Qualification goals
ASE – Master Automotive Software Engineering

Faculty of Computer Science at Deggendorf Institute of Technology

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Gender neutrality

All designations given to the various groups of university staff apply equally to all genders of the relevant groups.

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1 Objectives of the degree programme

The Automotive Software Engineering master's programme is designed primarily for graduates with a bachelor's degree in computer science or other technically related *Diplom* or bachelor's programmes, enabling them to consolidate their existing knowledge with theoretical and application-oriented knowledge in the field of automotive software engineering in order to specifically meet the requirements of modern development tasks in this high-tech field. The programme teaches essential advanced technical knowledge in selected areas of automotive software engineering that are necessary for the development of complex intelligent systems.

In addition, graduates will be further qualified to work independently and creatively in applied research and development in the areas specified above. The automotive industry is a key industry in Bavaria. In addition to car and lorry manufacturers, there are also numerous suppliers in Bavaria.

In modern vehicles, more and more functions are now implemented in software. There can be over 200 control units with up to 16 GB of software. Driven by the requirements of autonomous driving, graduates of this degree programme will be confronted with highly complex hardware/software systems in their future careers.
The degree programme therefore focuses on software development for autonomous driving, image recognition, artificial intelligence and embedded systems, in-car and Car2X communication.
The close connection to the DIT technology campus ensures research-oriented training in state-of-the-art laboratories.

2 Learning outcomes of the programme

The master's degree programme deepens and expands theoretical and application-oriented knowledge and skills.
The master's programme also expands on the technical skills in automotive informatics acquired in the *Diplom* or bachelor's programme, particularly in the context of autonomous driving. Master's students acquire the ability to work independently at an academic level, which is also promoted by the master's programme's connection to the research activities of the faculty and lecturers.
They will acquire knowledge of the methodological concepts and the latest research literature.

The knowledge and skills acquired will be applied to real or future-oriented problems derived from research projects and experiences within the Faculty of Computer Science in order to develop expertise and problem-solving skills in the fields of computer science, artificial intelligence, design of secure embedded systems, automotive communication systems, development and research. Furthermore, the ability to quickly and systematically familiarise oneself with new complex areas and problems is developed.

3 Programme outcomes and qualification goals

1. **Professional and methodological skills**:

Graduates acquire comprehensive knowledge and scientific basics in the field of automotive software engineering.
They deepen their knowledge of the state-of-the-art technology and methods in the field of automotive software.

This comprises, in particular

a) **Software development for vehicle systems:** Students develop the ability to design, implement and test complex software solutions for vehicle systems. This includes knowledge of programming languages, software architecture, algorithms and data structures.
b) **Embedded Systems:** Students master the development of embedded software for control units and sensors in vehicles. This includes working with communication protocols and hardware interfaces on modern microcontrollers.
c) **Vehicle communication and networking:** Knowledge of modern communication architectures (e.g. zone architecture) and modern networking technologies such as CAN and Automotive Ethernet is important. Students will be able to analyse and implement communication protocols.
d) **Software design for autonomous driving:** Modern technology such as image recognition and AI-based methods can be used effectively.
e) **Agile methods and project management:** Knowledge of agile software development methods and project management is essential for the efficient implementation of software projects in the automotive sector.

2. **Qualification for skilled employment:**

Students acquire the ability to apply interdisciplinary skills in the professional field of automotive software engineering. This comprises

a) Project management and teamwork: Students are able to plan, organise and implement complex software projects in a team. This includes coordinating tasks, managing resources and staying on schedule.

b) Application of software development methods: Graduates are familiar with various software development methods, both agile and classic. The ability to select and apply the appropriate approach for a specific project is important.

c) **Communication skills**: The ability to communicate technical concepts clearly and comprehensively is essential for success in the professional field. This includes writing technical documents, giving presentations and collaborating with customers and colleagues. Upon completion of the programme, students will be well equipped to do so.

3. Personal development:

Students acquire the ability to self-reflect and think critically in order to enable socially and ethically responsible behaviour. International students deepen their knowledge of the German language, whereas German-speaking students deepen their knowledge of another language. They are trained to:

a) **Self-reflection and self-management**: Students develop the ability to self-reflect and recognise their strengths, weaknesses and goals. This enables them to consciously shape their own development.

b) Critical thinking and problem solving: A master's degree programme promotes critical thinking. Students are able to analyse complex problems, evaluate different approaches to solutions and make informed decision.

c) Intercultural competence and empathy: The ability to work with people from different cultures is extremely important in a globalised world. Students develop empathy and respect for intercultural differences.

d) **Ethics and responsibility:** Personal development also includes addressing ethical issues. Students are aware of their responsibility as engineers and adhere to ethical standards in their work.

e) **Resilience and stress management**: The degree programme can be challenging. Students develop strategies for coping with stress and learn how to deal with setbacks.

f) **Continuous education and lifelong learning**: Personal development does not end with graduation. Graduates develop a willingness to continue their education and personal growth.

4 Learning outcomes of modules / module objectives / objectives matrix

Individual modules, their specific objectives and the skills to be acquired by graduates are described in the module handbook for the master's degree programme.

The following table shows the relationship between the individual modules and the objectives of the master's degree programme described in the previous section.

Objectives matrix of the modules in the master's degree programme Automotive Software Engineering

Module	Objectives											
	Expertise				Skills				Competencies			
	Automotive Informatics	Software Engineering	Embedded Systems	Self-development	Automotive Informatics	Software Engineering	Embedded Systems	Self-development	Automotive Informatics	Software Engineering	Embedded Systems	Self-development
Image Recognition	xx	x			xx	x			xx	x		
Digital Car / Innovation Management & Customer Design	xx		x	xx					xx		x	xx
Advanced Driver Assistance Systems	xx		xx		xx		xx		xx		xx	
Mobile Application & Interaction Design in Vehicles	x	xx	xx		x	xx	xx		xx	xx	x	
Communication Architecture (inCar)	xx	x	xx	x	xx	x	xx		xx	x	xx	x
English for Engineers				xx				xx				xx
Compulsory Elective	x	x	x	x	x	x	x	x	x	x	x	x
Artificial Intelligence and Software Development	x	xx	x		x	xx	x		x	xx	x	
Automotive Software Engineering	xx	xx	xx		xx	xx	xx		xx	xx	xx	
Project	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Automotive Microcontroller	x	xx	xx	x	x	xx	xx		x	xx	xx	x
Wireless and Car2X Communication	xx	x	xx		xx	x	xx		xx	x	xx	
Compulsory Elective	x	x	x	x	x	x	x	x	x	x	x	x
Master's Thesis	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx

Legend: xx strong relation; x medium relation