GENERAL SYLLABUS FOR THIRD-CYCLE PROGRAMMES IN THE SUBJECT AREA

COMPUTER SCIENCE AND ENGINEERING, 120–240 CREDITS, AT THE UNIVERSITY OF GOTHENBURG

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Summary This general syllabus is a revision of the general syllabus for third-cycle programmes in the subject computer science and engineering 120–240 credits, at the University of Gothenburg, decided by the IT Faculty on 16-04-2015. The general syllabus is translated from the Swedish version.
GENERAL SYLLABUS FOR THIRD-CYCLE PROGRAMMES IN
THE SUBJECT AREA COMPUTER SCIENCE AND ENGINEERING,
120–240 CREDITS, AT THE UNIVERSITY OF GOTHENBURG

The programme syllabus was established by the IT Faculty Board at the University of Gothenburg on 16-04-2015 (reg. no. U 2015/229) and revised on 20-10-2021. This programme syllabus applies to doctoral students admitted to third-cycle programmes in the subject area computer science and engineering from 20-10-2021.

1. Title of qualification

For a licentiate degree the title of the qualification is *Degree of Licentiate of Philosophy in Computer Science and Engineering* (Teknologie licentiatexamen i ämnet data- och informationsteknik alternativt Filosofie licentiatexamen i ämnet data- och informationsteknik).

For a doctoral degree the title of qualification is *Degree of Doctor of Philosophy in Computer Science and Engineering* (Teknologie doktorsexamen i ämnet data- och informationsteknik alternativt Filosofie doktorsexamen i ämnet data- och informationsteknik).

2. Subject area description

*Description of subject*

The aim of the third-cycle programme is to give the student a general understanding of the area of Computer Science and Engineering, and a broad understanding of current research issues and practical applications, with in-depth insight into one or more fields, and skills in research methodology.

The fields included in the computer science and engineering third-cycle programme are broad and span a large spectrum that includes theoretical underpinning of computer science, the development of applied systems, the design of computer hardware, the design of software languages, the processes, practices and methods of real-world software engineering, and realistic drawing of images in computer games and films.

*Description of specializations*

The subject of computer science and engineering covers the following specializations:

- **Bioinformatics** studies algorithms for handling, analysing, structuring and/or visualising biological data.
- **Computer engineering** studies the behaviour of computer systems’ hardware and software, in particular modelling and analysis of their non-functional behaviour (e.g., energy consumption, reliability, security, critical timing, or realism in computer graphics).
- **Computer science** studies logical-mathematical modelling of computation with applications in algorithms, data, software languages and machine learning.
- **Interaction Design** studies designing computer-based products and systems with a focus on usage.
- **Natural Language Processing** studies the development of computer programs for analysing, understanding, or generating human languages.
Software engineering studies systematic, disciplined, and quantifiable approaches to design, development, and maintenance of software in practice.

3. Programme objectives
The aim of the education is to develop the qualified knowledge and skills that are required to be able to independently conduct research in the subject area of Computer Science and Engineering and to contribute to the development of knowledge in the area.

3.1. Outcomes for a Degree of Licentiate

3.1.1. 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.

3.1.2. 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, autonomously, 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 autonomously in research and development work and to work autonomously in some other qualified capacity.

3.1.3. 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.
3.2. Outcomes for a degree of Doctor

3.2.1. Knowledge and understanding
For the 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.

3.2.2. Competence and skills
For the 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, 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 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.

3.2.3. Judgement and approach
For the Degree of Doctor, 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 it is used.

4. Content and structure

4.1. Content
The study programme towards a doctoral degree encompasses 240 credits. The study programme towards a licentiate degree encompasses 120 credits. One year of full-time studies equals 60 credits.

For the licentiate degree programme, the credits are distributed between courses and thesis work as follows:
courses corresponding to 30 credits and thesis corresponding to 90 credits.

For the doctoral degree programme, the credits are distributed between courses and thesis work as follows: courses corresponding to 60 credits and thesis corresponding to 180 credits.

**Courses**

Courses within the third-cycle study programme in the subject area computer science and engineering include:

**Compulsory courses**

- Teaching and Learning in Higher Education 1; Basic course (5 credits) or an equivalent or more comprehensive course.
- Ethics in research, corresponding to at least 3 credits

**Individual courses**

- Relevant topics corresponding to the remaining part of the required 60 credits minus compulsory courses

Individual courses may include individual reading courses as well as relevant optional third-cycle courses at Chalmers University of Technology, the University of Gothenburg, or other higher education institutions. Courses in the Generic Transferable Skills (GTS) at Chalmers in particular. The individually designed coursework part of third-cycle studies is specific to each doctoral student and is to be specified in the individual study plan.

**Licentiate thesis**

A licentiate thesis shall be written in English. In exceptional cases it can be written in Swedish; in such cases it shall contain a summary in English.

The purpose of the licentiate thesis is to account for the relevant scientific results that have been attained during the thesis work and describe these in a way that is accessible outside of the scientific inner circle of researchers. A licentiate thesis can either be written as a compilation thesis or as a monograph. If the licentiate thesis is a compilation thesis it shall introduce with a summarizing text, a so-called "kappa/introduction", followed by the included scientific articles. The purpose of the summarizing text is to put the articles in their scientific context, and to present relevant results that for various reasons are not described within the articles.

**Doctoral thesis**

A doctoral thesis shall be written in English. In exceptional cases it can be written in Swedish; in such cases it shall contain a summary in English.

The purpose of the doctoral thesis is to account for the relevant scientific results that have been attained during the thesis work and describe these in a way that is accessible outside of the scientific inner circle of researchers. A doctoral thesis can either be written as a compilation thesis or as a monograph. If the doctoral thesis is a compilation thesis it shall introduce with a summarizing text, a so-called "kappa/introduction", followed by the included scientific articles. The purpose of the summarizing text is to put the articles in their scientific context, and to present relevant results that for various reasons are not described within the articles.
4.2. Individual study plan
An individual study plan shall be drawn up for each doctoral student via the University of Gothenburg’s online system for individual study plans (the ISP system) and shall be established by the Head of Department no later than two months after the start of the studies. The principal supervisor is responsible for drawing up the ISP. The rules for drawing up individual study plans are set out in the *Rules and regulations for third-cycle studies at the University of Gothenburg – Doktorandreglerna*.

The individual study plan shall contain planned, ongoing, and completed parts of the study programme and shall function as a guiding document for the entire study programme and is to ensure that the study programme is undertaken and monitored effectively. The individual study plan shall be revised at least yearly so that it is maintained as a relevant document throughout the duration of the studies.

4.3. Supervision
For each doctoral student, at least two supervisors are to be appointed, one of which shall be the principal supervisor and the other shall be the assistant supervisor. The principal supervisor shall normally have at least the qualifications required for appointment as a docent (Reader). The rules for supervision are set out in the *Rules and regulations for third-cycle studies at the University of Gothenburg – Doktorandreglerna*.

4.4. Doctoral examiners
Each doctoral student is to have a doctoral examiner. The principal task of the doctoral examiner is to ensure that the doctoral student fulfils the programme objectives. The doctoral examiner is also to be involved in monitoring the doctoral student’s studies and participate in the preparation and revision of the student’s individual study plan.

4.5. Examination
After completion of a doctoral programme a doctoral degree is awarded. A licentiate degree can be an intermediate stage in a doctoral degree. If a licentiate degree is not a part of the studies, an interim seminar shall be held to denote that licentiate level has been reached.

**Examination, licentiate degree**

For a licentiate degree to be awarded, the doctoral student must have received a grade of pass for the licentiate thesis and its presentation and must also have passed the other elements that are included in the programme.

**Examination, doctoral degree**

For a doctoral degree to be awarded, the doctoral student must have had a doctoral thesis and its defence approved and must also have passed the other elements that are included in the programme.

The rules for Licentiate theses and licentiate seminars and Doctoral thesis and public defences are set out in the *Rules and regulations for third-cycle studies at the University of Gothenburg – Doktorandreglerna*.

5. Entry and admission requirements
To be admitted to third-cycle studies, the applicant must meet the criteria for general and specific entry requirements in accordance with what is stated in Chapter 7 of the Higher Education Ordinance. Selection of
applicants who meet the requirements for general and specific entry requirements must be made with regard to their ability to assimilate the education.

5.1. General entry requirements

According to the Higher Education Ordinance Chapter 7 Section 39, a person meets the general entry requirements for third-cycle courses and study programmes if they:

1. Have been awarded a second-cycle qualification,
2. Have met the requirements for courses comprising at least 240 credits of which at least 60 credits were awarded at second-cycle level, or
3. In some other way, in Sweden or abroad, have acquired substantially equivalent knowledge.

The Dean of the IT Faculty may grant individual applicants an exemption from the general entry requirements for third-cycle studies if there are special reasons for doing so.

5.2. Specific entry requirements

In addition to the general entry requirements for third-cycle studies, specific entry requirements may be applied. Specific entry requirements shall be absolutely essential for the doctoral student to be able to benefit from the third-cycle course or study programme (Higher Education Ordinance Chapter 7 Section 40). To be qualified for admission to third-cycle programme in Computer Science and Engineering the applicant is required to:

- have obtained a second-cycle qualification. The orientation of the student’s degree shall have a sufficiently close connection to the subject of the third-cycle programme. Equivalent requirements apply to individuals who have been awarded their degree in a country other than Sweden.

The examiner, in consultation with the principal supervisor, shall assess whether the applicant has the requisite capacity to successfully complete the third-cycle programme.

Other requirements for general entry and admission are regulated in the Rules and regulations for third-cycle studies at the University of Gothenburg – Doktorandreglerna.

6. Additional information

In other respects, reference is made to current legislation, guidelines at the University of Gothenburg and at the IT Faculty along with local regulations at the Department of Computer Science and Engineering. Information about the current regulatory framework is available via IT Faculty, University of Gothenburg (gu.se)

Evaluation

Follow-up and evaluation of third cycle education at the Department of Computer Science and information technology is conducted in accordance with the Policy for Quality assurance and Continuous Quality improvement of Education at the University of Gothenburg.