STUDY MODULE DESCRIPTION FORM

Name of the module/subject **Mobile and satellite communication systems**		Code **1010802111010810863**
Field of study **Electronics and Telecommunications**	Profile of study (general academic, practical) **general academic**	Year /Semester **1 / 1**
Elective path/specialty **-**	Subject offered in: **Polish**	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: **1** Laboratory: **-** Project/seminars: **-**		No. of credits **3**
Status of the course in the study program (Basic, major, other) **major**	(university-wide, from another field) **university-wide**	
Education areas and fields of science and art **technical sciences** **Technical sciences**		ECTS distribution (number and %) **3 100%** **3 100%**

Responsible for subject / lecturer:

prof. dr hab. inż. Krzysztof Wesołowski
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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Knows the principles of operation of digital transmission systems [K1_W15] Has a detailed, systematic knowledge of the fundamentals of the telecommunication theory, [K1_W17] Has a systematic knowledge, together with the necessary mathematical background, of the architecture and operation of 2G, 3G mobile networks, has basic knowledge of main standards, architecture and operation of WLANs and of radio access methods. [K1_W14]
2	**Skills**	Is able to determine basic parameters and properties of signals and telecommunication systems , under predefined constraints [K1_U15] Is able to evaluate the parameters describing digital signals transmission quality in various communication channels. Is able to match digital signal reception methods to transmission parameters and distortions introduced by the channel.. [K1_U19] Is able to compare systems and standards of wireless transmission and select the appropriate transmission mode or wireless standard, given particular transmission conditions and user mobility pattern. [K1_U23]
3	**Social competencies**	Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study. [K1_K01] Is aware of the main challenges current mob ile communication systems and is aware of the impact such systems and networks will have on the development of the information society [K1_K04]

Assumptions and objectives of the course:

Learning of theoretical foundations and standards describing the rules of operation of modern mobile communication systems, in particular 3G and 4G cellular systems as well as wideband radio access to fixed networks and selected topics in digital satellite systems

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

Knowledge:

1. Has a systematic, advanced knowledge of contemporary mobile communication systems based on spread spectrum and OFDM transmission - [K2_W06]

2. Is conversant with problems and methods related to electromagnetic radiation in radiocommunication systems. - [K2_W04]

3. Has a systematic, detailed knowledge, together with necessary mathematical background, of advanced methods of digital signal processing applied in mobile systems. - [K2_W09]

Skills:

1. Is able to analyze 3GPP standards published in English describing contemporary radiocommunication systems - [K2_U01]
2. Is oriented in activities of development of 3GPP standards 3GPP related to UMTS/HSPA and LTE systems - [K2_U08]
3. Is able to perform evaluation and comparison of 3G and 4G systems including EM radiation - [K2_U06]
4. Is able to evaluate parameters of satellite systems - [K2_U10]

Social competencies:

1. Understands the legal framework of Polish and international standards in mobile communication systems and understands legal consequences associated with them - [K2_K03]
2. Understands the meaning of terrestrial wireless systems and satellite systems for development of the information society - [K2_K07]
3. Is aware of the necessity to approach solving technical problems associated with cellular system design with responsibility and professionalism and is aware of its meaning for humans and environment - [K2_K05]

Assessment methods of study outcomes

Examination from the contents of the course and completion of excercises

Course description

Short history of development of wireless systems, satellite systems and standards which describe them. Repetition of information on signal propagation, fading and distortions in mobile communication channels. CDMA networks ? description of the UMTS system and its extensions (HDSPA, HSUPA and HSPA). Evolution of cellular systems according to ITU-R: IMT-Advanced, UMTS-LTE- basic information on LTE and WiMAX (IEEE 802.16).. Satellite link, propagation in the satellite ? earth path. Multiple access, ground stations, Examples of satellite systems and networks (VSAT, personal satellite systems (Iridium, Globalstar). Further development of 4G systems.

Basic bibliography:

1. K. Wesolowski, Mobile Communication Systems, Wiley, Chichester, 2002
2. H. Holma, A. Toskala, WCDMA for UMTS - HSPA Evolution and LTE

Additional bibliography:

1. G. L. Stüber, Principles of Mobile Communications, 2nd ed., Kluwer, Boston 2001
2. A. Goldsmith, Wireless Communications, Cambridge University Press, New York, 2005

Result of average student's workload

Activity	Time (working hours)
1. Studies of the literature	10
2. Participation in lecture	30
3. Participation in problem excercises	15
4. Preparation to the problem excercises	10
5. Preparation to the completion of excercises	10
6. Preparation to the examination	15

Student's workload

Source of workload	hours	ECTS
Total workload	90	3
Contact hours	50	2
Practical activities	35	1