Finalized 2025-12-16
Reg.no. HNT 2025/815

FACULTY OF HEALTH, SCIENCE AND TECHNOLOGY

Master of Science in Chemical Engineering

Civilingenjör Kemiteknik

Programme code: TACKT

ECTS Credits: 300
Education level: Second cycle
Degree type: Professional qualification
Language of instruction: Swedish and English

Finalized by

Faculty Board of Health, Science and Technology, 2025-12-16

Valid from

Autumn semester 2026

Entry requirements

General entry requirements plus

Mathematics 4/E, Physics 2 and Chemistry 1

or

Mathematics Further level 2, Physics level 2 and Chemistry level 1

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Introduction

Chemical engineering involves applying interdisciplinary approaches to the design of large-scale processes and systems, as well as to materials development. The combination of molecular and technical perspectives and the development of experimental skills are important components of a study programme in chemical engineering. Access to chemical engineering expertise is essential for society's transition to sustainable manufacturing processes based on renewable raw materials and energy. The Master of Science in Chemical Engineering at Karlstad University applies a holistic approach to how chemical engineering can contribute to sustainable social development and focuses on designing sustainable processes for both the business sector and the public sector.

Programme outcomes

The Higher Education Ordinance, System of Qualifications, specifies the outcomes required for certain degrees. The outcomes for a Degree of Master of Science in Chemical Engineering are 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 and proven experience in his or her chosen field of technology 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 complex issues autonomously and critically and with a holistic approach and also to participate in research and development work and so contribute to the formation 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 his or her 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 Degree of Master of Science in Engineering the student shall

- 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 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 System of Qualifications outlined in the Higher Education Ordinance, the Master of Science in Chemical Engineering at Karlstad University includes the following specific targets:

Knowledge and understanding

For a Degree of Master of Science in Engineering the student shall

- demonstrate in-depth knowledge of the principles of chemistry and how these are applied in chemical engineering, and
- demonstrate sound knowledge of the different dimensions of sustainable development.

Competence and skills

For a Degree of Master of Science in Engineering the student shall

- demonstrate the ability to connect the principles and proven experience of chemical engineering and chemistry with sustainability criteria in the design of new products, processes and systems.

Judgement and approach

For a Degree of Master of Science in Engineering the student shall

- demonstrate the ability to present arguments and adopt a proactive approach when the requirements for designing a new product or process are partially conflicting.

Programme structure

The programme is divided into two educational cycles: **bachelor's level** (180 credits) and **master's level** (120 credits). The programme comprises prescribed and free elective ourses. It is recommended that students confer with the programme coordinator when choosing such courses, since it will affect what courses will follow as well as the nature of the degree. There are opportunities for studying abroad.

Studies at the **bachelor's level** comprise six semesters (180 credits) and include basic chemistry and chemical engineering, as well as courses in mathematics and technology. Students are trained in experimental work and project work, which is communicated in writing and orally. The courses aim to provide students with knowledge in basic chemistry and chemical engineering, and prepare them for studies at master's level. Students can opt to complete a Degree of Bachelor of Science with Chemical Engineering as the main field of study.

Studies at the **master's level** comprise four semesters (120 credits) of specialised courses in chemical engineering of at least 90 credits, including a degree project of 30 credits.

Contact with the wider community is established early on in the programme and maintained throughout in order to let students come into contact with possible future careers, as well as to allow for collaboration in the courses. At the master's level, there is also close collaboration with researchers in chemical engineering.

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

Bachelor's level: Courses in chemical engineering, 75 credits, including basic chemical engineering, chemical engineering in society, applied thermodynamics, fluid mechanics, chemical reaction engineering, materials and environment, heat and mass transfer, introduction to separtion processes and equipment design, and separation processes.

Courses in chemistry, 45 credits, including basic chemistry, chemical calculations, organic chemistry, biochemistry, physical chemistry and analytical chemistry.

Courses in mathematics, 37.5 credits, including basic mathematics, analysis and geometry, linear algebra, calculus in several variables, and stochastic methods.

Courses in another technical field, 22.5 credits, including mechanics with applications, solid mechanics, and programming techniques.

After semester 6, students can also opt to complete a bachelor's essay in chemical engineering, 15 credits, for a Degree of Bachelor of Science.

Master's level: Mandatory specialisation courses in chemical engineering, 52.5 credits, Forest bioeconomy – processes, energy and products, Pulp and paper technology, Pulp and paper technology II, Bio-based materials and products, as well as prescribed elective specialisation courses in chemistry or chemical engineering or broadening courses, 7.5 credits, and a degree project for a Master of Science in Chemical Engineering, 30 credits.

Semester 8 comprises free elective courses in natural sciences and engineering, 30 credits. Semester 8 is also recommended for studies abroad.

Title of qualification

Master of Science in Chemical 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. 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.

This programme syllabus will replace the previous version approved 1 December 2022, reg. no: HNT 2022/658.