LEARNING OUTCOMES FOR THE FIELD OF STUDY **ELECTRONICS AND TELECOMMUNICATION**
First cycle programme – *academic profile*
Focus on - ***Information and Communication Technologies***

Place of the field of study in *the educational area*
The field of study **electronics and telecommunication** is part of the *technical science educational area*, and is related to the following fields of study : computing science, control engineering and robotics.

Symbols
K (before the underscore) – learning outcomes for the field of study
W - knowledge,
U – skills,
K – social competence
T1A – learning outcome in the technical science educational area for a first cycle program

Learning outcome symbol	Learning outcomes in electronics and telecommunication On completion of the first cycle programme in electronics and telecommunication, the student	Reference to learning outcomes in the technical science educational area
	With respect to KNOWLEDGE	
K1_W01	Has a systematic knowledge of mathematical analysis, algebra and theory of probability.	T1A _ W01
K1_W02	Has a basic, systematic knowledge of physics.	T1A _ W01
K1_W03	Knows and understands basic concepts and principles in copyright law and industrial property law, specifically those related to electronics and telecommunication.	T1A _ W10
K1_W04	Has basic knowledge of conducting business activities.	T1A _ W08 T1A _ W09 **T1A _ W11**
K1_W05	Has a detailed, systematic knowledge of the fundamentals of circuit theory, together with necessary mathematical background; this knowledge allows him/her to understand, analyze and evaluate the operation of electrical circuits.	T1A_W02 T1A_W03 T1A_W04 T1A_W07
K1_W06	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.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A_W07
K1_W07	Has a systematic knowledge, together with necessary mathematical background, of the theory of EM field, EM waves propagation, and of construction and properties of antennae.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A_W07
K1_W08	Has a wide, systematic knowledge of the properties and characteristics of electronic components, as well as of construction, analysis and design of electronic circuits.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A – W07
K1_W09	Knows the principles of construction of computer programs ; has knowledge from the area of computing science; knows the syntax of C, C++, C#, MatLab.	T1A_W02 T1A_W03 T1A_W04 T1A – W07
K1_W10	Knows and understands basic concepts and methods of description of linear and	T1A_W02

	non-linear electronic systems, control systems and telecommunications systems.	T1A_W03 T1A_W04 T1A – W07
K1_W11	Has a systematic knowledge, together with necessary mathematical background, of signal perception and acquisition by humans, quality evaluation, processing, digital representation, compression and transmission of audio (speech and sound) and video in multimedia systems.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A – W06 T1A – W07 T1A_W08 T1A_W10
K1_W12	Knows the theoretical foundations and principles of design of digital circuits, and of construction of digital electronic elements; knows the theoretical foundations of analysis and design of digital circuits and CAD.	T1A_W02 T1A_W03 T1A_W04 T1A_W07
K1_W13	Has a systematic knowledge of computer architecture. Has a systematic knowledge of microcontroller, microprocessor and microprocessor system architecture and programming in assembly language, and architecture and programming of specialized processors.	T1A_W02 T1A_W03 T1A_W04 T1A_W07
K1_W14	Has a systematic knowledge, together with the necessary mathematical background, of radio communication foundations. Has basic knowledge of the architecture and operation of 2G, 3G and 4G mobile networks. Has basic knowledge of main standards, architecture and operation of WLANs and of radio access methods. Has basic knowledge of construction and exploitation of radiocommunication systems and components of ICT networks, including wireless networks.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A_W07
K1_W15	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.	T1A_W03 T1A_W04
K1_W16	Has knowledge of simulation methods and performance of simulation experiments in which the parameters of the simulated circuit or system are evaluated.	T1A_W02 T1A_W03 T1A_W04 T1A_W07
K1_W17	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.	T1A_W02 T1A_W03 T1A_W04 T1A_W07
K1_W18	Has a systematic knowledge, together with necessary mathematical background, of the fundamentals of metrology, which is necessary to measure the signal properties and the parameters of electronic and telecommunication systems components. Has knowledge of measurement methods, measurement equipment and computerized measurement systems.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A_W07
K1_W19	Has a systematic knowledge, together with necessary mathematical background, of basic digital signal processing methods.	T1A_W02 T1A_W03 T1A_W04 T1A_W07
K1_W20	Has knowledge of devices and systems exploitation.	T1A_W03 T1A_W04 T1A_W05 T1A_W06 T1A_W07
K1_W21	Has a systematic knowledge, together with theoretical background, of optoelectronics and opto-telecommunication.	T1A_W01 T1A_W02 T1A_W03 T1A_W04 T1A_W07

K1_W22	Knows and understands the technical meaning of the terms describing telecommunication and computer networks . Has a basic, systematic knowledge of structure, operation and standards related to various types of telecommunication and computer networks. Knows the basics of traffic engineering, queuing theory, services, devices, management systems, network protocols and telecommunication techniques used in telecommunication and computer networks.	T1A_W02 T1A_W03 T1A_W04 T1A_W05 T1A – W07
K1_W23	Has a systematic knowledge of operating systems and data bases. Has the knowledge of computer resource management and protection technologies.	T1A_W02 T1A_W03 T1A_W04 T1A – W07
K1_W24	Knows about development trends in electronics and telecommunication.	T1A_W05
K1_W25	Knows occupational health and safety principles.	T1A_W08
	SKILLS	
K1_U01 All chairs	Is able to extract information from Polish or English language literature, databases and other sources. Is able to synthesize gathered information, draw conclusions, and justify opinions.	T1A_U01
K1_U02	Is able to communicate in English or in Polish in the professional environment and other environments.	T1A_U02
K1_U03	Is able to prepare a well-documented study, in English or in Polish, on problems related to electronics and telecommunication.	T1A_U03
K1_U04	Is able to prepare an oral presentation on particular issues in electronics and telecommunication (in Polish or in English).	T1A_U04
K1_U05	Is capable of studying autonomously.	T1A_U05
K1_U06	Is competent in a foreign language at a minimum of CEFR level B1, knows the electronics and telecommunication terminology in this language.	T1A_U06
K1_U07	Is able to use known mathematical analysis, algebra and theory of probability concepts to solve basic problems in electronics and telecommunication.	T1A_U09
K1_U08	Demonstrates the ability to solve basic problems in physics.	T1A_U09
K1_U09	Demonstrates the ability to solve typical tasks and problems related to analysis of electrical circuits.	T1A_U14 T1A_U15
K1_U10	Demonstrates the ability to solve problems related to signal analysis in time domain and frequency	T1A_U14 T1A_U15
K1_U11	Is able to solve typical problems in EM field analysis, EM wave propagation, and design and realizations of antennae.	T1A_U14 T1A_U15
K1_U12	Is able to use catalogues, find required information from application notes of semiconductor elements and electronic circuits, select appropriate elements and electronic circuits. Is able to identify a problem and formulate a design specification of a simple analogue electronic circuit. Is able to design and implement a simple analogue electronic circuit.	T1A_U01 T1A_U14 T1A_U15
K1_U13	Is able to write software for basic computational algorithms, using popular programming languages (e.g. Matlab, C). Uses high level programming languages: C, C++, C#, Matlab. Is able to write and run programs to solve selected problems in electronics and telecommunication. Is able to conduct simulation experiments to evaluate parameters of circuits, systems and networks.	T1A_U07 T1A_U09

K1_U14	Understands technical conditioning related to transmission, storage and presentation of multimedia and is able to formulate essential requirements for systems performing multimedia services. Understands basic rules of international standards.	T1A_U01 T1A_U02 T1A_U08 T1A_U09 T1A_U10 T1A_U13 T1A_U14 T1A_U15
K1_U15	Is able to determine basic parameters and properties of signals and telecommunication systems , under predefined constraints.	T1A_U08 T1A_U09 T1A_U10 T1A_U13 T1A_U14 T1A_U15
K1_U16	Is able to analyze, design and build digital circuits , using appropriate methods and engineering tools, and taking into consideration predefined criteria. Is able to use models, catalogue cards and application notes of semiconductor electronic elements. Is able to analyze and design circuits and systems using CAD.	T1A_U08 T1A_U09 T1A_U14 T1A_U15
K1_U17	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.	T1A_U08 T1A_U09 T1A_U15
K1_U18	Is able to perform typical calculations and use appropriate software to design and analyze the operation of digital signal processing systems.	T1A_U07 T1A_U09
K1_U19	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.	T1A_U08 T1A_U09 T1A_U10 T1A_U13 T1A_U14 T1A_U15 T1A_U16
K1_U20	Is able to formulate specifications, design and conduct measurements of optoelectronic components parameters. Is able to conduct link analysis, formulate requirements and design an optical fibre link.	T1A_U08 T1A_U09 T1A_U13 T1A_U14 T1A_U15 T1A_U16
K1_U21	Is able to select the construction of devices according to technical requirements and service conditions.	T1A_U08 T1A_U13 T1A_U14 T1A_U15 T1A_U16
K1_U22	Is able to design www pages, using appropriate programming languages.	T1A_U07 T1A_U09
K1_U23	Is able to practically configure, deploy and monitor a WLAN. 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.	T1A_U07 T1A_U09 T1A_U16 T1A_U10 T1A_U13 T1A_U15
K1_U24	Is able to analyze and design logic circuits. Is able to build complex digital circuits from commercially available ICs. Is able to analyze and build typical microcontroller and microprocessor systems. Is able to program in an assembly language.	T1A_U08 T1A_U09 T1A_U17 T1A_U18 T1A_U19
K1_U25	Is able to configure devices and launch a local computer network. Is able to select an appropriate algorithm for solving a network optimization problem. Is able to use applications analyzing traffic in LANs and applications enabling secure data transmission.	T1A_U07 T1A_U11 T1A_U12 T1A_U01

		T1A_U13 T1A_U14 T1A_U15 T1A_U16
K1_U26	Is able to solve standard/typical problems related to traffic engineering and parametrization of network elements .	T1A_U17 T1A_U18 T1A_U19
K1_U27	Can implement the occupational health and safety principles.	T1A_U11
with respect to SOCIAL COMPETENCE		
K1_K01	Is aware of the limitations of his/her current knowledge and skills; is committed to further self-study.	T1A_K01 T1A_K06
K1_K02	Demonstrates responsibility and professionalism in solving technical problems. Is able to participate in collaborative projects.	T1A_K04 T1A_K05 T1A_K06 T1A_ K03
K1_K03	Demonstrates responsibility for designed electronic and telecommunication systems. Is aware of the hazards they pose for individuals and communities if they are improperly designed or produced.	T1A_K02 T1A_K05 T1A_K07
K1_K04	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.	T1A_K04 T1A_K07 T1A_K05
K1_K05	Correctly interprets and solves the dilemmas related to working in electronics and telecommunication. Is able to think and act in a businesslike way.	T1A_K05 T1A_K06