

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Telecommunications Systems		Code 1010802111010832929
Field of study Electronics and Telecommunications	Profile of study (general academic, practical) general academic	Year /Semester 1 / 1
Elective path/specialty Information and Communication	Subject offered in: English	Course (compulsory, elective) obligatory
Cycle of study: Second-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 2 Classes: 2 Laboratory: - Project/seminars: -		No. of credits 5
Status of the course in the study program (Basic, major, other) major		(university-wide, from another field) from field
Education areas and fields of science and art technical sciences Technical sciences		ECTS distribution (number and %) 5 100% 5 100%
Responsible for subject / lecturer: prof. dr hab. inż. Andrzej Dobrogowski email: dobrog@et.put.poznan.pl tel. +4861 6653857 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań		Responsible for subject / lecturer: dr inż. Michał Kasznia email: mkasznia@et.put.poznan.pl tel. +4861 665 3858 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 basic, systematic knowledge of physics(K1_W02) Has a detailed, systematic knowledge of the fundamentals of circuit theory (K1_W05) Has a systematic knowledge, together with necessary mathematical background, of 1D signal theory (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 extract information from literature, databases and other sources (K1_U01) Is competent in a foreign language, knows the electronics and telecommunication terminology in this language (K1_U06) 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 typical tasks and problems related to analysis of electrical circuits (K1_U09) Demonstrates the ability to solve problems related to signal analysis (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) Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects (K1_K02)
Assumptions and objectives of the course: Presentation of the basic ideas of telecommunications, the techniques and principles that underlie the analysis, design, construction and maintenance of telecommunications systems and networks		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		

<p>1. Knows the principle of operation of digital transmission systems, including baseband transmission, digital modulations, signal transmission in channels, signal reception, forming the spectral properties of signals, countering channel distortions. - [K1_W15]</p> <p>2. Has a detailed, systematic knowledge, together with necessary mathematical background, of the fundamentals of the telecommunication theory, which is necessary to understand, analyze and evaluate the operation of analogue and digital telecommunications systems - [K1_W17]</p> <p>3. Knows about development trends in electronics and telecommunication - [K1_W24]</p>
<p>Skills:</p> <p>1. Demonstrates the ability to solve problems related to signal analysis in time domain and frequency - [K1_U10]</p> <p>2. Is able to measure typical parameters of signals, systems and devices, in particular those used in telecommunication. Is able to choose appropriate methods to measure given electrical quantities and parameters of signals and devices. Is able to plan and perform measurements and analyze the results - [K1_U17]</p> <p>3. Is able to select the construction of devices according to technical requirements and service conditions - [K1_U21]</p>
<p>Social competencies:</p> <p>1. Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study - [K1_K01]</p> <p>2. Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects - [K1_K02]</p> <p>3. Is aware of the main challenges facing electronics and telecommunication in the 21st century. Is aware of the impact electronics and ICT systems and networks will have on the development of the information society - [K1_K04]</p>

Assessment methods of study outcomes	
<p>1. Written exam, tests during exercises</p> <p>2. Activity during exercises</p>	
Course description	
<p>Lectures</p> <p>Characteristic of telecommunication: social meaning, past and future; telecommunication services; standards and standard organizations; telecommunication system; telecommunication channels; signals and systems; random signals; analog modulations of harmonic carrier; modulation and demodulation processes; noise characteristics of analog modulations; source coding: pulse-code modulation, DPCM, ADPCM; multiplexing; synchronization; line and error-control coding; equalization; digital modulations of harmonic carrier;</p> <p>Exercises</p> <ul style="list-style-type: none"> - random and deterministic signals - graphical presentation of modulated signals, - mathematical description of modulation and demodulation processes for AM, DSB-SC, and SSB signals, - angle modulation, - sampling, quantization, PCM, 	
<p>Basic bibliography:</p> <p>1. S. Haykin, M. Moher, Communication Systems, International Student Version, Wiley, 2010</p> <p>2. S. Haykin, Communication Systems, Wiley</p> <p>3. B. P. Lathi, Z. Ding, Modern Digital and Analog Communication Systems, Oxford University Press, 2010</p>	
<p>Additional bibliography:</p> <p>1. T. Anttalainen, Introduction to Telecommunications Network Engineering, Artech House, 1999</p> <p>2. T. Oeberg, Modulation, Detection and Coding, Wiley, 2001</p>	
Result of average student's workload	
Activity	Time (working hours)
1. participation in lectures	30
2. participation in exercises	30
3. individual work (solving problems)	30
4. Preparation for passing the examination	15
5. Preparation for exercise completion	15
6. Consulting with teachers	3
7. Participation in the exam	2

Student's workload		
Source of workload	hours	ECTS
Total workload	125	5
Contact hours	65	3
Practical activities	60	2