COURSE DESCRIPTION CARD - SYLLABUS

Course name
Digital Communication Systems [S1EiT1E>CST]

Course

Field of study
Electronics and Telecommunications

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
English

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
0

Other
0

Tutorials
15

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Has a systematic knowledge of mathematical analysis, algebra and theory of probability. Has a systematic knowledge, together with necessary mathematical background, of 1D signal theory; this knowledge allows him/her to understand and sole problems regarding the representation of signals and signal analysis in time domain and frequency domain. Knows and understands basic concepts and methods of description of linear and non-linear electronic systems, control systems and telecommunications systems

Course objective

To present the fundamentals of digital communication systems which cover baseband signal transmission, digital modulations of a sinusoidal carrier and transmission of digital signals over intersymbol interference channels.

Course-related learning outcomes

Knowledge:
Knows how to select elementary signals and data symbol formats for baseband signal transmission. Knows structures of optimal synchronous and asynchronous receiver, digital modulation techniques and equalization of transmission channel characteristics.

Has a knowledge from communication theory of criteria and design of optimal receiver structures for baseband and passband signal transmission and of determining error probability for digital modulations over AWGN channels
Has an elementary knowledge of applications of presented digital transmission techniques in contemporary and future digital communication systems.

Skills:
Is able to calculate/determine basic parameters of signals used in baseband and passband transmission and of digital communication systems utilizing these signals.
Is able to analyze the operation of receivers for digital signals and to design the key blocks of the transmitter and receiver of digital transmission systems.

Social competences:
Is able to notice and formulate directions of digital communication systems evolution both in the dimension of fundamental research and system view.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Lecture: Written or oral exam veryfing knowledge and skills obtained during lecture. Final grade given in the range from 2 to 5. Retake possible as explained in regulation of studies.
Exercises: Test written at the last classess composed of a set of tasks (requiring calculations, derivations, sketching plots, drawing conclusions from calculations etc.) related to the exercises solved during previous exercises. Final grade given in the range from 2 to 5. Retake possible as explained in regulation of studies.

Programme content

Lectures:
1. Digital baseband transmission - Shaping of Elementary Signals - Selection of the Data Symbol Format - Optimal Reception of Binary and Multilevel Signals
2. Digital Modulations of the Sinusoidal Carrier - Optimal Synchronous Receiver - Optimal Asynchronous Receiver - ASK Modulation - FSK Modulation - PSK Modulation - Differential Phase Shift Keying (DPSK) - QAM Modulation - Constant Envelope Modulations - Continuous Phase Modulation (CPM) - Trellis Coded Modulation - TCM - Multitone Modulations - OFDM
3. Digital Transmission on Channels Introducing Intersymbol Interference - Intersymbol Interference - Linear Equalizers - Nonlinear Equalizers
Exercises:
A set of examples tightly connected with material covered during lecture, e.g., PSD of baseband signal, transmission and reception of QAM/PSK signal, continuous phase signals.

Course topics

none

Teaching methods

Lecture utilizing computer presentation, discussion with studens and solving chosen problems on the whiteboard.
Exercise: Solution of a set of problems/exercises by students in their notebooks/on whiteboard with help from tutor. At the beginning each task is presented by the tutor and refered to the knowledge obtained during lectrue.

Bibliography

Basic
Introduction to Digital Communication Systems, K. Wesołowski, Wiley, Chichester, 2009
Additional
Communication Systems, 5th Ed., S. Haykin, M. Moher, Wiley, Chichester, 2010 2. Digital Communications, 5th Ed. , J. G. Proakis, M. Salehi, McGraw-Hill, New York, 2007

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	55	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	45	2,00