LEARNING OUTCOMES
established for the field of computer science, first-cycle programme, practical profile
for the 2024/2025 enrollment

Table of a field-related learning outcome references to the 6-th descriptors of the levels in the Polish Qualifications Framework				
Symbol of a field-related learning outcome	**Field-related learning outcomes**	**Reference to the 6-th descriptors of the levels in the Polish Qualifications Framework (PQF)**		
		Symbol of the first-stage universal descriptors of the levels in the PQF	Symbol of the second-stage descriptors in the Polish Qualifications Framework	
			Component code of the PQF description	Component code of the PQF description - regarding engineering competencies
KNOWLEDGE				
K_W01	Knows and understands the concepts and methods of the basic branches of mathematics, numerical methods and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W02	Knows and understands the concepts and applications of physics, including physical phenomena occurring in and around electronic components and systems	P6U_W	P6S_WG	P6S_WG
K_W03	Knows and understands the concepts, methods and techniques of automation systems, electronics, electrical engineering, electronic metrology and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W04	Knows and understands concepts, methods and techniques in the field of signal analysis and processing and the structure and operational activity of signal processes and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W05	Knows and understands software tools and the apparatus and equipment used in solving engineering tasks in the field of information systems and aspects of implementing and managing information systems at an advanced level	P6U_W	P6S_WG	P6S_WG
K_W06	Knows and understands the concepts of computer science, computer systems architecture and security in information systems and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W07	Knows and understands the concepts of implementing efficient algorithms, methods and techniques used in solving computer problems based on algorithm theory, data structures and artificial intelligence at an advanced level	P6U_W	P6S_WG	P6S_WG
K_W08	Knows and understands the concepts, methods and techniques used in solving computer tasks in the field	P6U_W	P6S_WG	P6S_WG

	of databases, using selected programming languages and database systems at an advanced level			
K_W09	Knows and understands the concepts, methods and techniques of computer networks at an advanced level and their design, device configuration, network security and operating systems computer network architecture, communication protocols, security and construction of network applications	P6U_W	P6S_WG	P6S_WG
K_W10	Knows and understands concepts at an advanced level in the architecture and organisation of computers, including multiprocessor systems, for the design of computer systems, industrial systems and for parallel processing of information	P6U_W	P6S_WG	P6S_WG
K_W11	Knows and understands the concepts, methods and techniques of programming, including in higher level, object-oriented languages and mechanisms of creating user interfaces at an advanced level, as well as practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W12	Knows and understands the concepts, methods and techniques of PLC and microcontroller programming based on low and high level languages at an advanced level and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W13	Knows and understands the concepts, methods and techniques relating to the administration of web servers, their components and content management systems at an advanced level and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W14	Knows and understands concepts and methods related to multimedia techniques, computer graphics techniques, image processing and compression, user interfaces at an advanced level and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W15	Knows and understands the latest development trends, processes related to the life cycle of devices, information systems and software, and the practical applications of this knowledge in professional activity	P6U_W	P6S_WG	P6S_WG
K_W16	Knows and understands the concepts of management and running own business and the basic principles of creating and developing various forms of entrepreneurship in the IT profession and the principles of occupational health and safety	P6U_W	P6S_WG P6S_WK	P6S_WG P6S_WK
K_W17	Knows and understands basic economic, legal, ethical and other conditions of various professional activities in the work of an IT specialist, also non-technical ones, including basic concepts and principles of industrial property protection and copyright	P6U_W	P6S_WG P6S_WK	P6S_WG P6S_WK
SKILLS				
K_U01	Is able to use obtained knowledge by appropriate selection of sources, acquire information from literature, databases and other sources, interpret, critically analyse and synthesise found information,	P6U_U	P6S_UW P6S_UK	P6S_UW P6S_UK

	prepare documentation concerning the realization of an engineering task			
K_U02	Is able to plan and organise individual and team work, interact with others in teamwork	P6U_U	P6S_UO	P6S_UO
K_U03	Is able to use a foreign language at B2 level of the Common European Framework of Reference for Languages by the Council of Europe, including elements of technical language in the field of computing	P6U_U	P6S_UK	
K_U04	Is able to apply obtained knowledge, mathematical models, physical models, computer simulations to analyse and evaluate the operation of analogue and digital electronic systems, signal analysis and signal processing systems, solving complex and unusual problems in conditions that are not fully predictable	P6U_U	P6S_UW	P6S_UW
K_U05	Is able to design and implement a relational database and use its resources in information systems formulating and solving tasks typical for professional activity	P6U_U	P6S_UW	P6S_UW
K_U06	Is able to compare project tasks (programming), functional and economic tasks (intuitiveness of use, speed of operation, cost) using appropriate methods and tools, including advanced information and communication techniques	P6U_U	P6S_UW	P6S_UW
K_U07	Is able to use appropriately selected programming environments, simulators and computer-aided design tools to plan and simulate, design and verify electronic components and circuits as well as electronic and microprocessor systems	P6U_U	P6S_UW	P6S_UW
K_U08	Is able to design, implement and apply efficient algorithmic techniques, select appropriate artificial intelligence methods for specific practical computational problems, build neural networks for a specific problem, create expert systems using fuzzy logic to solve complex and unusual problems	P6U_U	P6S_UW	P6S_UW
K_U09	Is able to create desktop and web-based software components, multimedia and advanced user applications in a selected programming environment, also using ready-made software components and templates in accordance with the architectural pattern	P6U_U	P6S_UW	P6S_UW
K_U10	Is able to formulate specifications of information systems at the level of the functions performed, as well as using hardware description languages	P6U_U	P6S_UW	P6S_UW
K_U11	Is able to design information systems, networks, IT process control devices taking into account usability and economic criteria using appropriate techniques, methods and tools	P6U_U	P6S_UW	P6S_UW
K_U12	Is able to use data sheets and application notes to select appropriate components for designed systems and circuits, evaluating, critically analysing and synthesising this information	P6U_U	P6S_UW	P6S_UW

K_U13	Is able to design an IT project, a computer system according to a given specification and estimate and plan its costs; he is able to implement, run and test it	P6U_U	P6S_UW P6S_UO	P6S_UW P6S_UO
K_U14	Is able to configure communication devices in local wired and wireless data communication networks using appropriate methods and tools	P6U_U	P6S_UW	P6S_UW
K_U15	Is able to design and program in known graphic environments Rusing appropriate methods and tools	P6U_U	P6S_UW	P6S_UW
K_U16	Is able to build, run and test a web server, database server, www server from specified elements on the basis of known network operating systems using appropriate methods and tools	P6U_U	P6S_UW	P6S_UW
K_U17	Is able to use obtained knowledge to assess the suitability of methods and tools for solving engineering tasks typical of computer science and apply the principles of occupational safety and health	P6U_U	P6S_UW P6S_UO	P6S_UW P6S_UO
K_U18	Is able to perceive non-technical aspects, including environmental, economic and legal ones while formulating and solving complex and untypical problems and performing tasks not fully predictable involving design of IT elements and systems	P6U_U	P6S_UW P6S_UK	P6S_UW P6S_UK
K_U19	Is able to program embedded systems, improve the reliability of the embedded system using appropriate documentation, methods and tools	P6U_U	P6S_UW	P6S_UW
K_U20	Is able to design, configure and administer a network, configure, secure and provide network services, detect and diagnose network problems and propose solutions	P6U_U	P6S_UW	P6S_UW
K_U21	Is able to solve complex and non-standard tasks/problems arising in the work environment, critically evaluate the effectiveness of own actions, present and evaluate opinions	P6U_U	P6S_UU	
K_U22	Is able to apply the acquired knowledge in practical activities using a critical analysis and synthesis of this information, plan his/her own development	P6U_U	P6S_UW P6S_UU	P6S_UW P6S_UU
SOCIAL COMPETENCES				
K_K01	Is ready to critically evaluate his/her knowledge and perceived content, recognise the importance of knowledge in solving cognitive and practical problems, and seek expert advice in case of difficulties in solving the problem independently	P6U_K	P6S_KK	
K_K02	Is ready to acknowledge non-technical aspects and effects of the activity of IT engineer, to fulfil social obligations, to co-organise activities for social environment	P6U_K	P6S_KO	
K_K03	Is ready to think and act in an entrepreneurial way, to initiate actions in the public interest	P6U_K	P6S_KO	
K_K04	Is ready to take responsible professional roles, including observing the rules of professional ethics and requiring others to do so, as well as taking care of the achievements and traditions of the profession	P6U_K	P6S_KR	

Reference to first-stage universal descriptors at level 6 In accordance with the appendix to the Act of 22 December 2015 on the Integrated Qualifications System (Journal of Laws 2020, item 226)		Codes
Knowledge outcomes: the student knows and understands:	At an advanced level – facts, theories, methods and complex relations between them. Various, complex conditions of the activity undertaken.	**P6U_W**
Skills outcomes: the student is able to:	Innovatively perform tasks and solve complex and untypical problems in changed and not fully predictable conditions. Independently plan their own lifelong learning. Communicate with the surroundings, justify their position.	**P6U_U**
Competence outcomes: the student is ready to:	Cultivate and disseminate models of proper conduct in the working environment and outside it. Independently take decisions, critically evaluate their own actions, the actions of teams which they manage and organisations in which they participate, take responsibility for the effects of these actions.	**P6U_K**

The descriptions used are presented beneath – in accordance with the Regulation of the Minister of Science and Higher Education of 14 November 2018 on the second-stage descriptors of learning outcomes for the qualifications at levels 6-8 of the Polish Qualifications Framework (Journal of Laws 2018 item 2218).

P6S_WG	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of knowledge: scope and depth – completeness of the cognitive perspective and dependence.
P6S_WK	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of knowledge: context – conditions, effects.
P6S_UW	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of skills: the use of knowledge – solved problems and performed tasks.
P6S_UK	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of skills: communicating – utterance receiving and forming , knowledge dissemination in the academic environment and use of a foreign language.
P6S_UO	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of skills: work organisation – planning and teamwork.
P6S_UU	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of skills: learning – planning one's own development and the development of other people.
P6S_KK	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of social competence: assessment – critical approach.
P6S_KO	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of social competence: responsibility – fulfilling social obligations and acting for the public interest.
P6S_KR	the second-stage descriptor of learning outcomes for the qualifications at level 6 of the Polish Qualifications Framework in the field of social competence: professional role – independence and development of the ethos.

WAYS OF THE VERIFICATION OF LEARNING OUTCOMES ACHIEVED BY THE STUDENT DURING THE WHOLE CYCLE OF EDUCATION

The teacher determines detailed learning outcomes and a form of their verification, and next puts them in the syllabus. The achievement of all learning outcomes determined for particular classes means the implementation of the assumed concept of education in the conducted field. The verification and assessment of learning outcomes achieved by the student during the whole cycle of education takes place through:

1) assessment of the student's current preparation for classes, participation in classes;
2) assignments (tests, papers, presentations, projects);
3) examinations (oral, written examination etc.);
4) student internships (in accordance with the internship regulations);
5) diploma process (in accordance with the study regulations).

Exams and graded credits are conducted under conditions of controlled independence.

Forms and methods of class management and the criteria of the grade and its components are determined in the syllabus.

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