

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Foudations of Wireless Communications</b>		Code <b>1010802111010812863</b>
Field of study <b>Electronics and Telecommunications</b>	Profile of study (general academic, practical) <b>general academic</b>	Year /Semester <b>1 / 1</b>
Elective path/specialty <b>Information and Communication</b>	Subject offered in: <b>English</b>	Course (compulsory, elective) <b>elective</b>
Cycle of study: <b>Second-cycle studies</b>	Form of study (full-time,part-time) <b>full-time</b>	
No. of hours Lecture: <b>2</b> Classes: <b>2</b> Laboratory: <b>2</b> Project/seminars: <b>-</b>		No. of credits <b>5</b>
Status of the course in the study program (Basic, major, other) <b>major</b>		(university-wide, from another field) <b>from field</b>
Education areas and fields of science and art <b>technical sciences</b> <b>Technical sciences</b>		ECTS distribution (number and %) <b>5 100%</b> <b>5 100%</b>
<b>Responsible for subject / lecturer:</b> prof. dr hab. inż. Krzysztof Wesolowski email: wesolows@et.put.poznan.pl tel. 0616653812 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań		<b>Responsible for subject / lecturer:</b> prof. dr hab. inż. Krzysztof Wesolowski email: wesolows@et.put.poznan.pl tel. 0616653812 Faculty of Electronics and Telecommunications ul. Piotrowo 3A 60-965 Poznań
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	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	<b>Skills</b>	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	<b>Social competencies</b>	Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study [K1_K01]
<b>Assumptions and objectives of the course:</b> Knowledge of the basics of radio propagation in various environments, typical phenomena and distortions; Knowledge of the basics of cellular systems and their design.  Please note that this course is preparatory for the second cycle studies, so the study outcomes are still related to the first cycle studies.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b>		
1. A student has basic knowledge and mathematical foundations in the area of radio communications, has basic knowledge of the 2G, 3G and 4G mobile systems; A student has basic knowledge concerning the architecture and maintenance of radio communication systems and elements of tele-information networks, including wireless networks - [K1_W14] 2. A student has a sufficient knowledge and mathematical foundations in the area of EM field, EM wave propagation and antennas - [K1_W01]		
<b>Skills:</b>		

1. A student is able to solve basic problems in the area of electromagnetic fields, radio propagation, antenna design - [K1_U11]
2. A student is able to compare radio communication systems and standards, and to select advantageous radio transmission technique or wireless standard in the given propagation and users mobility conditions - [K1_U23]
<b>Social competencies:</b>
1. A student is aware of the necessity of professional approach to technical problems and responsibility for his/her proposed technical solutions - [K1_K02]
2. A student feels responsibility the designed electronic and telecommunication systems and is aware of the potential threats for other persons or society of improper use of these systems and designs - [K1_K03]
3. A student is able to formulate opinions concerning challenges of contemporary radio communications; A student is aware of the impact of radio systems and networks on the information society - [K1_K04]

<b>Assessment methods of study outcomes</b>		
Tests and written exam. Test at the end of exercises, approved C++ programs in lab.		
<b>Course description</b>		
Lectures: Elements of digital communication systems: overview of digital modulations, multiple access methods, orthogonality principle, basic information of block and convolutional codes; cellular system concept, radio propagation, fading channels, frequency selective fading, mobile radio communication channel modeling, propagation modeling, classification of radio systems, overview of the GSM system and its derivatives (GPRS and EDGE), overview of UMTS (CDMA system), directions in future mobile communications.		
Exercises: Training of orthogonality principle on the example of different elementary signals, calculations of SNIR for different cellular size clusters, calculations of propagation losses for different propagation models, multipath propagation, calculations of link power budget		
Lab.: Writing of several C++ programs illustrating problems considered during exercises		
<b>Basic bibliography:</b>		
1. K. Wesolowski, Mobile communication systems, Wiley, Chichester, 2003.		
2. K. Wesolowski, Introduction to digital communication systems, Wiley, Chichester, 2009		
<b>Additional bibliography:</b>		
1. T. S. Rappaport, Wireless Communications. Principles and Practice, Prentice Hall, 1996		
2. A. F. Molisch, Wireless Communications, Wiley, Chichester, 2005		
<b>Result of average student's workload</b>		
Activity	Time (working hours)	
1. Participation in lectures	30	
2. Participation in problem exercises	30	
3. Participation in lab exercises	30	
4. Literature studies	10	
5. Solving given problems at home (individual work)	10	
6. Preparation to the completion of exercises	10	
7. Preparation to the examination	13	
8. Consulting with teachers	3	
9. Presence at the exam	2	
10. Presence on the final test of exercise classes	2	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	140	5
Contact hours	97	2
Practical activities	80	3