

Major learning outcomes for the field of study	Description of learning outcomes Upon completion of his or her first-cycle studies in Technical and Information Technology Education the graduate:	Reference to learning outcomes in the area of technical sciences
<b>KNOWLEDGE</b>		
<b>1) general knowledge (not directly related to engineering)</b>		
<b>K_W01</b>	Knows and understands mathematical methods essential for describing basic problems in the area of materials science and engineering, mechanical engineering and information technology comprising linear algebra, basic concepts of differential and integral calculus, elements of mathematical logic, statistics and numerical methods	Has knowledge of mathematics, physics, chemistry and other field-related areas useful for formulating and solving simple problems associated with the scope of his or her field of study <b>T1A_W01</b>
<b>K_W02</b>	Has organised basic knowledge of experimental physics including mechanical engineering, thermodynamics, gravitational field, optics, electromagnetic field and elements of contemporary physics	Has knowledge of mathematics, physics, chemistry and other field-related areas useful for formulating and solving simple problems associated with the scope of his or her field of study <b>T1A_W01</b>
<b>K_W03</b>	Has basic knowledge of selected branches of chemistry essential for understanding basic technological processes	Has knowledge of mathematics, physics, chemistry and other field-related areas useful for formulating and solving simple problems associated with the scope of his or her field of study <b>T1A_W01</b>
<b>K_W04</b>	Has basic terminology concerning pedagogy, didactics and social psychology	Has basic knowledge of fields of studies associated with his or her field of study <b>T1A_W02</b>
<b>K_W05</b>	Has knowledge of ecological aspects of undertaken engineering activities	Has basic knowledge essential for understanding social, economic, legal and nontechnical aspects of engineering <b>T1A_W08</b>
<b>K_W06</b>	Knows basic terminology concerning macro- and microeconomics, entrepreneurship, work organisation and management	Has basic knowledge essential for understanding social, economic, legal and nontechnical aspects of engineering <b>T1A_W08</b>
		Has basic knowledge concerning management, including quality management, and running a business <b>T1A_W09</b>
		Knows general principles of creating and developing forms of individual entrepreneurship using knowledge of scientific branches and disciplines relevant to his or her field of study <b>T1A_W11</b>
<b>K_W07</b>	Has basic knowledge of standards, patents and copyright law; knows and understands basic terminology and principles relating to protecting	Knows and understands basic terminology and principles related to industrial and intellectual property

	one's industrial and intellectual property and technology transfer with reference to technical and information technology solutions	protection; is able to use patent information resources <b>T1A_W10</b>
<b>2) basic engineering knowledge</b>		
<b>K_W08</b>	Has knowledge of procedural and object-oriented programming, artificial intelligence and databases	Has detailed knowledge of selected problems related to his or her field of study <b>T1A_W04</b>
<b>K_W09</b>	Knows principles of engineering graphics and technical drawing	Has basic knowledge of fields of studies associated with his or her field of study <b>T1A_W02</b>
		Knows basic methods, techniques, tools and materials used to solve simple engineering problems related to his or her field of study <b>T1A_W07</b>
<b>K_W10</b>	Has basic knowledge of technical mechanics, strength of materials and general engineering construction principles	Has well-established theoretical general knowledge of key issues related to the scope of his or her field of study <b>T1A_W03</b>
		Has basic knowledge of fields of studies associated with his or her field of study <b>T1A_W02</b>
		Knows basic methods, techniques, tools and materials used to solve simple engineering problems related to his or her field of study <b>T1A_W07</b>
<b>K_W11</b>	Knows problems relating to the manufacture and machining of engineering materials	Has well-established theoretical general knowledge of key issues related to the scope of his or her field of study <b>T1A_W03</b>
<b>K_W12</b>	Has basic knowledge of metrology, knows and understands methods of measuring physical quantities and analysing results of such measurement	Knows basic methods, techniques, tools and materials used to solve simple engineering problems related to his or her field of study <b>T1A_W07</b>
		Has knowledge of mathematics, physics, chemistry and other field-related areas useful for formulating and solving simple problems associated with the scope of his or her field of study <b>T1A_W01</b>
<b>K_W13</b>	Has elementary knowledge of electrical power engineering, electronics and basics of automatic control	Has basic knowledge of fields of studies associated with his or her field of study <b>T1A_W02</b>
<b>3) knowledge closely related to solving engineering tasks</b>		
<b>K_W14</b>	Has knowledge of information technology systems comprising the architecture of computer and operational systems	Has well-established theoretical general knowledge of key issues related to the scope of his or her field of study <b>T1A_W03</b>
		Has basic knowledge of fields of studies associated with his or her field of study <b>T1A_W02</b>

<b>K_W15</b>	Has basic knowledge of the theory, technology and operation of computer networks; knows properties and principles of operation of various network devices	Has well-established theoretical general knowledge of key issues related to the scope of his or her field of study <b>T1A_W03</b>
<b>K_W16</b>	Has detailed knowledge related to problems of analysing the functional materials and processes at the nanometer scale	Has well-established theoretical general knowledge of key issues related to the scope of his or her field of study <b>T1A_W03</b>
<b>K_W17</b>	Knows the current state of and is versed in the latest development trends in the area of materials science and engineering, nanotechnology and machine design	Has basic knowledge of development trends in the area of science and scientific disciplines relevant to his or her field of study <b>T1A_W05</b>
<b>K_W18</b>	Has knowledge of optimisation procedures of designing structures and practical engineering applications	Has detailed knowledge of selected problems related to his or her field of study <b>T1A_W04</b>
<b>K_W19</b>	Has basic knowledge of operating and diagnosing technical systems, including the lifespan of devices	Has basic knowledge of the lifespan of devices, facilities and technical systems <b>T1A_W06</b>
<b>K_W20</b>	Has knowledge of computer-aided technical education	Has detailed knowledge of selected problems related to his or her field of study <b>T1A_W04</b>
<b>SKILLS</b>		
<b>1) general skills (not directly related to engineering)</b>		
<b>K_U01</b>	Is able to extract information from the literature, databases and other properly selected sources, integrate it, interpret it, draw conclusions, formulate and justify his or her opinions	Is able to extract information from the literature, databases and other properly selected sources, also in English or another foreign language of international communication in the area of his or her field of study, is able to integrate obtained information, interpret it, draw conclusions and formulate and justify his or her opinions <b>T1A_U01</b>
<b>K_U02</b>	Is able to plan and arrange self-education process	Is able to plan and arrange self-education process <b>T1A_U05</b>
<b>K_U03</b>	Is able to prepare and give an oral presentation in Polish and in a foreign language and a well-documented treatise regarding problems related to materials science and engineering, mechanical engineering and machine design, electrical power engineering, electronics and information technology	Is able to prepare a well-documented treatise of problems related to his or her field of study in Polish and a foreign language recognised as primary for scientific branches and disciplines relevant to his or her field of study <b>T1A_U03</b>
		Is able to prepare and deliver an oral presentation in Polish and a foreign language concerning detailed issues related to his or her field of study <b>T1A_U04</b>
<b>K_U04</b>	Is able to use the mathematical knowledge he or she has acquired to describe processes, create models, write down algorithms and other activities in the area of technology and information technology	Is able to use analytical, simulation and experimental methods to formulate and solve engineering problems <b>T1A_U09</b>
<b>K_U05</b>	Is able to carry out ergonomic workplace evaluation	Is able to carry out critical analysis of the way in which existing technical solutions, especially devices,

		facilities, systems, processes and services function, and evaluate them, particularly in relation to his or her field of study <b>T1A_U13</b>
<b>2) basic engineering skills</b>		
<b>K_U06</b>	Is able to draw and measure basic elements of engineering structures	Is able to use information and communication technologies to carry out engineering tasks <b>T1A_U07</b>
		Is able to design and develop a simple device, facility, system or process relevant to his or her field of study using appropriate methods, techniques and tools, according to provided specification <b>T1A_U16</b>
<b>K_U07</b>	Is able to carry out simple calculations for strength of engineering structure elements	Is able to use analytical, simulation and experimental methods to formulate and solve engineering problems <b>T1A_U09</b>
<b>K_U08</b>	Is able to properly select standard analytical or numerical tools to solve technical problems; is able to make a critical evaluation of results of numerical analysis	is able to evaluate usefulness of routine methods and tools for solving a simple engineering problem relevant to his or her field of engineering, and choose and use the appropriate method and tool <b>T1A_U15</b>
<b>K_U09</b>	Is able to use computer-aided software design (e.g. CAD)	Is able to use analytical, simulation and experimental methods to formulate and solve engineering problems <b>T1A_U09</b>
		Is able to identify and formulate a specification of simple practical engineering problems relevant to his or her field of study and choose and use the appropriate method and tools <b>T1A_U14</b>
<b>K_U10</b>	Is able to design simple mechanical constructions, electronic, optical and measurement systems	Is able to design and develop a simple device, facility, system or process relevant to his or her field of study using appropriate methods, techniques and tools, according to provided specification <b>T1A_U16</b>
<b>K_U11</b>	Is able to create computer software using high-level programming language, including C programming language	Is able to design and develop a simple device, facility, system or process relevant to his or her field of study using appropriate methods, techniques and tools, according to provided specification <b>T1A_U16</b>
<b>K_U12</b>	Is able to use a foreign language to communicate, read and understand specialist texts related to technology and information technology	Has language skills at B2 level related to scientific branches and disciplines relevant to his or her field of study, in accordance with requirements set for level B2 Common European Framework of Reference for Languages <b>T1A_U06</b>
<b>K_U13</b>	Is able to use information and communication techniques relevant to engineering tasks	Is able to use information and communication techniques relevant

		to engineering tasks <b>T1A_U07</b>
		Is able to communicate using various techniques in professional and other contexts <b>T1A_U02</b>
<b>K_U14</b>	Knows the principles of job organisation; obeys health and safety regulations	Is prepared for working in an industrial environment and knows safety rules related to that work <b>T1A_U11</b>
<b>K_U15</b>	Is able to carry out initial economic analysis of undertaken engineering activities and assess their labour intensity	Is able to carry out initial economic analysis of undertaken engineering activities <b>T1A_U12</b>
<b>3) skills closely related to solving major engineering tasks</b>		
<b>K_U16</b>	Is able to identify a technical problem, specify its complexity and propose a scheme of its analysis and solution	Is able to identify and formulate a specification of simple practical engineering problems relevant to his or her field of study and choose and use the appropriate method and tools <b>T1A_U14</b>
		is able to evaluate usefulness of routine methods and tools for solving a simple engineering problem relevant to his or her field of engineering, and choose and use the appropriate method and tool <b>T1A_U15</b>
<b>K_U17</b>	Is able to use programming languages (C++, C#, SQL and NET components) when it comes to applications and configurations of information technology systems based on databases	Is able to design and develop a simple device, facility, system or process relevant to his or her field of study using appropriate methods, techniques and tools, according to provided specification <b>T1A_U16</b>
<b>K_U18</b>	Is able do design control software for simple measurement systems using standard devices and control and measurement modules	Is able to design and develop a simple device, facility, system or process relevant to his or her field of study using appropriate methods, techniques and tools, according to provided specification <b>T1A_U16</b>
<b>K_U19</b>	Is able to plan and carry out standard measurement, analyse and record results of research; is able to identify and assess the importance of basic factors disturbing a measurement	Is able to plan and carry out experiments, including computer measurements and simulations, interpret results he or she has obtained and draw conclusions <b>T1A_U08</b>
<b>K_U20</b>	Is able to select materials which have appropriate physicochemical and structure properties for laboratory and engineering uses	Is able to evaluate usefulness of routine methods and tools for solving a simple engineering problem relevant to his or her field of engineering, and choose and use the appropriate method and tool <b>T1A_U15</b>
<b>K_U21</b>	Is able to select appropriate manufacture technologies in order to shape products, their structure and properties	Is able to evaluate usefulness of routine methods and tools for solving a simple engineering problem relevant to his or her field of engineering, and choose and use the appropriate method and tool <b>T1A_U15</b>

<b>K_U22</b>	Is able to design and carry out numerical simulations of physical phenomena and technical processes using standard software	Is able to plan and carry out experiments, including computer measurements and simulations, interpret results he or she has obtained and draw conclusions <b>T1A_U08</b>
<b>K_U23</b>	Is able to configure basic measurement systems and diagnostic systems from functional modules and components in various branches of technology	Is able to design and develop a simple device, facility, system or process relevant to his or her field of study using appropriate methods, techniques and tools, according to provided specification <b>T1A_U16</b>
<b>K_U24</b>	Is able to prepare technical documentation of basic measurement and diagnostic systems using standard tools for computer-aided design	Is able to identify and formulate a specification of simple practical engineering problems relevant to his or her field of study and choose and use the appropriate method and tools <b>T1A_U14</b>
<b>K_U25</b>	Is able to discern the social, economic and legal aspects when formulating and solving engineering problems	Is able to discern the system and nontechnical aspects when formulating and solving engineering problems <b>T1A_U10</b>
		Is able to carry out initial economic analysis of undertaken engineering activities <b>T1A_U12</b>
<b>ATTITUDES</b>		
<b>K_K01</b>	Is able to work responsibly on task assigned to him or her both on his or her own and as part of a team, assuming various roles; shows professionalism in his or her work and responsibility for decisions he or she takes	Is able to cooperate and work in a team, assuming various roles <b>T1A_K03</b>
<b>K_K02</b>	Follows the rules of professional ethics, is responsible for the reliability of results obtained in his or her work	Is able to properly identify and settle dilemmas related to the job he or she does <b>T1A_K05</b>
<b>K_K03</b>	Understands the need of and opportunities for continuous self-improvement (courses, postgraduate studies) to raise his or her professional, personal and social competences	Understands the need of life-long learning; is able to inspire and organise other people's learning process <b>T1A_K01</b>
<b>K_K04</b>	Is aware of the need of taking care of his or her physical fitness	Is able to cooperate and work in a team, assuming various roles <b>T1A_K03</b>
<b>K_K05</b>	Is able to communicate information on technology and information technology in a widely understandable manner	Is aware of the social role of technical university graduates, and especially understands the need of informing the society (especially through mass-media) about new developments, information and opinions in the field of technology and other aspects of engineering; attempts to present the information and opinions in a commonly understandable way <b>T1A_K07</b>
<b>K_K06</b>	Is aware of the importance of nontechnical aspects and results of engineering, including its environmental impact	Is aware of the importance of and understands nontechnical aspects and results of engineering, including

		its environmental impact, and responsibility for the decisions taken in relation to this <b>T1A_K02</b>
<b>K_K07</b>	Is able to identify priorities correctly in order to carry out a task defined by him or her or others	Is able to identify priorities correctly in order to carry out a task defined by him or her or others <b>T1A_K04</b>
<b>K_K08</b>	Is able to think and act in an entrepreneurial and innovative way	Is able to think and act in an entrepreneurial and innovative way <b>T1A_K06</b>
<b>K_K09</b>	is aware of the social role of technical university graduates, and especially understands the need of informing the society about new developments, information and opinions in the field of technical physics and other aspects of engineering	Is aware of the social role of technical university graduates, and especially understands the need of informing the society (especially through mass-media) about new developments, information and opinions in the field of technology and other aspects of engineering; attempts to present the information and opinions in a commonly-understandable way <b>T1A_K07</b>