Name of module:	**Reliable Embedded Systems**
Keywords:	dstributed real time systems, safety, security
Modulenumber:	**ASM 214**
Target group(s):	2. Semester ASM
ECTS-Credits:	8
Language of instruction:	English
Module owner:	Prof. Jörg Friedrich

Extent of work (hours)

Workload	Contact hours	Self study	Exam preparation
240	120	90	30

Prerequisites:	- C/C++ programming - computer architecture basics - operating system basics - object oriented modelling (UML)
Total target:	- Ability to analyze, design, and implement safety-critical distributed real-time systems - Awareness of safety and security issues in the development of automotive applications
Module content:	- Basic concepts for real-time systems - Distributed architectures and lobal time - Modeling real-time systems - Fault tolerance - Real-time communication - Real-time operating systems - Real-time scheduling - Validation of real-time systems - 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

Reference material:	• Kopetz, H.: Real-Time Systems, Kluwer 1997 • Veríssimo, P. and Rodrigues, L.: Distributed Systems for System Architects, Kluwer 2001 • Lecture material
Offered:	Summer term only

Submodules and assessment

Title of submodule	**Distributed Real-Time Systems**
Type of instruction / form of learning:	Lecture
ECTS-Credits:	4
Hours per week:	4
Aims, learning outcomes:	• to understand the requirements for distributed real-time systems • to understand and apply the concept of global time • to understand the concept of fault, errors, and failures • to understand event-triggered and time-triggered real-time communication • to understand real-time operating systems and real-time scheduling • to understand how to validate distributed real-time systems
Type of assessment:	final written examination 90 min

Title of submodule	**Safety and Security**
Type of instruction / form of learning:	Lecture
ECTS-Credits:	4
Hours per week:	4
Aims, learning outcomes:	• To understand the main concepts: safety, functional safety, security, information security • To understand the main concepts in security • To be aware of security threats in the automotive domain • To understand security risk management • To know about safety and security in vehicular ad hoc networks (VANETs) • To understand the main concepts in safety • To understand safety management according to ISO 26262
Type of assessment:	final written examination 90 min