Mechatronics and Automation

Fields of education: Engineering and Information Technologies

1. Professional qualification

Professional career outline

The Mechatronics and Automation profile is concerned with the design of autonomous systems by means of sensors, data processing and actuators. While the systems to be controlled come from a diverse range of disciplines, an automation system itself can often be classified as a mechatronics system, meaning that it consists of mechanical and electronic elements. A typical example would be a robot, which in itself is a mechatronics system, but which can also be used as an actuator in an automated process. The data processing on the other hand is typically executed on embedded devices, and borrows its methods from computer science as well as from math and signal processing.

Graduates with an MSE degree in Mechatronics and Automation can carry out research and can be employed in a broad range of industries such as the aerospace, automotive, chemical processing, communications, healthcare, microtechnology, manufacturing and food industries, as well as in automation and control system design.

Jobs in the field include electric-mechanical technology, control-system engineering, embedded systems, data-logging engineering, and more. Professionals are typically employed in engineering, product development, research & development, and consulting.

Since mechatronic technologies and automation are required in so many different industries, professionals typically possess the systems thinking required to gain an understanding of the entire process at hand. Application-specific knowledge is often acquired either on-the-job or in interdisciplinary collaboration with domain experts.

Professional skills

MSE graduates with the Mechatronics and Automation profile possess expertise in the tools and methods needed to automate processes.

MSE graduates with the Mechatronics and Automation profile can model, analyse, design and implement mechatronics systems. They plan, design and create automated machines, devices and systems.

MSE graduates have profound understanding in the fields of mechatronics, robotics, measurement and control technologies. They have knowledge in adjacent fields such as signal processing, communications, data processing and data security. They master the interdisciplinary development methodology for mechatronics systems, from the analysis of the requirements to the final product, as well as data processing and security. They master the interdisciplinary development methodology for mechatronics systems, from the analysis of the requirements to the final product.

MSE graduates can analyse and evaluate complex systems, and they have the technical skills and the prerequisites to assume a project leader role.

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 Electrical Engineering
- BSc in Mechanical Engineering

- BSc in System Engineering
- BSc in Microtechnics
- BSc in Industrial Systems
- BSc in Mechatronics Engineering

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

In the MSE “Mechatronics and Automation” profile, students deepen their knowledge of the tools and methods available for process automation. This understanding facilitates MSE graduates to make use of advanced tools and technologies not available to bachelor students.

Compared to BSc graduates, who have acquired basic engineering knowledge, an MSE graduate will be able to carry out in-depth development and design of products and systems, by considering all the requirements independently.

Students can master different subject areas in the domain of mechatronics. Additionally, students are trained to apply a higher level of abstraction and implement cross-system concepts by working on real applied research projects. As a result, MSE graduates have all the prerequisites to lead projects in an industrial environment, and to participate in current research projects.

2. Profile contents

The profile covers the following content:

In «industrial systems», students of the Mechatronics and Automation profile are taught how to analyse and develop industrial systems at the integration level. The focus is on the automation of production lines using robots, sensors and other mechatronic systems. Particular attention is dedicated to problems related to data handling and security.

MSE graduates master the concepts of kinematics, dynamics and vibrations, and are able to choose and integrate sensors and actuators in the system. They are also familiar with concepts of statistics and machine learning for predictive maintenance.

The content of «mechatronic devices» contemplates the design and the development of integrated components, for example, of a more complex industrial system like robot arms or grippers, mobile robots, drones, medical systems etc.. Students therefore have deep knowledge in many fields like drives and power electronics, embedded and real-time systems, real-time algorithms and signal processing.

In «robotics» MSE graduates learn how to define, design and develop robotic systems capable of autonomous behaviour. They are able to select the required actuators, sensors, computer systems and communication systems needed for human-robot interaction. They are familiar with software systems required for the control and simulation of robot arms, mobile robots and drones and can develop applications with them. They can use sophisticated environment sensors like 3D-cameras and laser scanners. They can apply the necessary algorithms, libraries and software products to interpret them. They are also familiar with software systems to plan, learn and navigate in complex environments, and can network robots and integrate them into the cloud.

The content of «dynamic systems and control» deals with problems in the domain of advanced control.

MSE graduates master the methods of modelling, identification, simulation and control with the aim of improving the performances in nanopositioning systems, drive systems, MIMO processes, robotic systems and autonomous systems. They can measure, condition and fuse signals from sensors in order to integrate them into the control system, and use advanced control methods, like model based design, robust and optimal control, Model Predictive Control, Kalman filters, in continuous and discrete time domains.