Faculty of Technology and Science

PROGRAMME STUDY PLAN

Programme Code	TAMMM
Programme Approval	The Programme Study Plan was approved by the Faculty Board of Technology and Science on 29 October 2009 and is valid from the autumn semester of 2010 at Karlstad University.
Programme Title	Master Programme in Mechanical Engineering with specialisation in Materials Engineering
Credits	120 ECTS
Language of Instruction	English or Swedish
Degree Level	Master's
Degree Type	General
Prerequisites	A Bachelor of Science degree of 180 ECTS cr. in Mechanical Engineering, or equivalent, including the following: • Mathematics 30 ECTS cr., covering basic one and multivariable calculus, linear algebra and partial differential equations • Basic mechanical engineering of 90 ECTS cr., including materials, design and manufacturing engineering.

General Information

The aim of the study programme is that students acquire advanced qualifications in the field of mechanical engineering with specialisation in materials engineering. The training is designed to provide a mechanical engineering perspective with a basis in materials, design and manufacturing engineering. The focus is on engineering design application, which includes functional materials and engineering materials in the manufacturing process, designs and consumption products. The materials engineering specialisation also provides special knowledge of the materials aspects of the design process, which contributes a holistic view to the process and supports constructive

interaction between the expert areas involved. Advanced materials analysis and broad knowledge facilitate strategic selection of right materials for a certain application. The programme prepares students for design work, industrial research and development, and for doctoral studies.

Aims

Knowledge and understanding

For a Master's Degree, students should be able to demonstrate

- knowledge and understanding of mechanical engineering, including a broad view of the field as well as in-depth knowledge of materials engineering and insight into current industrial research and development work,
- deeper methodological knowledge in the main field of study, and
- ability to contribute to a sustainable development, for instance, in the selection of materials and processes.

Skills and abilities

For a Master's Degree, students should be able to demonstrate

- the ability to critically and systematically integrate knowledge and analyse, assess and handle complex phenomena, problems and situations even with limited information,
- the ability to apply a holistic view in a design process, integrating knowledge of materials engineering with knowledge of design and manufacturing techniques,
- skills in simulation and modelling of materials properties and design,
- the ability to critically, independently and creatively identify and formulate problems, and to plan, carry out and evaluate advance tasks using appropriate methods within a specified time limit, and thus contribute to knowledge development,
- the ability to clearly present and discuss conclusions and the information and arguments on which these are based orally and in writing in dialogue with different groups nationally and internationally,
- the ability to work in a group with others in international as well as interdisciplinary environments,
- the skills required to participate actively in industrial research and development work, and
- the ability to use systematic project management methods to plan, carry out and evaluate major and minor projects.

Judgement and approach

For a Master's Degree, students should be able to demonstrate

- the ability to make assessment in the mechanical engineering field taking into account relevant scientific, social and ethical aspects and awareness of ethical aspects of research and development work,
- insight into the potential and limitations of science, its role in society and people's responsibility for how it is used, and
- ability to identify their need of further knowledge and take responsibility for developing their knowledge.

Programme Structure
The programme runs over four terms, the last including the degree project. The courses in the first three terms are connected through common themes, one for each term. The studies are partly in the form of projects in which students work together with the same task. Students practise presenting their work orally and in writing. The structure allows students to combine courses to create a programme matched to their needs and interests.

Programme Curriculum

Term 1
Theme: Materials, shape and manufacturing
The aim is to provide further knowledge and reinforce basic knowledge of materials, shape and manufacturing and their function in the design process. Students are also expected to learn to master IT-tools while working on projects, for instance, drawing up CAD-plans, performing strength calculations, selecting materials, and simulating manufacturing processes.

Mandatory courses 22.5 ECTS cr.
Materials in Industrial Application 7.5 cr.
Project Work on Engineering Design 7.5 cr.
Materials Characterisation 7.5 cr.

Electives 7.5 ECTS cr. (examples)
Manufacturing Technology 7.5 cr.
Materials Selection 7.5 cr.

Term 2
Theme: Materials, models and simulation
The aim is to provide advanced knowledge in the field of materials engineering and to develop students' ability to use numerical methods in strength calculation as well as their ability to work with industrial development.

Mandatory courses 30 ECTS cr.
Deformation and Failure 7.5 cr.
Simulation and Modelling 7.5 cr.
Project Work on Simulation and Modelling 7.5 cr.
Project Management 7.5 cr.

Term 3
Theme: Materials and mechanical properties
The aim is to provide advanced knowledge in the field of materials engineering microstructures (constitution and morphology of materials), mechanical properties and materials development trends. Students are also expected to develop their abilities to do research in an industrial and/or academic setting.

Mandatory courses 15 ECTS cr.
Polymers and Polymer-Based Composites 7.5 cr.
Project Work on future Engineering Materials 7.5 cr.

Electives 15 ECTS cr. (examples)
Surface Technology and Tribology 7.5 cr.

Term 4
Degree Project 30 ECTS cr.

Degree Title
Master of Science Major Mechanical Engineering

Credit Transfer
According to the *Higher Education Ordinance* (Ch 6, § 12-14), students may transfer credits from previously completed university courses subject to approval. Transfer of credits for a course module, or university studies generally, is subject to the approval by the course examiner. Transfer of credits for a full course is subject to the approval by the Rector

Additional Information
Students are not allowed to start working on their Degree Project until they have completed programme courses totalling 60 ECTS cr.

The local regulations for undergraduate studies at Karlstad University stipulate the obligations and rights of students and staff.