Detailed learning outcomes and their reference to outcomes in technical sciences

Codes:
K – programme-specific learning outcomes
W – knowledge category
U – skills category
K (after the underscore) – personal and social competencies category (KPS)
T1A – learning outcomes in the field of technical sciences for undergraduate studies, general academic profile

Major: Power Engineering
Level of education: undergraduate studies
Education profile: general academic

Code	Programme-specific learning outcomes	Reference to outcomes in technical sciences (T1A)
	KNOWLEDGE – he/she ...	
K1A_W01	demonstrates systematic knowledge of foundations of logic, linear algebra and analytic geometry, differential and integral calculus and their uses.	T1A_W01
K1A_W02	demonstrates general knowledge of classical, relativistic and quantum physics concepts; demonstrates knowledge of general laws of physics, physical quantities and fundamental interactions.	T1A_W01
K1A_W03	demonstrates basic knowledge of principles of conducting physical measurements and describing their results, types of measurement uncertainties, ways of their determination and expression	T1A_W01
K1A_W04	is familiar with numerical methods and procedures, as well as programming concepts and computing capabilities	T1A_W01
K1A_W05	demonstrates an understanding of periodic properties of elements and behaviour of compounds	T1A_W01, T1A_W02, T1A_W03
K1A_W06	is familiar with the foundations of mechanics and strength of materials	T1A_W02, T1A_W03
K1A_W07	is familiar with the principles of engineering graphics and technical drawing, which enable to solve technical problems in the scope of power engineering	T1A_W01, T1A_W02, T1A_W03
K1A_W08	demonstrates an understanding of concepts in the fields of electrical engineering and electronics, is familiar with functioning of electric machines and the principles of their selection for electric power systems	T1A_W02
K1A_W09	is familiar with the methods of linear analysis of dynamic systems and demonstrates an understanding of basic structures of control systems	T1A_W01, T1A_W02
K1A_W10	demonstrates an understanding of machine design principles and	T1A_W02

	materials selection	
K1A_W11	demonstrates an understanding of reliable and safe operation of machines and equipment, as well as power facilities; is familiar with the principles of machines and devices selection for the needs of an electric power system	T1A_W02, T1A_W03
K1A_W12	demonstrates an understanding of problems related to energy transmission, transport and storage	T1A_W02
K1A_W13	is familiar with the basic principles of technical and chemical thermodynamics, as well as the basic laws of heat and mass transfer and fluid mechanics	T1A_W02, T1A_W03
K1A_W14	is familiar with the methods of electric power quantities measurement	T1A_W02, T1A_W03
K1A_W15	is familiar with the principles and technologies of environmental protection related to energy processes	T1A_W02, T1A_W05, T1A_W08
K1A_W16	demonstrates an understanding of financial engineering, functioning of the energy market and environmental protection	T1A_W08, T1A_W09
K1A_W17	is familiar with the structure of basic equipment used in conventional power engineering	T1A_W02, T1A_W03, T1A_W06, T1A_W07
K1A_W18	is familiar with fundamental technologies of conventional, nuclear and renewable energy engineering, demonstrates an understanding of the principles of their design and operation	T1A_W02, T1A_W04, T1A_W05, T1A_W06, T1A_W07, T1A_W10
K1A_W19	is familiar with the methodology of energy assessment of processes, as well as the importance of cumulative use of natural resources and fossil fuels	T1A_W04, T1A_W09, T1A_W10
K1A_W20	is familiar with the principles of using the waste-to-energy process	T1A_W04, T1A_W09, T1A_W10
K1A_W21	demonstrates fundamental knowledge necessary to understand social, economic, legal and other non-technical conditions of an engineer's work	T1A_W08
K1A_W22	demonstrates fundamental knowledge regarding management, including quality management and business operation	T1A_W09
K1A_W23	is familiar with the general principles of establishment and development of individual enterprises, which use the knowledge from the disciplines and areas of the studied programme	T1A_W11
K1A_W24	demonstrates detailed knowledge related to selected concepts from the area of the studied programme	T1A_W04, T1A_W09, T1A_W10
SKILLS – he/she ...		

1) general skills (unrelated to the field of engineering studies)		
K1A_U01	collects information from literature, data bases and other well selected sources, also in English, integrating all the obtained information, interpreting it, drawing conclusions and justifying opinions	T1A_U01
K1A_U02	communicates by using various techniques in professional and other environments	T1A_U02
K1A_U03	prepares a well documented analysis, such as a technical report, both in Polish and in English	T1A_U03
K1A_U04	is able to prepare and present in Polish and in English an oral presentation regarding detailed concepts in the field of power engineering	T1A_U04
K1A_U05	reads the specialist press (also in English) and self-educates him/herself	T1A_U05
K1A_U06	demonstrates linguistic skills which meet the requirements for B2 level, as specified in the Common European Framework of Reference for Languages; demonstrates the skills of using English specialist terminology in the field of power engineering	T1A_U06
2) basic engineering skills		
K1A_U07	uses logic to correctly formulate statements and assess the truth value of complex sentences; conducts calculations in vector spaces; uses the language of vectors and matrices in technical concepts; demonstrates an understanding of continuous and differentiable functions; is familiar with geometric and physical uses of the definite integral; uses the method of differential and integral calculus for description of physical and technical concepts	T1A_U09
K1A_U08	analyses and solves basic physical problems based on the studied laws and methods of physics, in particular: a) demonstrates an understanding of fundamental laws of physics and based on that knowledge, he/she is able to explain physical phenomena, b) uses the laws and methods of physics, as well as proper mathematic tools to solve typical problems in physics	T1A_U09
K1A_U09	conducts basic physical measurements, as well as describes and presents their results in a clear way	T1A_U08
K1A_U10	uses modern computer software to perform tasks typical for engineering, as well as technical drawing, engineering graphics and numerical analysis	T1A_U07, T1A_U08
K1A_U11	builds various models of technological processes, as well as analyses them by using analytical and experimental methods, and conducts simulations of those processes	T1A_U08, T1A_U09
K1A_U12	interprets social phenomena (of cultural, political, legal, economic nature) in the fields related to the studied programme	T1A_U10
K1A_U13	is prepared to work in an industrial environment and is familiar with safety rules related to such work	T1A_U11
K1A_U14	conducts an initial economic analysis of undertaken engineering activities	T1A_U12
3) skills directly related to performing engineering activities		

K1A_U15	prepares models of basic mechanic systems, conducting analysis of their operation and using methods of engineering graphics	T1A_U13, T1A_U14, T1A_U15
K1A_U16	solves basic problems in the field of electrical power engineering	T1A_U13, T1A_U14, T1A_U15
K1A_U17	demonstrates the skills of selecting methods of adjustment and control of basic power engineering systems	T1A_U13, T1A_U14, T1A_U15
K1A_U18	demonstrates the skill of selecting typical parts of machines and of determining their properties, including strength	T1A_U13, T1A_U14, T1A_U15
K1A_U19	describes physical and chemical processes, using the laws of thermodynamics, heat and mass transfer, as well as fluid mechanics	T1A_U13, T1A_U14, T1A_U15
K1A_U20	calculates the amount of emission of pollutants from electric power systems	T1A_U13, T1A_U14, T1A_U15
K1A_U21	determines the values of cumulative energy and natural resources consumption ratios for entire process lines	T1A_U13, T1A_U14, T1A_U15
K1A_U22	defines efficiency of basic electric power machines and equipment, as well as analyses the impact of selected process parameters on process capacity process capacity/watt-hour efficiency	T1A_U13, T1A_U14, T1A_U15
K1A_U23	identifies power technology schemes	T1A_U14
K1A_U24	demonstrates an ability to use the renewable energy technology	T1A_U16
K1A_U25	selects power equipment in the process of system design for the power engineering industry	T1A_U16
K1A_U26	is able to prepare and present a project, system or process typical for heat power engineering	T1A_U16
K1A_U27	formulates and solves basic problems in the area of the studied programme	T1A_U14, T1A_U15, T1A_U16
K1A_U28	assesses effects of technological solutions related to the studied programme	T1A_U14, T1A_U15, T1A_U16
PERSONAL AND SOCIAL COMPETENCIES		
K1A_K01	demonstrates an understanding of the need for lifelong learning, especially with a view to improving one's professional and personal competencies	T1A_K01
K1A_K02	is aware of the importance of understanding non-technical aspects and effects of an engineer's work, as well as its impact on the environment and responsibility for the decisions taken in this respect	T1A_K02
K1A_K03	cooperates and works in a team, assuming various roles	T1A_K03
K1A_K04	clearly determines priorities in performance of a task set by	T1A_K04

	him/herself or others	
K1A_K05	correctly identifies and solves dilemmas related to his/her profession	T1A_K05
K1A_K06	thinks and acts in an enterprising manner	T1A_K06
K1A_K07	is aware of the social role of a technical university graduate and understands the need to formulate and provide information, as well as opinions regarding technological achievements and other aspects of an engineer's work, to the society via the mass media; undertakes efforts to provide such information and opinions in a generally comprehensible way	T1A_K07