

MK113 - Kanalcodierung

MK113 - Channel Coding

General information	
Module Code	MK113
Unique Identifier	ChannelCod-01-MA-M
Module Leader(s)	Prof. Dr. Badri-Höher, Sabah (sabah.badri-hoeher@haw-kiel.de)
Lecturer(s)	Prof. Dr. Badri-Höher, Sabah (sabah.badri-hoeher@haw-kiel.de)
Offered in Semester	Wintersemester 2018/19
Module duration	1 Semester
Occurrence frequency	Regular
Module occurrence	In der Regel im Wintersemester
Language	Englisch
Recommended for international students	Yes
Can be attended with different study programme	Yes

Curricular relevance (according to examination regulations)
Study Subject: M.Eng. - MET - Elektrische Technologien (PO 2017, V3) Study Specialization: Kommunikationstechnik und Embedded Systems Module type: Wahlmodul Semester: 2
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Study Specialization: Information Technology and Systems Module type: Wahlmodul Semester: 1, 3
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Study Specialization: Business IT-Management Module type: Wahlmodul Semester: 1, 3
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Study Specialization: Intelligent Systems Module type: Wahlmodul Semester: 1, 3
Study Subject: M.Sc. - MIE - Information Engineering (PO 2022, V3) Study Specialization: IT Security Module type: Wahlmodul Semester: 1, 3

Qualification outcome
<i>Areas of Competence: Knowledge and Understanding; Use, application and generation of knowledge; Communication and cooperation; Scientific self-understanding / professionalism.</i>
After successful completion of this module, the students will be able to perform error detection and error correction in digital transmissions schemes and digital storage systems. Furthermore, the students will be able to perform channel encoding and channel decoding.

The students will be capable to distinguish between different code families, particularly block codes and convolutional codes. Furthermore, they will be able to perform suitable decoding methods, like syndrome decoding for block codes and Viterbi decoding for convolutional codes. Additionally, they can construct serial and parallel concatenated codes and use them in digital systems.

In lab experiments, the students will emulate data transmission. They will model channel coding schemes and design suitable decoding methods in order to perform error detection and error correction. They will exploit different decoding schemes (hard-decision vs soft-decision decoding, maximum-likelihood decoding, Viterbi algorithm). The students will be able to measure bit error rates and to evaluate the decoders in different simulation environments.

Due to group-wise problem solving with typically just two students per group, problems can be solved efficiently. Soft skills like communication skills will be trained. The students will learn to split complex problems into sub-tasks and to join the corresponding sub-results.

Content information

Content	Block codes (SPC, Hamming, BSH, CRC, RS, LDPC): Properties, parameters. Convolutional codes: Description, state diagramm, trellis diagramm. Decoding : Hard- and Soft-decoding, Syndrom-decoding, ML-decoding, Viterbi-algorithm. Concatenated codes: - Serial concatenation and their decoding - Parallel concatenation (Turbo codes)
Literature	- E. Biglieri, Coding for Wireless Channels. Springer, 2005. - J.G. Proakis, Digital Communication. McGraw-Hill, New York, 1995. - .M. Bossert, Channel Coding for Telecommunications, John Wiley & Sons, 1999. - P.M. Gray, Source Coding Theory. Kluwer Academic Publishers, 1998. - J.C.A Van der Lubbe, Information Theory. Cambridge University, 1988. - R. Veldhuis, Intorduction to Source Coding. Prentice Hall, UK, 1993.

Teaching formats of the courses

Teaching format	SWS
Labor	1
Lehrvortrag	2
Übung	1

Workload

Number of SWS	4 SWS
Credits	5,00 Credits
Contact hours	48 Hours
Self study	102 Hours

Module Examination

Examination prerequisites according to exam regulations	None
MK113 - Bericht	Method of Examination: Bericht Weighting: 20% wird angerechnet gem. § 11 Absatz 2 PVO: Yes Graded: Yes

MK113 - Klausur	Method of Examination: Klausur Duration: 90 Minutes Weighting: 80% wird angerechnet gem. § 11 Absatz 2 PVO: Yes Graded: Yes
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