Energy and Environment

Fields of education: Engineering and Information Technologies

1. Professional qualification

Professional career outline

Graduates with a MSE in Energy and Environment occupy a wide range of positions in the field of industry and the public - and service sector as well.

With their competences, they assess issues related to both classical and sustainable energy production, storage and conversion as well as their distribution and demand-side management in a comprehensive way; in doing so they take into consideration the efficient use of natural resources and the protection of the environment. In implementing the solutions, they consider – beside the technical ones - the legal and economic constraints as well as the social acceptance.

Professional skills

The Master's graduates of the profile of Energy and Environment have competences in energy as well as environmental and process engineering. They have a thorough technical knowledge within the basic areas of electrical energy technology, fluid- and thermodynamics, environmental technology or heat and material transport.

Above all, they can systematically analyse, describe, model and simulate complex technical processes across disciplines. This enables them to develop, optimise, implement, remove and operate efficient and resource-saving plants, systems and processes and, in addition, to provide sophisticated services.

The comprehensive, interdisciplinary knowledge in topics such as energy, environmental and process engineering qualifies the graduates to provide a pragmatic decision-basis for issues in energy and environ-mental technologies and systems. The profound proficiencies allow and enable the graduates to work in interdisciplinary teams, to lead larger projects and to take on management tasks in the field of energy, pro-cess and/or environmental technology.

Entry skills

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

- BSc in Energy and Environment
- BSc in Renewable Energy and Environment
- BSc in Electrical Engineering
- BSc in Electronics Engineering
- BSc in Mechanical Engineering
- BSc in Automotive Engineering (Automobiltechnik)
- BSc in Materials and Process Engineering (Material- und Verfahrenstechnik)
- BSc in Systems Engineering (not accepted is B.Sc. Systems Engineering FHNW)

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

At Bachelor level most students are trained in sub-areas of the profile as e.g. electrical, mechanical or environmental engineering with a practical training leading to professional qualification.

The profound specialist knowledge allows the Master's students to conduct and lead applied research and development at the forefront of the respective domain.

The Master's course leads to in-depth proficiency in a broad field of energy and environment. This extended skill allows a graduate to combine multidisciplinary (e.g. electrical, electrochemical, thermal as well as fluid dynamic techniques) into complex energy processes and systems. During the Master's program the sensibility to implement sustainable processes for environmental protection is strongly developed.

2. Profile contents

The profile covers the following content:

Energy production covers "renewable energies" as e.g. photovoltaics or wind power as well as classical energy technologies (hydropower and fossil fuels including combined heat and power generation). The area of energy conversion includes power electronics, high-voltage technology, and (electro-)mechanical devices. Energy storage and distribution is covered in the innovative area of thermal and electrochemical storage and hydrogen technologies in stationary and mobile applications. Demand-Side Management includes measures to reduce energy consumption through increased energy efficiency but also for load-shifting to better match the distribution and transmission through smart grids and metering. Innovative prosumer and peer-to-peer concepts will be considered as well.

The content also includes the design, operation, control and optimisation of physical, chemical and bio-mass processes and contains the systematics of the material conversion technology under consideration of the procedural strategy on the basis of the three pillars "equilibrium", "balancing" and "kinetics". The fundamental principles of mechanical, thermal and chemical process engineering are trained; Students learn how complex systems are described, modelled and controlled. In particular, they learn to use modern data processing techniques to analyse coupled thermo-electro-chemical systems energetically and energetically. A concept of material cycling and energy recovery with respect to process optimisation complements the fundamental process engineering principles and conception of advanced combustion equipment.

Further content comprises the classical areas of environmental technology, namely the sustainable treatment of

- air (from stationary and mobile applications, exhaust gas, aviation)
- water (municipal and industrial wastewater treatment)
- recycling of waste and soil.

The students know the mechanical, chemical and biological processes used for environmental engineering. This includes system thinking, life cycle assessment, the implementation of concepts related to circular economy, innovation and integrated risk management with the aim of reducing resource and energy use, waste generation and emissions along the value chains and in production systems. The legal context and how legal regulations as well as normative and ecological conditions can be fulfilled is part of the education.