FACULTY OF HEALTH, SCIENCE AND TECHNOLOGY

Master in Mechanical Engineering - Specialization Data-driven Mechanical Engineering

Masterprogram i maskinteknik - inriktning datadriven maskinteknik

Programme code: TAMDD

ECTS Credits: 120
Education level: Second cycle
Degree type: General qualification
Language of instruction: English

Finalized by

Faculty Board of Health, Science and Technology, 2025-10-14

Valid from

Autumn semester 2026

Entry requirements

Bachelor's degree in mechanical engineering or comparable, including at least 75 ECTS credits in mechanical engineering or materials engineering.

Applicants must also have:

- At least 22.5 ECTS credits in mathematics
- At least 7.5 ECTS credits in programming or data processing
- At least 7.5 ECTS credits in solid mechanics
- At least 7.5 ECTS credits in materials engineering
- At least 7.5 ECTS credits in production systems or mechanical design.

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English B / English 6 or equivalent is also required.

Introduction

The program leads to a Master's degree in Mechanical Engineering. The program aims to prepare students for engineering roles in mechanical engineering, with an emphasis on data-driven methods in design and simulation. It is built on three pillars: cutting-edge expertise in mechanical engineering, digital skills, and collaborative skills. This combination equips students for interdisciplinary work and emerging industrial roles in digitalized manufacturing, design, and R&D. In addition, students learn how digitalization improves efficiency and sustainability through improved decision-making and reduced material and energy use.

Programme outcomes

The Higher Education Ordinance, Degree Regulations, states the objectives to be achieved for a particular degree. The objectives for a master's degree are as follows:

Knowledge and understanding
For the master's degree, the student shall

- demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

Competence and skills

For the master's degree, the student must

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
- 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, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

Judgment and approach
For the master's degree, the student must

- demonstrate the ability to make assessments in the main field of study 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 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.

Independent project (degree project)

A requirement for the award of a Degree of Master (120 credits) is completion by the student of an independent project (degree project) for at least 30 credits in the main field of study. The degree project may comprise less than 30 credits, however no less than 15 credits, if the student has already completed an independent project in the second cycle for at least 15 credits in the main field of study or the equivalent from a programme of study outside Sweden.

Programme structure

The programme covers four semesters (120 credits) and comprises courses within the main field of at least 60 credits, including a degree project of 30 credits.

Progression is ensured by the implementation of increasingly complex learning outcomes, which are designed to both provide specialisation and form the basis for assessment. 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 to current research is particularly important for scientific and methodological specialisation. Karlstad University's continual quality development is ensured by 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. Through partnerships and the inclusion of external representatives in preparatory and decision-making faculty bodies, the degree programme maintains its relevance in relation to the wider community.

Internationalisation

Karlstad University wants to promote collaboration and exchange with other universities. In line with this, Karlstad University has partnerships with many other universities in Sweden and abroad, as well as 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

The program begins with mandatory advanced courses in material engineering, applied data analysis and machine learning, simulation and scientific computing. The program also includes advanced courses in data-driven dynamic systems, optimization and industrial networks, material engineering and cybersecurity.

Depending on previous knowledge, an introductory course to the finite element method or material engineering is provided during the first semester.

Opportunities for individualization are provided primarily during semester 2 and 3, via elective courses in mechanical engineering of 22.5. It is recommended that the student obtain information about this and consult with the program director when making these choices, as it is important for the nature of the degree that the student intends to complete.

The studies conclude with a degree project in the field of mechanical engineering of 30 credits.

Structure of the programme

(C) = Compulsory, (E) = Elective

Year 1

Autumn semester

(C) Programming with mechanical engineering applications 7.5 hp
(C) Data analysis and applied machine learning 7.5 hp
(C) Polymer Engineering 7.5 hp
(E) Materials in industrial applications 7.5 hp or Finite element method basics 7.5 hp

Spring semester

(C) Networking and cybersecurity in mechanical engineering 7.5 hp
(C) Data-driven dynamical systems 7.5 hp
(C) Simulation and modelling 7.5 hp
(E) Production systems II 7.5 hp or Engineering design II 7.5 hp

Year 2

Autumn semester

(C) Optimization-driven mechanical design 7.5 hp
(C) Project in data-driven mechanical engineering 7.5 hp

(E) Sustainable product development 15 hp or Project in simulation and modeling 7.5 hp or Robotics and intelligent control 7.5 hp or Electrical power systems technology 7.5 hp

Spring semester

(C) Final project 30 hp

Title of qualification

Master degree in mechanical engineering

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.

Additional information

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