

Modulbezeichnung:	Principles of Communications II
Kürzel für Stundenplan	COM II
Semester:	6
Modulverantwortliche(r):	Prof. Dr.-Ing. Horst Hellbrück
Dozent(in):	Prof. Dr.-Ing. Horst Hellbrück
Sprache:	Englisch
Zuordnung zum Curriculum	Bachelor International Study of Electrical Engineering
Lehrform / SWS:	Class: 4 SWS with exercises, max. 30 Students per group Laboratory: 1 SWS with integrated presentations held by the students, max. 3 students per group, max 4 groups in the lab.
Arbeitsaufwand:	80h presence (64 h class incl. exercises, 16 h lab.) 40 h preparation and evaluation for classes incl. exercises 60 h preparation and evaluation for lab plus presentation
Kreditpunkte:	6
Voraussetzungen:	Principles of Communications I
Lernziele / Kompetenzen:	Students should be able to <ul style="list-style-type: none"> • explain the structure and functions of reference models • describe the characteristics of base band transmission systems as well as systems using digital modulation schemes, • calculate characteristics of transmission lines, e.g. characteristic and input impedance, reflection factor, the influence of the termination on data transmission, • explain the fundamental operation of fibre optics, • draw the output signal of a line encoder following a given encoding algorithm and to assess their characteristic features, • describe the steps from an analog to a digital signal and to determine the values of a sampled signal using a linear or non-linear (PCM, A-law) A/D conversion, • analyse the spectrum of different kinds of modulation (ASK, FSK, PSK, and QAM), • select encoding strategies taking into account the signal-to-noise ratio S/N and the corresponding bit error rate BER, • describe the principles of multiplexing and the different kinds of access methods
Inhalt:	See "Course Topics" in the Appendix
Literatur:	Glover, Grant: Digital Communications, Prentice Hall Young: Electronic Communication Techniques, Prentice Hall Tanenbaum: Computer Networks, Prentice-Hall
Studien-/Prüfungsleistungen:	written exam (120 min), presentation laboratory

Course Topics

1. Fundamentals (workload 20h)

- 1.1 OSI Reference Model 7 Layers, Functions and Services
- 1.2 First three layers, the base for transmission and switching systems
- 1.3 Models

2. Signals (Workload 30h)

- 2.1 Signal Definition and Classes
- 2.2 Representation of Signals
- 2.3 Fourier Analysis and Fourier Integral
- 2.4 Linear Time Invariant Systems (LTI) and Filters
- 2.5 Intersymbol Interference (ISI)
- 2.6 Random Signals

3. Media (Workload 30h)

- 3.1 Wires
 - 3.1.1 Schematic Representation
 - 3.1.2 Cable Parameters
 - 3.1.3 Wave Propagation
 - 3.1.4 Reflection and Refraction
- 3.2 Fiber Optics
 - 3.2.1 Advantages of Fiber Optics
 - 3.2.2 Main Characteristics of Fiber

4. Data Transmission (workload 30h)

- 4.1 Basics of Baseband transmission
- 4.2 Cables - Copper and Fiber
- 4.3 Line Coding
- 4.4 Digital Modulation
- 4.5 Regeneration
- 4.6 Example Modem
- 4.7 Example DSL

5. Data Link Layer (workload 50h)

- 5.1 Framing
- 5.2 Medium Access
- 5.3 Error Control
- 5.4 Flow Control

6. Examples (workload 20h)

- 6.1 PPP
- 6.2 Ethernet
- 6.3 Telecommunication Systems

Lab Experiments:

- L1: Introduction
- L2: Signals
- L3: Transmission Media
- L4: Line Coding

Presentation: Topics to be determined individually