
Medical Engineering

Fields of education: Engineering and Information Technologies

1. Professional qualification

Professional career outline

Graduates are qualified and able to apply problem-solving strategies to detect and analyse market needs and requirements in the industrial and clinical field. The transfer of independently developed, engineering oriented solutions into market-oriented technologies and products is an important element in the profile.

The interdisciplinary relationship between different stakeholders in medical technology such as clinicians, hospitals, insurance companies, notified bodies / regulatory agencies and the industry is recognised with regard to the development and application of medical devices and diagnostic products.

The Profile "Medical Engineering" contains current topics in health science & medical technology such as biomedical engineering, digital health and medical diagnostics & devices. Clinical & industrial requirements combined with the development, optimisation, and application of engineering-oriented solutions is in the primary focus.

Professional skills

The profile Medical Engineering covers all activities in connection with the development, manufacture, use and optimisation of devices, products or services in the medical environment. The profile aims to provide knowledge and skills to conduct design studies and development projects for products, instruments and systems, and then to lead them to certification.

Graduates of the profile Medical Engineering are able to interact with various partners from medical, IT, mechanical, electrical, etc. profiles. They are able to recognise and analyse multidisciplinary problems, develop engineering solutions on their own.

This profile includes the regulatory requirements associated with medical devices for obtaining CE marking by compliance with European directives or possibly FDA requirements. Particular attention is paid to the risks associated with the use of medical devices for which methods and tools for risk analysis and management are developed.

Preferred fields of employment for graduates with a MSE Master's degree in Medical Engineering are senior positions in R&D and production with personnel and management responsibility.

Entry skills

Specific skills are required to enrol in this profile. Interested students will be individually assessed for their suitability by the respective University of Applied Sciences. The assessment of the entry skills is part of the enrolment process of the respective school.

Differentiation to bachelor level

MSE graduates have advanced competencies to solve complex interdisciplinary problems and develop technical solutions specific to the medical field. They have gained specialist knowledge and skills by carrying out in-depth applied research projects.

MSE graduates are leading persons with a higher engineering level, a systemic understanding and a self-organizing capability.

2. Profile contents

The profile covers the following content:

Biomedical engineering is a very multidisciplinary field that covers orthopaedics, tissue engineering, regenerative medicine, biomechanics, biomaterials, microfluidics, rehabilitation, assistive robotics, implants & prosthesis, performance technology, aging or geriatrics, biomedical signal processing and mathematical modelling.

Digital health systems covers health care & hospital management, telemedicine, data analysis, machine learning, AI, safety, data protection, analysis of physiological time series in the context of small/smart/big data, as well as all aspects of data science relevant in the health context.

Medical diagnostics and therapeutic systems include following technical areas:

- Mechatronic system, embedded systems, low power design, sensors, personalised medicine (body functions modelling)
- Medical imaging, OCT devices, optics, signal processing, diagnosis in electrophysiology, in ophthalmology and in dermatology, MRI, CT, ultrasound, PET / SPECT, image quality and radiation exposure, medical diagnostics
- Point-of-Care diagnostics (lab-on-chip, micro-TAS, implantable sensors, pumps, and stimulators), wearable technologies, augmented-self concepts, invasive and non-invasive body marker measurements in combination with big-data analysis, massive DNA fingerprinting and data security

Market access of medical devices : Process landscape for medical devices, regulations (MDR, FDA, MDSAP) such as quality management, regulatory affairs, post market clinical follow up, risk management and usability, software development (SaMD), clinical evaluation, Good x Practice (GxP – x: laboratory / manufacture / distribution / clinical), advanced medical device product/system development processes, biocompatibility and sterilisation processes, supply chain management, market access for suppliers.

Furthermore, ethic and social aspects of the use of medical technologies are being addressed.