



---

Faculty of Health, Science and Technology

## Study Plan

### Master of Science in Computer Engineering

<b>Programme Code</b>	TACDA
<b>Programme Title</b>	Master of Science in Computer Engineering Civilingenjör datateknik
<b>Credits:</b>	300
<b>Approval</b>	The programme Study Plan was approved by the Faculty Board of Health, Science and Technology on 9 December 2016 and is valid from the autumn semester of 2017 at Karlstad University.
<b>Language of Instruction</b>	Swedish and English
<b>Degree Level</b>	Master's
<b>Degree Type</b>	Professional
<b>Prerequisites</b>	General admission requirements plus upper secondary school level Mathematics E, Physics B, and Chemistry A, or general admission requirement plus upper secondary school level Mathematics 4, Physics 2, and Chemistry 1 (field-specific eligibility 9 or A9).

#### Introduction

Computer engineering is a rapidly developing field. The focus of Karlstad University's Master of Science in Computer Engineering programme is therefore on equipping graduates with the ability to quickly 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 programme provides knowledge and skills that are nationally in demand and internationally competitive. The programme further provides a solid theoretical and practical knowledge in mathematics, basic natural sciences and technology.

## Objectives

Upon completion of the Master of Science in Computer Engineering programme, students are 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:

- Overarching aim: For a Master of Science in Engineering students should demonstrate the knowledge and skills required to work independently as a graduate engineer.
- Knowledge and understanding  
For a Master of Science in Engineering students should
  - demonstrate knowledge of the disciplinary foundation of and proven experience in their chosen field as well as insight into current research and development work, and
  - demonstrate both broad knowledge of their chosen field, 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 Master of Science in Engineering students should
  - demonstrate the ability to identify, formulate and deal with complex issues independently, critically, creatively and with a holistic approach and also to participate in research and development work and so contribute to the development of knowledge,
  - demonstrate the ability to create, analyse and critically evaluate various technological solutions,
  - demonstrate the ability to plan and use appropriate methods to undertake advanced tasks within predetermined parameters,
  - demonstrate the ability to integrate knowledge critically and systematically as well as the ability to model, simulate, predict and evaluate sequences of events even with limited 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 to clearly present their conclusions and the knowledge and arguments on which they are based in speech and writing to different audiences in both national and international contexts.
- Judgement and approach  
For a Master of Science in Engineering students should
  - demonstrate the ability to make assessments informed by relevant disciplinary, social and ethical aspects as well as 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 both social and economic aspects and also environmental and occupational health and safety considerations, and
  - demonstrate the ability to identify a need for further knowledge and undertake ongoing development of their skills.
- Independent project (degree project)  
For a Master of Science in Engineering students should

- as part of the programme complete an independent project (degree project) of at least 30 credit points.

In addition to the requirements specified in the Higher Education Ordinance (SFS 2006:1053) and in Karlstad University's regulations, students completing a Master of Science in Computer Engineering should meet the following requirements:

- Knowledge and understanding
  - demonstrate in-depth 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, handle and solve engineering issues in a multidisciplinary manner,
  - plan appropriate testing and analysis methods for computer technological products and services, and analysing results, and
  - demonstrate ability to and experience of active participation in research and development work on computer technological products and services, and doing teamwork.
- 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 levels: Bachelor's level (180 cr.) and Master's level (120 cr.). The programme includes blocks of optional and/or elective courses. Students should ensure that they have the needed information about these and should consult programme coordinators when choosing courses, since choices can affect subsequent courses.

The **Bachelor's level** comprises six semesters and includes courses in mathematics, natural science, engineering, computer engineering 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 Master-level studies, while they have the opportunity to earn a Bachelor's degree in computer engineering. The computer engineering courses include central subjects such as programming, operating systems, data structures and algorithms, computer networking, green IT and computer security.

The **Master's level** comprises four semesters and includes at least 60 credits worth of courses in computer engineering at Master's level, including a degree project of 30 credits. The first semester is comprised of optional courses and there are good opportunities to complete these courses abroad. In addition to the final degree project and preparation for the project, the rest of the courses are in the areas of specialisation of the Department of Computer Science: computer networking, computer security and software engineering. These specialised studies are usually led by a researcher from the relevant research group. The final degree project is preferably completed in conjunction with industry, government agencies or the computer science research group.

All students admitted to the programme are guaranteed places on the Master's level, provided that they meet the entry requirements for Master-level 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 instruction, working methods and examination format 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 community and through including external representatives in preparatory and decision-making faculty bodies.

Contact with the 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 in lecturing on programme courses.

### **Programme Curriculum**

**Bachelor's level:** Computer engineering, including programming, operating systems, data structures and algorithms, and software engineering (97.5 cr.), mathematics (45 cr.), natural science and engineering (30 cr.), and humans, technology, society (7.5 cr.).

**Master's level:** Computer engineering, including computer networking, computer security and software engineering (67.5 cr.), optional courses (30 cr.), elective courses in computer engineering (22.5 cr.).

### **Degree Title**

Master of Science in Computer Engineering

Civilingenjörsexamen Datateknik

### **Credit Transfer**

According to the *Higher Education Ordinance (Ch. 6 ½ 12-14)*, students may transfer credits from previously completed university courses subject to approval.

### **Additional information**

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