IT Fundamentals

1	Module Number	Study Program	Semester	Offered in	Duration	Module Type	Workload (h)	ECTS Points
	3905	ASM	1	X WS SS	1 Semester	compulsory	180	6

2	Courses	Teaching and Learning Forms	Contact Time (SWS)	Contact Time (h)	Self-Study Time (h)	Language
	a) Data Structures and Algorithms	Lecture	3	45	90	English
	b) Programmable Systems and Networks	Lecture	3	45		
				[1 SWS = 15h]		

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

Use and Transfer

- … 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

Scientific Innovation

- … 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/ouputs • Overview of structure and tasks of an operation system • Types of operation systems • Processes and threads • Memory management • Interprocess communication and synchronisation • 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 Minutes
7	**Further Use of Module** Automotive Communication Usability and Dependability
8	**Module Manager and Full-Time Lecturer** NN, NN
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** 12.10.2022