



Faculty of Health, Science and Technology

Programme Study Plan

Master of Science in Industrial Engineering and Management

Programme Code:	TACIE
Programme Title:	Master of Science in Industrial Engineering and Management Civilingenjör Industriell ekonomi
ECTS Credits:	300 ECTS credits
Approval:	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.
Language of Instruction:	Swedish and English
Degree Level:	Master's
Degree Type:	Professional
Prerequisites	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

The programme leads to a Master of Science in Industrial Engineering and Management. The aim is to develop students' knowledge and understanding of issues connected to the commercial application of technology. Accordingly, the programme integrates engineering, economics and management, while using mathematics as an important analytical tool. Karlstad University's Industrial Engineering and Management programme is based on mechanical and computer engineering. At master's level courses on Business and Innovation as well as on Production are included. Students may specialise in one of these areas or in a combination of the two. Connections between mechanical and computer engineering will be important in the digitalised manufacturing processes of the future, and also in future innovations that will be enhanced through so-called servicification (customer-adapted services for increased value creation), an area in which Karlstad University conducts leading research.

The programme leads to insight into the role played by engineers in economic and social aspects of societal development, and prepares students do responsible work. The programme provides knowledge and skills that are nationally in demand and internationally competitive as well as a good foundation in natural sciences and technology, economics, management, and mathematics and also develops students' personal traits and approaches.

Graduates from Karlstad University's Industrial Engineering and Management programme combine their skills in engineering and natural science with management of technology-based activities. They may serve to link engineers and natural scientists lacking backgrounds in economics with economists lacking backgrounds in engineering or natural sciences.

Aims

Upon completion of the programme, graduate engineers 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 in Industrial Engineering and Management, 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 ECTS credits.

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 Industrial Engineering and Management should also:

- Knowledge and understanding
 - have sufficient knowledge and understanding of computer and mechanical engineering to be able to follow and contribute to development in these fields, based on an understanding of economic conditions,
 - demonstrate broad knowledge of economics and specialised knowledge of some aspects of the field, and
 - demonstrate ability to critically review and assess decisions from economic and engineering perspectives.
- Competence and skills
 - demonstrate ability to formulate and analyse problems in industrially-affiliated research and development work based on economic models and knowledge of project and organisational management, and
 - demonstrate ability to work in groups in international and transdisciplinary environments.
- Judgement and approach
 - demonstrate insight into the possibilities and limitations of business sciences, the role they play in society as well as people's responsibility for their application, and
 - demonstrate insight into the importance and practice of leadership.

Programme Structure

The programme is divided into two levels: **Bachelor's level** (180 ECTS cr.) and **Master's level** (120 ECTS cr.).

The **Bachelor's level** comprises six semesters and includes courses in mathematics, natural sciences and engineering, as well as an introduction to areas of the humanities and social sciences. Students also develop skills in project work, report writing and communication. These courses prepare students for Master-level studies, but may also lead to a Bachelor's degree in industrial engineering and management. Students deciding to conclude their studies with a Bachelor's degree are no longer guaranteed places on Master's level. This is therefore not a recommended course of action for students wishing to continue to complete a Master's of Science degree in Engineering at Karlstad University, but is an option for students wishing to wrap up their studies at this university.

The **Master's level** comprises four semesters of specialisation in industrial economics and management in the areas of Business and Innovation and Production. A degree project of 30 ECTS credits is included.

The programme includes blocks of elective and/or optional courses. Students should ensure that they have the necessary information about these and should consult the study counsellor/programme coordinators when choosing courses, since choices can affect subsequent courses and the nature of the degree obtained.

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 and for cooperation in courses.

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.

Specialisation in the programme 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 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 community and through including external representatives in preparatory and decision-making faculty bodies.

Internationalisation

Karlstad University wants to promote cooperation and exchange with other universities. Karlstad University collaborates with many other universities in Sweden and abroad, and encourages students to make the most of such opportunities. Programme students who want to complete some of their courses at foreign institutions, preferably a semester on Master's level, are therefore supported.

Programme Curriculum

Bachelor's level: Foundational courses in mathematics, industrial economics and management, natural science and engineering (mechanical and computer engineering). In addition at least 7.5 ECTS credits are completed in the area of Humanity, Technology and Society. During semester 5 and 6 students may elect course from industrial economics and management (business and innovation, as well as production) or courses in computer or mechanical engineering.

Master's level: The final two years on the programme includes comprise 120 ECTS cr. of specialisation on Master's level. At least 30 ECTS credits comprise elective courses, enabling students to specialise in either Business and Innovation or Production. Students adopt a degree profile through their choice of electives.

Students may also choose up to 15 ECTS credits of elective courses in computer or mechanical engineering. 15 ECTS credits of the compulsory courses constitute preparation for the degree project, including an introduction to the research field of industrial economics and management and to research methodology.

The programme concludes with a degree project in industrial economics and management of 30 ECTS credits (equivalent to 20 weeks of fulltime study).

Degree Title

Master of Science in Industrial Engineering and Management

Civilingenjörsexamen industriell ekonomi

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.