Attachment no. 3 to ZW 16/2020
Attachment no. 1 to programme of studies

ASSUMED LEARNING OUTCOMES

FACULTY: **Electrical Engineering**
MAIN FIELD OF STUDY: **Electrical Engineering**
EDUCATION LEVEL: **second-level studies**
PROFILE: **general academic**

Location of the main-field-of study:

Branch of science: Engineering and technology

Discipline / disciplines (for several disciplines, please indicate the major discipline)

Automation, electronics, electrical engineering and space technologies

Explanation of the markings:

P7U – universal first degree characteristics corresponding to education at the second-level studies - 7 PRK level *
P7S – second degree characteristics corresponding to education at the second-level studies - 7 PRK level *

W - category "knowledge"
U - category "skills"
K - category "social competences"
K2ETK_W1, K2ETK_W2, K2ETK_W3,, ... - main-field-of study learning outcomes related to the category "knowledge"
K2ETK_U1, K2ETK_U2, K2ETK_U3,, ... - main-field-of study learning outcomes related to the category "skills"
K2ETK_K1, K2ETK_K2, K2ETK_K3,, ... - main-field-of study learning outcomes related to the category "social competences competences"

… _inż. – learning outcomes related to the engineer competences

* delete as applicable

Main field of study learning outcomes	Description of learning outcomes for the main-field-of study **Electrical Engineering** After completion of studies, the graduate:	Reference to PRK characteristics		
		Universal first degree characteristics (U)	Second degree characteristics typical for qualifications obtained in higher education (S)	
			Characteristics for qualifications on 7 levels of PRK	Characteristics for qualifications on 7 levels of PRK, enabling acquiring engineering competences
KNOWLEDGE (W)				
K2ETK_W1	*has advanced knowledge about application of mathematical methods to description, synthesis and analysis of linear and nonlinear circuits and systems taking into account both continuous and discrete types*	**P7U_W**	**P7S_WG**	
K2ETK_W2	*has knowledge about application of numerical and optimization methods to solution of engineering problem*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W3	*has knowledge on computational and analysis methods of power system faults*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W4	*has knowledge about description, analysis and modelling of electrical drive systems of different types of control, using different kinds of electrical motors*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W5	*student has extended knowledge of how to measure physical quantities using electrical methods* *he/she knows how sensors, converters and other measuring instruments work and knows their construction* *student knows the methods and measuring systems used to measure selected physical quantities*	**P7U_W**	**P7S_WG**	
K2ETK_W6	*has knowledge about management, including quality management and business running*		**P7S_WK**	**P7S_WK_inż**
K2ETK_W7	*he understands the legal and standardisation framework of engineering and the need to act accordingly to it in everyday practice* *has the knowledge about technical standardisation basics, responsibility for the quality and safety of manufactured goods,*		**P7S_WK**	

	assessment of compatibility, making patent descriptions and patent database			
K2ETK_W8	*he knows the principles of operation of the power system in various operating states, technologies of generation, transmission, distribution and use of electrical energy.* *Has the knowledge of technical, economic, environmental and legal aspects related to the operation of the power sector and its components*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W9	*has in-depth knowledge of issues related to various aspects of construction and operation of modern systems and devices used in widely understood electrical engineering.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W10	*has knowledge in the field of operation and modeling of complex objects and power systems and electromechanical energy conversion.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W11	*has an organized knowledge of various threats and problems related to the functioning of electrical systems, networks and devices.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W12	*has knowledge in the field of reliability, continuity and certainty of electricity supply in the power system as well as applied solutions and technologies.* *He knows the issues of electricity quality and the rules for the selection of devices, systems and systems improving the quality of energy.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W13	*has knowledge in the field of physics, useful for understanding the phenomena, processes, operation of various systems and devices used in power installations,* *knows the materials and technologies used in electrical engineering.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**

K2ETK_W14	*he knows the principles of operation and solutions of power electronic systems, has an organized knowledge of automation and control of various installations, systems and power facilities.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W15	*has an organized knowledge of energy efficiency and rationalization of energy consumption.* *Has extended knowledge of various electricity generation technologies, including renewable energy sources.*	***P7U_W***	***P7S_WG*** ***P7S_WK***	
K2ETK_W16	*has knowledge of the collection and processing of information as well as control and communication techniques used in the broadly understood electrical engineering.*			
K2ETK_W17	*has detailed knowledge of the planning, design and operation of electrical systems, facilities and devices.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W18	*has knowledge of the structures, methods and algorithms of automation and control as well as the construction of control systems used in electrical engineering.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
K2ETK_W19	*has an ordered and theoretically founded knowledge of selected branches of electrical engineering; knows and understands selected issues constituting detailed knowledge, appropriate for the education program within the selected specialization.*	**P7U_W**	**P7S_WG**	**P7S_WG_inż**
SKILLS (U)				
K2ETK_U1	*can properly apply the mathematical methods to description, synthesis and analysis of electrical linear and nonlinear circuits and systems, taking into account both continuous and discrete types*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U2	*can properly apply the numerical and optimization algorithms to solve engineering problems* *is able to correctly define the problem, design an algorithm and interpret the results*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**

K2ETK_U3	*can properly describe, conduct analysis and form models of electrical drive systems of different types of control using different kinds of motors*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U4	*student can measure selected physical quantities using suitable measuring instruments, sensors and converters relying on known methods and measuring systems* *he/she can analyse the results of his/her measuring activities*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U5	*depending on the choice of level of studied language, student:* *has knowledge, abilities and competence compatible with requirements specified for additional B2+ ESOKJ level characteristic for scientific and technical language connected with the studied discipline and related fields* *or* *has knowledge, abilities and competence compatible with requirements specified for additional C1+ ESOKJ level; makes use of specialist texts on his/her own, uses scientific and technical language in both oral and written forms, analyses given texts and presents them in various specialist debates*	**P7U_U**	**P7S_UK** **P7S_UU**	
K2ETK_U6	*depending on the choice of level of studied language, student:* *has knowledge, abilities and competence compatible with requirements specified for A1 ESOKJ level,* *has basic knowledge of studied language, knows daily life and fundamental intercultural behaviour basic vocabulary and grammatical structures* *or* *has knowledge, abilities and competence compatible with requirements specified for A2 ESOKJ level,* *uses vocabulary and grammatical structures related to the studied field and accordingly with the socio-cultural knowledge, can participate in discussions on common subjects and to a certain extent talk about studies and professional work*	**P7U_U**	**P7S_UK** **P7S_UU**	

K2ETK_U7	*is able to formulate and justify opinions, present problems related to studied field, related to working environment, also participate in scientific and professional discussions*	**P7U_U**	**P7S_UW** **P7S_UK**	
K2ETK_U8	*can design various systems, installations and devices used in electrical engineering in accordance with the requirements and with the use of modern design aids.*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U9	*he is able to carry out a multi-criteria analysis of selected phenomena, processes, systems, objects and electrotechnical devices.*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U10	*can model, using appropriate software, digital models of power grid elements and perform simulation analysis of dynamic phenomena in complex three-phase power grids.*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U11	*is able to carry out measurements and tests of various devices, systems and electrotechnical systems, as well as to correctly interpret and evaluate the obtained results.*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U12	*is able to use in a practical way knowledge in the field of selected electrotechnical departments, appropriate for the education program within the selected specialization.*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U13	*can solve problems in the field of collecting and processing information in the control process.* *He is able to implement an installation project using solutions of broadly understood automation, select the right controller and its peripheral systems in accordance with the project requirements, program the controller in the selected programming language and carry out commissioning and testing works.*	**P7U_U**	**P7S_UW**	**P7S_UW_inż**
K2ETK_U14	*is able to prepare and present a presentation containing the results of the master's thesis, as well as justify in a discussion the manner of implementation and the results achieved, knows the rules of creative discussion.*	**P7U_U**	**P7S_UW** **P7S_UK**	**P7S_UW_inż**

K2ETK_U15	*is able to prepare a master's thesis in the area of specialization, including:* *- is able to obtain information from literature, databases and other sources, integrate it, interpret and critically evaluate it,* *- can plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions,* *- can use analytical, simulation and experimental methods to formulate and solve problems* *- can formulate and test hypotheses related to research problems,* *- is able to integrate knowledge from various fields and disciplines and apply a systemic approach, also taking into account non-technical aspects,* *- can assess the usefulness and the possibility of using new achievements (techniques and technologies) in the represented discipline* *- is able to propose improvements / improvements to the existing technical solutions,* *- is able to interpret the obtained research results, draw appropriate conclusions and formulate recommendations,* *- is able to edit a master's thesis in accordance with formal requirements*	**P7U_U**	**P7S_UW** **P7S_UK** **P7S_UO**	**P7S_UW_inż**
SOCIAL COMPETENCES (K)				
K2ETK_K1	*understands the need for live long learning and rising qualifications*		**P7S_KK**	
K2ETK_K2	*is able for a teamwork on a complex engineering task, according to his role in the team and the working time schedule*	**P7U_K**		
K2ETK_K3	*is aware about the importance and non-technical aspects of engineering activities, i.e. influence on environment, therefore takes responsible actions*		**P7S_KO** **P7S_KR**	
K2ETK_K4	*correctly identifies and solves dilemmas related to profession*	**P7U_K**	**P7S_KK** **P7S_KR**	

K2ETK_K5	*has the awareness of the social role of an technical university alumnus* *understands the need of formulating and publishing, i.e. via mass media, information and opinions related to technical achievements in engineering and to other activities of an engineer* *is able to publish it in a comprehensive manner, justifying different opinions*	**P7U_K**	**P7S_KO**	
K2ETK_K6	*he can think critically and support his own view, so he can select priorities properly and choose appropriate measures to achieve the tasks defined by himself or other people taking into account the issues of social responsibility*	**P7U_K**	**P7S_KO**	
K2ETK_K7	*knows the team work rules knows how to lead a small team and how to take responsibilities for the results*	**P7U_K**	**P7S_KR**	