

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Digital Modulations and Their Applications		Code 1010804161010813601
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: dr inż. Piotr Tyczka email: tyczka@et.put.poznan.pl tel. 61 665 39 18 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań		
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 modulation techniques which are used in digital communication systems. It covers baseband signal transmission, transmission with the use of a sinusoidal carrier and digital signal transmission 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
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Course description

<p>1. Digital baseband transmission</p> <ul style="list-style-type: none"> - Shaping of Elementary Signals - Selection of the Data Symbol Format - Optimal Reception of Binary and Multilevel Signals <p>2. Digital Modulations of the Sinusoidal Carrier</p> <ul style="list-style-type: none"> - 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 <p>3. Digital Transmission on Channels Introducing Intersymbol Interference</p> <ul style="list-style-type: none"> - Intersymbol Interference - Linear Equalizers - Nonlinear Equalizers

Basic bibliography:

1. Podstawy cyfrowych systemów telekomunikacyjnych, K. Wesolowski, Wydawnictwa Komunikacji i Łączności, Warszawa, 2003
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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