

Modul – No.	716	Mandatory	
Module name	Informatics and Communication Technology		
Module coordinator	Prof. Hühn		
Title	Informatics and Communication Technology		
Title of examination	Informatics and Communication Technology		
Semester	03		
Course Type	Language	Lecture including exercises	English
SWS/ ECTS/ Workload	2/2/-	5	150
Requirements for attendance	None		

1. Content and objectives

Content:

a) Informatics

- Introduction: Information processing in technological systems, information-processing systems, IPO-model
- Basics of coding
- IP-Systems without memory – circuits: Normal Form theorem
- IP-Systems with memory – circuits and automata
- Flip-Flops, creation of a memory through feedback, basics of automation theory
- Computers as programmable systems with memory, Von-Neumann Architecture
- Solvability of problems: Computability of problems, Turing machine, complexity

b) Communication Technology

- Introduction into information theory
- Signals in time and frequency domain
- Analog-Digital-Conversion
- Baseband transmission and line coding
- Digital modulation and demodulation
- dB-calculation

Objectives:

The lecture submits basics knowledge about computers which enable engineers and computer scientist to enhance their usage, developing and programming of computers. The students are able to understand the relation between bits in a computer and bits as information (quantity of information) and they will be aware that the interpretation (decoding) of bits is always context-sensitive. On completion, they are able to work and calculate with binary numbers (unsigned, complement of two, floating-point number). The attendants will master the description of information through bits, octal numbers and hexadecimal. Furthermore, the students will be able to describe simple sequential information-processing problems as automata.

The students can display and explain communication relations as source-sink relation and apply the model of digital transmission on any communication scenario. They are familiar with the substance of information and the correlation of Information – Message (Data). The students know the basic terms of the information theory. They can classify continues and discrete information sources and know the meaning of important categories such as entropy (in information theory), redundance, redundancy reduction (entropy encoding) and can calculate the redundance and entropy for simple and discrete sources. They know about the relation of redundance and error correction. They can estimate the ability of code for error correction on basis of the Hamming distance.

The students know the analog-digital-conversion as source encoding of continuous sources. They master the sampling-theorem and the description of quantization errors with the help of the quantization noise.

The students can recognize the source coding/decoding as interface between information source or sink and digital channel, in the model of the digital transmission. They will be able to determine transfer functions through measurements. They know and master the essential digital modulation schemes and line coding schemes and can distinguish between bitrate, bandwidth and symbol rate (signal alternation speed). The acquisition of application-oriented knowledge is maintained especially through the conduction of laboratory experiments.

2. Methods of instructions

Lecture with integrated exercises

3. Requirements for attendance

For the attendance are knowledge of higher mathematical functions required, especially differential and integral calculation.

The students receive next to the lecture script a summary of exercises and instruction for the conduction of experiments in the laboratory. Those manuals contain a theory part that deepen the required knowledge for conducting the experiments. The following literature is recommended for the preparation or postprocessing of the course:

- Proakis, John u.a.: Grundlagen der Kommunikationstechnik. Pearson Studium 2004
- Widenfeller, Hermann: Grundlagen der Kommunikationstechnik. Teubner Stuttgart 2002.
- Mildenerger, O.: Informationstechnik kompakt; Theoretische Grundlagen. Vieweg Braunschweig 1999.
- Kreß, Dieter; Kaufhold, Benno: Signale und Systeme verstehen und vertiefen. Vieweg und Teubner Verlag Wiesbaden, 2010.

4. Usability of this module

The module is offered as mandatory course in the master study course „Computer Engineering for IoT Systems“ as well as elective course in other master courses of the Engineering Department.

5. Requirements for assessment

Assessment is performed as written examination (120 minutes). Students need to pass the module examination, which encompasses all contents of the lecture.

6. ECTS credits

5 ECTS credits

7. Frequency of offer

Every summer term

8. Work load

150 h of total work load, from:

- 45 h of presence at lectures/exercises
- 45 h of self-study
- 35 h of exercising tasks at home
- 30 h of preparation and attendance for examination

9. Duration of module

1 semester