to doctoral studies in computer science.

A person who in some other way in the country or abroad has acquired equivalent qualifications also has special eligibility.

4. Admission Procedure

Applications for admission to doctoral studies are processed in accordance with the procedures prescribed by the Board of Karlstad University.

5. Selection

Candidates will be selected on the basis of their assessed capacity to successfully complete a programme at the doctoral level in the time equivalent to four years of full-time study. In the ranking and selection of the candidates, special attention will be paid to previous studies, especially to the quality of independently documented research or development projects completed, and to work experience with relevance to the doctoral programme. Special consideration is also given to the candidates' general qualifications and personal qualities.

6. Content and Outline

The doctoral programme can lead to a doctoral or licentiate degree. The licentiate degree requires two years of study, the equivalent of 120 ECTS credits. The doctoral degree requires four years of study, the equivalent of 240 ECTS credits. The studies include course work as well as independent thesis work.

To earn a licentiate degree, the candidate is required to complete 30 ECTS credits of course work and a thesis of 90 ECTS credits.

To earn a doctoral degree, the candidate must complete 60 ECTS credits of course work and a thesis of 180 ECTS credits.

6.1 Courses

For the **Licentiate** degree the course The History and Philosophy of Science, 7.5 ECTS credits is mandatory

For the **Doctor's** degree the courses The History and Philosophy of Science, 7.5 ECTS credits, and Communicating Science, 4.5 ECTS credits are mandatory, totalling 12 ECTS credits.

Subject Specific Courses

Mandatory subject specific courses in computer science are:

- a) Computer Science Colloquium, 1.5 ECTS credits
- b) Introduction to Research Studies in Computer Science, 1.5 ECTS credits

Other subject specific courses are chosen from

- a) Other courses in computer science offered at doctoral level
- b) Directed reading courses in the specialisation area
- c) Other relevant computer science courses at Master's level.

Other courses

Courses in other subjects of relevance to the candidate's specialisation area.

The advisor decides which courses to include in consultation with the candidate. Mandatory course requirements must be considered. The examiner decides on the number of credits earned for each course.

6.2 Doctoral and Licentiate Theses

Third-cycle students are required to write a thesis for a licentiate degree and/or a doctor's degree, which should either be a monograph or a compilation thesis.

The licentiate thesis is defended at a licentiate seminar and the doctoral thesis at a public examination. Further information is provided in the policy documents Regulations on the Licentiate Thesis and Regulations on Doctoral Thesis and Public Defence Procedures.

The licentiate thesis, defended at a licentiate seminar, is expected to display the academic quality required for international publication of parts or summary. The doctoral thesis, publicly defended, is expected to meet requirements for publication in highly reputable international science journals. The licentiate/doctoral thesis topics should be related to computer science research at Karlstad University.

Licentiate/doctoral theses in computer science are normally written in English. If a language other than English is chosen, there must be a summary in English.

Further information is provided by the policy documents “Doctoral Thesis Requirements” and “Licentiate Thesis Requirements”.

6.3 Supervision

Doctoral students are entitled to advisors in accordance with the principles stated in the current policy document at Karlstad University.

6.4 Individual Study Plan

Each doctoral student must draw up an individual study plan in conjunction with the advisors. The plan should include a realistic estimate of time for course work, thesis work and supervision as well as a project description and relevant ethical considerations.

The plan shall also include an introduction to the research area, formulation of problem, aim, methodological and theoretical frames, and relevant ethical considerations. **The individual study plan is subject to continual follow-up (at least once a year) with written comments and corrections.**

If the follow-up calls for changes in time or project plan, a revision of the ISP is required.

Goal attainment in licentiate/doctoral studies shall be monitored on two occasions in the course of studies. After one year, an individual goal matrix is formulated and attached to the student’s individual study plan.

One year before the preliminary date of licentiate degree completion and two years before the preliminary date doctoral degree completion the outcome of the individual goal matrix is evaluated when the ISP is followed up. If the evaluation indicates that the goal attainment is not satisfactory, the study plan is revised to ensure that the national requirements are met at the time of the final examination. The revised goal matrix is attached to the individual study plan.

6.5 Examination

Doctoral students are examined in accordance with the requirements of each individual course syllabus. Doctoral or licentiate theses are examined in accordance with the *Higher Education Ordinance* (Ch.6, §§ 40-47) and Karlstad University’s current policy document.