

## FACULTY OF ELECTRONICS

**SUBJECT CARD**

Name of subject in Polish: **Podstawy telekomunikacji**  
 Name of subject in English: **Fundamentals of Telecommunications**  
 Main field of study (if applicable): **Electronic and Computer Engineering**  
 Specialization (if applicable): .....

Profile: **academic**  
 Level and form of studies: **1 st level/ full-time**  
 Kind of subject: **obligatory**  
 Subject code: **ECEA00021**  
 Group of courses: **YES**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	60		60		
Form of crediting	credit with grade		credit with grade		
For group of courses mark (X) final course	X				
Number of ECTS points	4				
including number of ECTS points for practical (P) classes			2		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1		1		

**PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES****SUBJECT OBJECTIVES**

C1 Obtaining the knowledge on fundamental principles of telecommunication  
 C2 Gaining basic skills on the analysis and assessment of telecommunication signals

**SUBJECT LEARNING OUTCOMES****I. Relating to knowledge: has basic knowledge of telecommunications**

PEU\_W01 – knows basics of signal representation in time and frequency domain.  
 PEU\_W02 – knows basics of notions used in the description of telecommunication systems.  
 PEU\_W03 – knows basics of analogue and digital modulations.  
 PEU\_W04 – knows the theorem on the bandwidth of telecommunication channel and principles of wideband systems.  
 PEU\_W05 – knows and understands telecommunication systems architecture.  
 PEU\_W06 – knows the telecommunication system parameters.

**Relating to skills:**

PEU\_U01 – is able to set and operate the spectrum analyzer,  
 PEU\_U02 – is able to measure primary parameters of an analogue-modulated and a digitally-modulated signals,  
 PEU\_U03 – is able to assess the influence of interference on transmission parameters of communication systems

<b>PROGRAMME CONTENT</b>		
<b>Lecture</b>		<b>Number of hours</b>
Lec 1	Introduction. The purpose and role of telecommunications. Standardization and legal aspects.	2
Lec 2	The concept of telecommunication system, modulations.	2
Lec 3	The source and channel coding, multiple access techniques	2
Lec 4	Basics of information theory, signals in time and frequency domain.	2
Lec 5	The communication channel, entropy and redundancy	2
Lec 6	Radio systems, interference and noise	2
Lec 7	Antennas and link budget	2
Lec 8	Radio propagation	2
Lec 9	Optical fibers and waveguides	3
Lec 10	Cellular networks (2G – 5G)	2
Lec 11	Satellite networks	2
Lec 12	High frequency circuits	2
Lec 13	Wireless networks, RFID, interaction of radio signals with human body	3
Lec 14	Revision	2
	<b>Total hours</b>	<b>30</b>

<b>Laboratory</b>		<b>Number of hours</b>
Lab 1	Introduction. Getting acquainted with laboratory equipment. Spectrum analyzer, bandwidth, signal to noise ratio	3
Lab 2	Analogue modulations – AM	3
Lab 3	Analogue modulations – FM	3
Lab 4	Analogue modulations – PM	3
Lab 5	Digital modulations – ASK/ FSK	3
Lab 6	Digital modulations – PSK/ CDMA	3
Lab 7	Analysis of interference influence on transmission parameters of communication systems	3
Lab 9	Optical communication – fibers and passive fibers components	3
Lab 8	Optical communication – transmission through the fibers	3
Lab 10	Final test.	3
	Total hours	30

### TEACHING TOOLS USED

N1. Traditional lectures using multimedia presentations  
N2. Supervised laboratory activities  
N3. Consultation  
N4. Self study

### EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming (during semester), P – concluding (at semester end))	Learning outcomes code	Way of evaluating learning outcomes achievement
F1	PEU_W01 - PEU_W06	written or electronic test
F2	PEU_U01 - PEU_U03	written test, reports

$P = 0,6 * F1 + 0,4 * F2$   
a positive concluding grade is conditioned by obtaining positive grades of all forms of classes included in the subject

### PRIMARY AND SECONDARY LITERATURE

#### PRIMARY LITERATURE:

- [1] Simon Haykin, *Communication Systems*, Wiley, May 2009, ©2010
- [2] Tommy Öberg, *Modulation, detection and coding*, John Wiley & Sons, Chichester 2001.
- [3] Jerry D. Gibson, *Principles of digital and analog communications*, MacMillan Publ., New York, 1993.
- [4] Chakrabarti, P., *Optical Fiber Communication*. McGraw-Hill Education, 2015.

#### SECONDARY LITERATURE IN POLISH:

- [1] W. David Gregg, *Podstawy telekomunikacji analogowej i cyfrowej*, Wydawnictwa Naukowo-Techniczne, Warszawa 1983.
- [2] Daniel Józef Bem, *Systemy telekomunikacyjne. Cz. 1, Modulacja, systemy wielokrotne, szumy*. Politechnika Wroclawska, Wroclaw 1978.
- [3] Zieliński, T. P., *Cyfrowe przetwarzanie sygnałów: od teorii do zastosowań*. Wydawnictwa Komunikacji Łączności, 2005.

#### **SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)**

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