Usability and Dependability

1	Module Number	Study Programme	Semester	Offered in	Duration	Module Type	Workload (h)	ECTS Points
	3909	ASM	2	WS XSS	1 Semester	compulsory	210	7

2	Courses	Teaching and Learning Forms	Contact Time (SWS)	Contact Time (h)	Self-Study Time (h)	Language
	a) Safety and Security	Lecture	3	45	105	Englisch
	b) Automotive Man Machine Interaction (MMI)	Lecture	4	60 [1 SWS = 15h]		

3 **Learning Outcomes and Competences**

Once the module has been successfully completed, the students can...

Knowledge and Understanding

- … understand usability, user experience (UX), and users'/drivers' requirements and project management issues in the development of automotive applications
- ... understand safety and security issues in the development of automotive applications

Use, Application and Generation of Knowledge

Use and Transfer

- … understand and apply requirements analysis, test and documentation
- … understand and evaluate existing navigation systems
- … implement and test a prototype navigation system
- … understand usability and UX management according to ISO 9241
- … give presentations of project results

- ... understand the main concepts: safety, functional safety, security, information security.
- … understand the main concepts in security
- ... be aware of security threats in the automotive domain
- ... understand security risk management
- … understand the main concepts in safety
- … understand safety management according to ISO 26262

Scientific Innovation

- … use methods and tools to gain new insights in the field of usable and dependable automotive systems

Communication und Cooperation

- ... communicate actively within an organization and obtain information
- ... present technical contents and discuss them regularly
- ... communicate and cooperate within the group to find adequate solutions for the task at hand

Scientific Self-Conception/ Professionalism

- … derive recommendations for decisions from a social and ethical perspective based on the analyses and evaluations made

4 **Contents**

Lecture a): **Safety and Security**

- Main concepts: safety, functional safety, security, information security
- Main concepts in security
- Security threats in the automotive domain, e.g.
  - Insecure bus systems
  - Chip manipulation
  - Component theft

	○ Evading access controls • Counter measures based on cryptography • Security risk management • Safety and Security in vehicular ad hoc networks (VANETs) • Main concepts in safety • Safety management according to ISO 26262 Lecture b): **Automotive Man Machine Interaction (MMI)** • Basics terms and concepts of man machine interaction, requirements of graphical user interfaces, design requirements (software ergonomics, usability, dialog principles). On-board Pattern Recognition Systems. • machine vision systems (e.g. in traffic monitoring and automatic congestion detection, in driver assistance systems, for gesture recognition) • speech communication: speech recognition and understanding systems, speech dialogs: speech synthesis and language generation (Human-Machine Interface). • usability engineering, testing and evaluation of recognition systems Driver Assistance Systems • concepts for programming of driver assistance systems in automobiles: environment models, interpretation and fusion of sensor data, piloting functions, cooperative concepts. • implementation of important concepts in laboratory – user-centered design Human Factors Engineering • human factors, such as vision, cognition • driver attention and distraction • usability, user-centered design, UX • multimodal Interfaces Lab (programming exercises and presentations, simulation) Project • selected tasks and semester project (group work)
	Participation Requirements compulsory: - recommended: • C/C++ programming • computer networks basics • object oriented modelling (UML) • software engineering
6	**Examination Forms and Prerequisites for Awarding ECTS Points** Written Examination 120 min
7	**Further Use of Module** Master Thesis
8	**Module Manager and Full-Time Lecturer** Prof. A. Beck, Prof. Dr. D. Schoop,

9	**Literature** • *Shiho Kim, Rakesh Shrestha, Automotive Cyber Security Introduction, Challenges, and Standardization, Springer, 2020* • *Christof Paar, Embedded Security in Cars, 2005* • *Hans-Leo Ross, Safety for Future Transport and Mobility, Springer, 2021* • *ISO 26262 („Road vehicles – Functional safety“)* • *DIN EN ISO 9241 („Ergonomics of human-system interaction”)*
10	**Last Updated** 16 Oct 2022