UNIVERSITY OF SKÖVDE

TRANSLATION FROM SWEDISH

PROGRAMME SYLLABUS

Computational Methods in Engineering - Master's Programme

120 credits

Programme code: IBEMA
Version number: 5
Valid from: Autumn term 2027
Ratified by: Curriculum Committee for Engineering Science
Date of ratification: 1 June 2026

1. General information about the study programme

The study programme is provided by the University of Skövde and is named Computational Methods in Engineering - Master's Programme (Industriell beräkningsteknik - masterprogram). It comprises 120 credits and is a second-cycle programme. The main field of study is Virtual Product Realization.

2. Entry requirements

A Bachelor's degree equivalent to a Swedish Kandidatexamen of 180 credits, with a major within mechanical engineering or production engineering (or the equivalent). Additionally, courses of at least 7.5 credits in Strength of Materials (or equivalent) and 7.5 credits in the Finite Element Method (or equivalent) are required.

A further requirement is proof of skills in English equivalent of studies at upper secondary level in Sweden, known as English course 6 or English level 2 (or equivalent). This is normally demonstrated by means of an internationally recognized test, e.g. IELTS, TOEFL or the equivalent.

The entry requirements above are applicable for admission to the study programme. For further studies within the programme, the entry requirements for each course must be met. These entry requirements are specified in each separate course syllabus.

3. Study programme content

The program focuses on the development and use of digital tools for modeling and simulation in modern engineering. The program's courses deal with both theory and application of numerical methods and simulation techniques. The first part of the program focuses on how IT can be applied in an engineering context, ie. to process, represent, use and communicate information in different types of systems and models. This includes courses in modeling, optimization, Artificial Intelligence (AI), research methodology and a project course where students can apply acquired knowledge. The latter part of the program focuses on applications of numerical methods and simulation techniques in engineering. This includes courses in modeling, computer-aided manufacturing and process-planning as well as simulation techniques that together enables handling of engineering problems in a wide range of technical applications. The emphasis of the program's applications focuses on mechanical engineering designs and manufacturing processes. The program ends with a degree project where the acquired knowledge is to be applied by independently formulating and solving a problem of a research and development nature within the main subject area.

The following courses are included in the programme

Artificial Intelligence for Visual Anomaly Detection A1N 6 credits

Advanced Computer-Aided Manufacturing A1N, 6 credits

Data Driven Analytics A1N, 6 credits

Data Acquisition, Control and Monitoring A1N, 6 credits

Computational Intelligence A1N, 6 credits

Industrial Systems Philosophy A1N, 6 credits

Optimisation-driven Design A1N, 6 credits

Systems Thinking A1N, 6 credits

Design and Development Project I A1N 6 credits

Design and Development Project II A1N 6 credits

Scientific Theory in Industrial Informatics A1N, 6 credits

Research Methodology and Communication A1F, 6 credits

Engineering Optimization: Methods and Applications A1F, 6 credits

Virtual Process Modelling A1F, 12 credits

Master Degree Project in Virtual Product Realization A2E, 30 credits

4. General objectives

Objectives for education at the second-cycle level in The Higher Education Act

Second-cycle courses and study programmes shall involve the acquisition of specialist knowledge, competence and skills in relation to first-cycle courses and study programmes, and in addition to the requirements for first-cycle courses and study programmes shall:

- further develop the ability of students to integrate and make autonomous use of their knowledge,
- develop the students' ability to deal with complex phenomena, issues and situations, and
- develop the students' potential for professional activities that demand considerable autonomy, or for research and development work.

5. Study programme objectives

Main area of education is virtual product realization.

Objectives for Master's Degree according to the Higher Education Ordinance

Knowledge and understanding

For a master's degree (120 credits) 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 specialized methodological knowledge in the main field of study.

Competence and Skills

For a master's degree (120 credits) the student shall

- 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.

Judgement and Approach

For a master's degree (120 credits) the student shall

- 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.

Local Objectives for the Study Programme according to the University of Skövde

Students shall, after completion of the programme

- demonstrate the ability to develop and evaluate digital tools to formulate technical solutions with regard to the development of a sustainable society.

6. Language of instruction

The teaching is conducted in English.

7. Degree qualification

A student who passes the courses in the programme fulfills the requirements for obtaining a Degree of Master of Science with a major in in Virtual Product Realization.

Degree certificates are issued after application. Information about how to submit an application can be found on the website of the University of Skövde.

8. Changes to the programme syllabus

The programme syllabus and its courses may be changed, within the framework of the objectives for the study programme.

9. Student influence

Student influence in the study programme is ensured by means of programme evaluations. The students are informed about the results of the evaluations and potential measures that have been taken or are planned, based on the course evaluations.

10. Additional information

Further information about the study programme, as well as national and local governing documents for higher education, is available on the website of the University of Skövde.