STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Digital Communication Systems		**1010804161010813005**
Field of study: **Electronics and Telecommunications**	Profile of study (general academic, practical): **general academic**	Year /Semester: **3 / 6**
Elective path/specialty: **-**	Subject offered in: **Polish**	Course (compulsory, elective): **elective**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time): **part-time**	
No. of hours: Lecture: **20** Classes: **-** Laboratory: **-** Project/seminars: **-**		No. of credits: **2**
Status of the course in the study program (Basic, major, other): **other**	(university-wide, from another field): **university-wide**	
Education areas and fields of science and art: **technical sciences** **Technical sciences**		ECTS distribution (number and %): **2 100%** **2 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Has a systematic knowledge of mathematical analysis, algebra and theory of probability [K1_W01] Has a systematic knowledge, together with necessary mathematical background, of 1D signal theory; this knowledge allows him/her to understand the representation of signals and signal analysis in time domain and frequency domain [K1_W06] Knows and understands basic concepts and methods of description of linear and non-linear electronic systems, control systems and telecommunications systems [K1_W10]
2	**Skills**	Is able to use known mathematical analysis, algebra and theory of probability concepts to solve basic problems in electronics and telecommunication [K1_U07] Demonstrates the ability to solve problems related to signal analysis in time domain and frequency domain [K1_U10]
3	**Social competencies**	Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study [K1_K01]

Assumptions and objectives of the course:

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.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Has a knowledge of selection of elementary signals and data symbol formats for baseband signal transmission, structures of optimal synchronous and asynchronous receiver, digital modulation techniques and equalization of transmission channel characteristics. - [K1_W15]

2. 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 - [K1_W17]

3. Has an elementary knowledge of applications of presented digital transmission techniques in contemporary and future digital communication systems. - [K1_W24]

Skills:

1. Is able to calculate/determine basic parameters of signals used in baseband and passband transmission and of digital communication systems utilizing these signals. - [K1_U15]

2. 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. - [K1_U19]

Social competencies:
1. Is able to notice and formulate directions of digital communication systems evolution both in the dimension of fundamental research and system view. - [K1_K04]

Assessment methods of study outcomes
Final test conducted after giving all lectures
Course description
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
Basic bibliography: 1. Podstawy cyfrowych systemów telekomunikacyjnych, K. Wesołowski, Wydawnictwa Komunikacji i Łączności, Warszawa, 2003
Additional bibliography: 1. Systemy telekomunikacyjne, t. I i II, S. Haykin, Wydawnictwa Komunikacji i Łączności, Warszawa, 1999 2. Digital Communications, wyd. 4, J. G. Proakis, McGraw-Hill, New York, 2000

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures which include computational examples illustrating issues presented	20
2. Solving problems given as a homework during lectures	10
3. Preparation to the final test and presence on the test	15

Student's workload

Source of workload	hours	ECTS
Total workload	50	2
Contact hours	22	1
Practical activities	28	1