Mechanical Engineering

Fields of education: Engineering and Information Technologies

1. Professional qualification

Professional career outline

The Mechanical Engineering profile covers all activities related to the development, manufacture, use and optimisation of machinery, materials, equipment and products in the industrial, research and regulatory environment.

Graduates with a MSE in Mechanical Engineering are able to identify and analyse problems, independently develop technical engineering solutions and successfully translate these solutions into marketable products. It is important to use the existing technologies in mechanical engineering efficiently to maximise the company's success under consideration of environmental and social constraints. Graduates must be able to create complex designs taking into account the applicable standards with state-of-the-art CAx technologies. The mechanical understanding of machines is supplemented by a holistic consideration of complete systems and the ability to evaluate and optimise machines and systems.

Preferred fields of application for graduates with a master's degree in mechanical engineering are senior positions with management responsibilities in the fields of R&D and production. This can be in manufacturing and engineering companies as well as in the public sector.

Professional skills

The education provided in the profile Mechanical Engineering gives students a comprehensive understanding of technologies, technical products and systems. It takes into account the fact that present day technology increasingly requires comprehensive knowledge in the fields of product development, materials and production technology.

The professional competences to be acquired include the conception, development and production of components and systems as well as the necessary materials and means of production. The focus is on mechanical and mechatronic systems including control and automation. In addition to this, students acquire in-depth mathematical competences for simulation, analysis, optimisation and verification.

In addition to professional expertise, methodological competences are central: Master's graduates are in a position to solve complex problems with adequate methods. They can quickly ascertain the international state of knowledge, assess existing scientific approaches and select and apply them according to their own situation. They are able to capture the requirements of all stakeholders and optimally fulfil them under the given conditions.

Entry skills

Specific skills are required to enrol in this profile. Students holding one of the following Bachelor degrees generally fulfil these entry requirements.

- BSc in Mechanical Engineering (Maschinentechnik und Maschinenbau)
- BSc in Microtechnology (Mikrotechnik)
- BSc in Automotive Engineering (Automobiltechnik)
- BSc in Industrial Design Engineering
- BSc in Materials and Process Engineering (Material- und Verfahrenstechnik)
- BSc in Systems Engineering (Systemtechnik)

The assessment of the entry skills is part of the enrolment process of the respective school. Students who do not hold one of the above mentioned Bachelor degrees will be individually assessed for their suitability by the respective University of Applied Sciences.

Differentiation to bachelor level

Compared to the graduates of a bachelor's program, the graduates with a MSE in Mechanical Engineering will be able to develop not only components, parts and characteristics of a product or process, but also independently design the products and systems taking into account the design and functional requirements. The MSE graduates are able to conduct complex projects in an industrial and research environment, to apply a broader range of toolsets and to take on leadership roles through in-depth analysis and abstraction skills.

2. Profile contents

The profile covers the following content:

Graduates of the profile Mechanical Engineering are able to manage the design, modelling, prototyping, testing, measuring, validating, and optimizing of components, modules or whole systems to fulfil the requirements for standards, safety and functionality. This involves tasks such as sampling and assessing materials for the final product, utilizing digital tools to create and to optimise designs, and determining the process guidelines for optimum functionality.

They master development methods and look at the entire product life cycle right through to product disposal and recycling. They use state-of-the-art development tools, production technologies and manufacturing processes to optimise costs and deadlines in compliance with safety, environmental and quality requirements.

Mastering new production technologies with a holistic view will be vital to keep Swiss production at a competitive level. Industrial production methods will see fundamental changes over the coming years. New manufacturing processes (e. g. Additive Manufacturing) will offer revolutionary opportunities, and together with the definition of new materials, and new concepts and solutions for manufacturing design, simulation and execution, have the potential for a major upheaval.

Production Technology is a multidisciplinary domain, which encompasses a broad set of enabling technologies, processes and practices. It will require fundamental knowledge in process and systems engineering and at the same time, particular attention will be dedicated to complementary and orthogonal aspects like digital manufacturing (cyber-physical systems), energy efficiency and environmental and social sustainability. MSE students will leverage on the previously listed aspects in order to be able to design and develop the next generation of sustainable manufacturing systems. Therefore they need strong competences in the integration of technologies and components independently from the domain of application.

Materials are no longer defined at the end of the design process, but are part of the early design development. In this context Master's graduates analyse and test materials and material surfaces as well as the associated production methods. They are able to build up and deploy complex constitutive models to describe and understand advanced material behaviours. In addition they can develop and select suitable materials for a given application, characterise them and apply them to the final product. Master graduates can also view and assess more complex systems in a particular application, from the selection of raw materials to product disposal or recycling.