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# Computer Science

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Fields of education: Engineering and Information Technologies

## 1. Professional qualification

### Professional career outline

The occupational profile of the MSE profile Computer Science is based on the job profiles in ICT<sup>1</sup> with consideration of the latest developments in ICT technologies.

Preferred job positions for MSE graduates in ICT Computer Science are expert positions in research and development as well as technical management in all kinds of service and production industry as well as in organisations in the private and public sector.

To that end, MSE graduates need master-level competencies in all important areas of computer science such as Software Engineering and Technology, Information- and Communication Systems, as well as cybersecurity and advanced user interfaces. They must be able to research and develop, plan, specify and conceptualise innovative solutions and architectures.

### Professional skills

MSE graduates have the knowledge and competences to research and develop, plan, specify and conceptualise innovative ICT systems and architectures. They can develop these systems in a user-centred manner considering the requirements of all stakeholders as well as security and regulatory issues. They can integrate these systems in heterogeneous IT landscapes. They can apply and further develop tools for data analysis and management, simulation and modelling efficiently and adequately. They can systematically and adequately test all kinds of IT systems and infrastructures. They can evaluate and optimise these systems regarding different quality criteria. They can analyse the risks of IT systems and IT projects and mitigate them in an appropriate way.

MSE graduates can solve complex problems using adequate expert, data analysis, and decision-making tools. They have learned to analyse and evaluate new technologies and research approaches in their specialisation area and to include explicit and implicit requirements and constraints in their decision processes.

They have acquired enough management competences to be able to lead smaller development teams in a productive way and to take the responsibility of managing IT infrastructures.

### Entry skills

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

- BSc in Computer Science<sup>2</sup>

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.

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<sup>1</sup> siwssICT Schweizerischer Verband der Informations- und Kommunikationstechnologie: Berufe der ICT, Informations- und Kommunikationstechnologien, 9. Auflage 2017

<sup>2</sup> There exist different UAS specific names of the BSc in Computer Science

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## Differentiation to bachelor level

In contrast to BSc students MSE graduates have a more solid theoretical and conceptual foundation in CS in general and deepened knowledge and skills in one or more selected areas mentioned below. They can abstract a problem situation in a way to find and realize efficient, sustainable and innovative solutions for the underlying general problem. They can assess and apply research findings in their specialisation area to real world problems in order to find innovative solutions.

## 2. Profile contents

The profile covers the following content:

MSE students in CS have master-level knowledge and skills in the main areas of Computer Science mentioned below and can acquire deepened knowledge and skills in one of these areas:

MSE students focusing on "Software Engineering and Technology" research, analyse and develop all kinds of innovative applications, software systems and architectures (e.g. parallel, cloud-based and IoT systems) in close collaboration with the stakeholders and customers. They are able design and develop advanced user interfaces in a user-centred way. They follow an adequate agile risk-based software development process and make use of appropriate software development tools and programming languages. They can take different roles in software development teams and even lead a smaller development teams.

MSE students focusing on "Communication Systems" analyse, plan, implement and run communication systems of all kinds that are connected, cloud-based, distributed, embedded or mobile. They can research and develop distributed applications, communication protocols, interfaces, services and systems, virtual platforms and networks and can run these systems in a secure and reliable way. They also have profound knowledge in wireless communication and IT security. They can assess and adopt new technologies in their field emerging from research.

Information systems are IT systems that facilitate the collection, organisation, management, analysis, retrieval or visualisation of any kind of information, e.g. text, audio or images. MSE students focusing on "Distributed Information Systems" research, develop, implement and run efficient distributed applications and information systems of all kinds, operating on both structured and unstructured data, at scale. These systems may be able to optimize themselves through learning from data and exhibit a great user experience. MSE graduates develop and implement these distributed applications, and information systems in a secure and reliable way. They can assess and adopt new technologies in their field emerging from research.

MSE students focusing on Cybersecurity will learn how to develop secure software and systems and how to attack and defend them. They know relevant cryptographic building blocks, design principles and methods, processes and security controls to build and maintain systems that are secure and that follow the security/privacy by design principle. The students know the threat landscape and they can take on the role of an attacker if needed. They can evaluate the security of a system and make recommendations on how to improve it. They can assess and adopt new security technologies emerging from research and investigate new threats emerging from practice.

MSE students focusing on "Advanced User Interfaces" research, design, implement and evaluate advanced user interfaces in a user centred way for professional as well as gaming application. These UIs use different modalities, e.g. gestures, speech, as well as virtual or augmented reality to allow a most natural interaction and best possible immersion for the user. The MSE students can assess and adopt new interaction technologies in their field emerging from research.

MSE students focusing on "Embedded Computing" will learn about integrating and optimizing complex systems composed byof heterogeneous hardware platforms and advanced software ecosystems. They will design performance critical software for heterogeneous platforms, including single/multiple processor boards, single/multiple core MCUs, GPUs, SoCs, and mission specific accelerators. They will study peripheral rich and connected systems addressing real time concerns, concurrency, and embedded operating systems integration. They will explore advanced hardware-software co-design methods for optimizing performance in term of energy efficiency and use of constrained resources.