Programme Syllabus

Master of Science in Computer Engineering

Programme Code:	TACDA
Programme Title:	Master of Science in Computer Engineering
	(Civilingenjör datateknik)
Credits:	300
Programme Approval:	The programme syllabus was approved by the Faculty Board of Health, Science and Technology, 3 February 2022, effective from the autumn semester of 20022.
Language of Instruction:	Swedish and English
Education Cycle:	Second cycle
Degree Type:	Professional
Degree Title:	Degree of Master of Science in Computer Engineering
	Civilingenjörsexamen datateknik
Entry Requirements:	General admission requirements and Mathematics 4/Mathematics E, Physics 2, and Chemistry 1

Introduction

Computer engineering is a rapidly developing field. In line with this, the programme at Karlstad University is designed to equip students with the ability to continuously acquire and apply new knowledge. Development of engineering excellence and practicing collaboration are central in the programme. Graduates from Karlstad University's computer engineering programme are able to plan, develop, design, produce and use advanced technological systems.

In addition to engineering excellence, the programme leads to insight into the role played by engineers in economic and social aspects of societal development, and prepares students to

do responsible work. The training will give the students knowledge and skills that are nationally and internationally competitive. The programme further provides sound theoretical and practical knowledge in mathematics, basic natural sciences and technology.

Programme Outcomes

Upon successful completion of the Master of Science in Computer Engineering programme, students will be prepared for PhD-level study in the field, have the ability to keep up with technological developments and have acquired a basis for lifelong learning.

For a Master of Science Degree in Computer Engineering, students at Karlstad University should meet the requirements specified in the Higher Education Ordinance (SFS 2006:1053) as follows:

General outcomes
For a Degree of Master of Science in Engineering, the student shall demonstrate the knowledge and skills required to work autonomously as a graduate engineer.

Knowledge and understanding
For a Degree of Master of Science in Engineering the student shall
- demonstrate knowledge of the disciplinary foundation of the engineering field chosen and proven experience in this field as well as insight into current research and development work, and
- demonstrate both broad knowledge of his or her chosen field of technology, including knowledge of mathematics and the natural sciences, as well as a considerable degree of specialised knowledge in certain areas of the field.

Competence and skills
For a Degree of Master of Science in Engineering the student shall
- demonstrate the ability to identify, formulate and deal with issues critically, autonomously and creatively using a holistic approach and to participate in research and development work and thereby contribute to knowledge development,
- demonstrate the ability to create, analyse and critically evaluate various technological solutions,
- demonstrate the ability to plan and using appropriate methods undertake tasks within predetermined parameters,
- demonstrate the ability to use knowledge critically and systematically to model, simulate, predict and evaluate series of events on the basis of relevant information,
- demonstrate the ability to develop and design products, processes and systems while taking into account the circumstances and needs of individuals and the targets for economically, socially and ecologically sustainable development set by the community,
- demonstrate the capacity for teamwork and collaboration with various constellations, and
- demonstrate the ability in speech and writing both nationally and internationally to clearly report and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences.

Judgement and approach
For a Degree of Master of Science in Engineering the student shall
- demonstrate the ability to make assessments informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work,
- demonstrate insight into the possibilities and limitations of technology, its role in society and the responsibility of the individual for how it is used, including social and

      economic aspects as well as environmental and occupational health and safety aspects, and

- demonstrate the ability to identify the need for further knowledge and undertake ongoing development of his or her skills.

Independent project (degree project)
For a Degree of Master of Science in Engineering the student shall

- within the parameters of course requirements complete an independent project (degree project) of at least 30 credits.

In addition to the learning outcomes specified in the Higher Education Ordinance and Karlstad University's regulations, students completing a Master of Science in Computer Engineering should meet the following requirements:

Knowledge and understanding

- demonstrate specialised knowledge of computer engineering principles and their use in developing applications in the areas of computer networking, computer security and software engineering.

Competence and skills

- formulate, process and solve engineering issues using a multidisciplinary approach,
- plan appropriate testing and analysis methods for computer technological products and services, and be able to analyse outcomes, and
- demonstrate the ability and experience to actively participate in research and development work on computer technological products and services, and the ability to cooperate with others in a group.

Judgement and approach

- provide a holistic perspective on human–computer interaction, as well as how this relates to sustainable development.

Programme Structure
The programme is divided into two educational cycles: **first cycle** (180 credits) and **second cycle** (120 credits). The programme includes blocks of elective and optional courses. Students should ensure that they have the necessary information and consult the programme coordinators before making choices about these courses as it may affect the subsequent courses.

The **first-cycle** part of the programme comprises six semesters and includes studies in mathematics, natural sciences, engineering, computer science as well as some courses in the humanities and social sciences. Students also develop skills in project work, report writing and communication. These courses prepare students for second-cycle studies, while also offering them the opportunity to earn a Degree of Bachelor of Science in Computer Science. The courses in computer science cover central subject areas such as programming, operating systems, data structures and algorithms, computer networking, sustainable IT and computer security.

The **second-cycle** part of the programme comprises four semesters and consists of studies in computer science of at least 60 credits at second-cycle level, including a degree project of 30 credits. The first two semesters consist of courses in the profile areas of computer science: computer networking, cyber security and software design. These courses are usually led by a researcher from the relevant research group. The third semester consists of optional courses with the opportunity to study abroad. It is also possible to specialise further in the profile areas of computer science, or select courses from other subject areas. The degree project is preferably completed in collaboration with a company, government agency or the research group in computer science.

All students admitted to the programme are guaranteed a place on the second-cycle part of the programme, provided that they meet the entry requirements for second-cycle courses.

Basic courses are followed by intermediate and advanced courses and specialisation is ensured through the formulation of increasingly more complex learning outcomes that are assessed across the programme. Different forms of teaching methods, working methods and examination formats are used in the programme, ensuring scientific, methodological, content, language and professional specialisation and development. Establishing a strong connection with current research is particularly important for scientific and methodological specialisation.

The university's constant quality enhancement depends on enthusiastic lecturers offering quality courses. Student evaluations, contact with alumni, and student representation in preparatory and decision-making bodies play an important role in this respect. Societal relevance is maintained through partnerships with the larger community and through including external representatives in preparatory and decision-making faculty bodies.

Contact with the larger community is established early on in the programme and maintained throughout, with the aim of familiarising students with possible future employment areas and conditions. Practising computer engineers are, for example, involved as guest lecturers in the programme.

Internationalisation
Karlstad University wants to promote collaboration and exchange with other universities. Karlstad University has partnerships with many other universities in Sweden and abroad, and has an organisation in place to support students who want to make use of this opportunity. Students are therefore encouraged to complete part of the programme at a university abroad.

Programme Curriculum
First cycle: Computer engineering, including courses in, for example, programming techniques, operating systems, data structures and algorithms, and software engineering, of a total of 97.5 credits, as well as mathematics 45 credits, natural sciences and engineering 30 credits, and humans, technology, society 7.5 credits.

Second cycle: Computer engineering, including courses in, for example, computer networking, cyber security, and software engineering, of a total of 90 credits, as well as optional courses of 30 credits.

Credit Transfer
Students have the right to transfer credits from previously completed university courses in Sweden or abroad, subject to approval according to the current regulations. Students have

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Additional Information
The local regulations for first and second cycle education at Karlstad University stipulate the obligations and rights of students and staff.

This programme syllabus will replace the previous version approved 9 December 2016, reg. no: HNT 2016/335.