

IT Fundamentals

1	Module Number 13574	Study Program ASM	Semester 1	Offered in XWS ☐ SS	Duration 1 Semester	Module Type compulsory	Workload (h) 180	ECTS Points 6
2	Courses		Teaching and Learning Forms		Contact Time		Self-Study Time (h)	Language
					(SWS)	(h)		
	c) Data Structures and Algorithms		Lecture		3	45	90	English
	d) Programmable Systems and Networks		Lecture		3	45		
3	Learning Outcomes and Competences Once the module has been successfully completed, the students can ... Knowledge and Understanding ... explain the architecture and workings of a modern computer ... understand the representation of items as data in computers ... explain the working of an operation system ... explain the challenges and solutions for communication between computers Use, Application and Generation of Knowledge <i>Use and Transfer</i> ... design an algorithm for a specific task ... implement an algorithm efficiently in an imperative programming language (C, Python) ... analyse the complexity of an algorithm ... choose a data structure suitable for a specific task ... analyse network communication ... choose types of network communication for a specific task ... consider the architecture of the computer and the operating system to implement a distributed system <i>Scientific Innovation</i> ... use methods and tools to gain new insights in the field ... create software solutions to task at hand Communication and Cooperation ... communicate actively within the lectures and obtain information. ... present technical contents and simulation results and discuss them with the class and the lecturer. ... communicate and cooperate within the group in order to find adequate solutions for the task at hand. Scientific Self-Conception/ Professionalism ... present and justify the solution to given tasks theoretically and methodically ... take ideas and suggestions from other source into consideration							

4	Contents a) Lecture: Data Structures and Algorithms • Number theory • Graph theory • Notation, design and classification of algorithms • Data structures: arrays, lists, sets • Complexity, efficiency, computability, O-notation • Search and sort algorithms • Programming in C • Programming in Python b) Lecture: Programmable Systems and Networks • Number and character encoding (range, resolution, overflows) • Architecture of computers • Architecture of CPU, memory and inputs/outputs • Overview of structure and tasks of an operation system • Types of operation systems • Processes and threads • Memory management • Inter-process communication and synchronization • File systems • Program execution • Network fundamentals and architectures • Addressing, media access (Ethernet, WLAN) • Local networks (IP) • Routing in networks • Transport protocols (TCP, UDP) • Application protocols
5	Participation Requirements Compulsory: • none Recommended: • Discrete mathematics • Basics of some programming language • Computer handling
6	Examination Forms and Prerequisites for awarding ECTS Points Written Examination 120 min
7	Further Use of Module Automotive Communication Usability and Dependability
8	Module Manager and Full-Time Lecturer Prof. Dr. Dominik Schoop
9	Literature • Brian W. Kernighan and Dennis M. Ritchie: The C Programming language, Prentice Hall, 2000 • Randal E. Bryant, David R. O'Hallaron: Computer Systems A Programmer's Perspective, Pearson, 2015 • Andrew S. Tanenbaum and Herbert Bos: Modern Operating Systems, Pearson, 2014 • James Kurose and Keith Ross: Computer Networking, Pearson, 2021
10	Last Updated 06.12.2023