University of Silesia in Katowice
Faculty of Mathematics, Physics and Chemistry

Learning outcomes of the programme:

1.	Field of study	Applied Computer Science
2.	Academic year of entry	2015/2016 (winter term), 2016/2017 (winter term)
3.	Level of qualifications/degree	first-cycle studies (in engineering)
4.	Degree profile	general academic

Code of the learning outcome of the programme	Learning outcomes The graduate:	Codes of the learning outcomes of the areas of education to which the learning outcome of the programme is related
KNOWLEDGE		
K_W02	has basic knowledge of the mathematical basics of algorithmics, understands the mathematical basics of algorithm analysis and the influence of selection of data structures and algorithms on the operation time of computer programmes	T1A_W01, T1A_W02, X1A_W01, X1A_W02, X1A_W03
K_W05	has knowledge of the theoretical basis of control and the basic elements and systems of automation and robotics	T1A_W01, T1A_W02
K_W17	has basic knowledge of artificial intelligence methods	T1A_W01, T1A_W02, T1A_W04, X1A_W01, X1A_W04
K_W21	has general, forward-looking knowledge of various branches of IT and related scientific and technological fields	T1A_W01, T1A_W02, T1A_W05, T1A_W06, X1A_W01
K_W22	knows and understands basic concepts, mathematical description, algorithms and operations performed on raster and vector graphics; knows color spaces and principles of object lighting and rendering	T1A_W01, T1A_W02, T1A_W03, X1A_W02
SKILLS		
K_U19	is able to acquire knowledge independently in order to improve their professional qualifications and competences	T1A_U05, X1A_U07
K_U20	knows at least one foreign language at the intermediate (B2) level and can make use of English-language IT literature	T1A_U01, T1A_U04, T1A_U06, X1A_U10
K_U22	is able to identify further learning opportunities and self-learn using library resources, electronic sources and databases	T1A_U01, T1A_U02, T1A_U05, X1A_U07
SOCIAL COMPETENCES		
K_K01	knows the limitations of their own knowledge and understands the need to continue to learn and improve their professional, personal and social competences	T1A_K01, X1A_K01, X1A_K05
K_K02	can work in a group while assuming different roles; understands the division of tasks and the individual's need to fulfil a given task; can listen to different opinions and discuss a particular issue; can identify appropriate priorities for carrying out a task set by themselves or by someone else; can formulate precise questions with a view to improving understanding of a given topic or finding missing points in reasoning	T1A_K03, T1A_K04, X1A_K01, X1A_K02, X1A_K05
K_K06	is aware of the social role of a graduate of a technical programme of studies, recognizes and understands the need to promote information on the development of computer science and other aspects of the work of an engineering-information technology specialist	T1A_K07

Code of the learning outcome of the programme	Learning outcomes leading to the acquisition of engineering competences The graduate:	Codes of the learning outcomes of the areas of education to which the learning outcome of the programme is related
KNOWLEDGE		
K_W01	knows basic concepts and theorems from selected areas of further mathematics, including logic, mathematical analysis, algebra, analytical geometry, discrete mathematics, probabilistics; knows basic computational techniques useful in computer science; understands the importance of mathematical formalism in formulating and solving IT and engineering problems	InzA_W02, T1A_W01, T1A_W02, T1A_W07, X1A_W01, X1A_W02, X1A_W03, X1A_W04
K_W03	has knowledge of physics including: elements of mechanics, electricity and magnetism, optics and quantum mechanics and the physical basis of operation of selected semiconductor and optronic devices	InzA_W02, T1A_W01, T1A_W02, T1A_W07, X1A_W01
K_W04	has knowledge of the basics of electrical engineering, electronics and digital technology	InzA_W01, InzA_W02, T1A_W02, T1A_W06, T1A_W07

K_W06	has structured knowledge of contemporary paradigms, languages and methods of programming and software engineering	InzA_W02, InzA_W05, T1A_W01, T1A_W03, T1A_W04, T1A_W05, T1A_W07, X1A_W04
K_W07	has structured knowledge of software design and development and of typical software development environments and tools	InzA_W01, InzA_W02, T1A_W03, T1A_W04, T1A_W06, T1A_W07, X1A_W04
K_W08	has basic knowledge of how to use typical applications and information systems for commercial and engineering purposes	InzA_W02, InzA_W05, T1A_W07, X1A_W04
K_W09	knows the structure and organisation of typical computer systems; knows and understands the concept of "conventional machine" in computer system architecture; knows the methods of performing sequential and parallel processing in computer systems	InzA_W01, T1A_W03, T1A_W05, T1A_W06, X1A_W01, X1A_W04, X1A_W05
K_W10	has knowledge in the field of measurement data acquisition and processing necessary to implement simple automated measurement systems	InzA_W02, T1A_W02, T1A_W04, T1A_W07
K_W11	has the knowledge necessary to design and program a simple embedded system, knows the specifics, structure and organisation of typical microprocessors and microcontrollers	InzA_W01, InzA_W02, InzA_W05, T1A_W02, T1A_W04, T1A_W06, T1A_W07
K_W12	has basic knowledge of modern design methods using CAD/CAM/CAE systems	InzA_W02, InzA_W05, T1A_W02, T1A_W07
K_W13	knows and understands the concept and typical functionalities of an operating system, multitasking/multi-threaded work, multi-access; knows the basic mechanisms of intra-system communication; has basic knowledge of virtualisation and its importance for modern information technologies	InzA_W02, T1A_W03, T1A_W04, T1A_W05, T1A_W07, X1A_W01, X1A_W05
K_W14	has the necessary knowledge of modern network and Internet technologies, knows the reference models of network systems, including the ISO/OSI model; knows the basic protocols, network services and applications, and typical methods of data transmission taking into account the specifics of the media used	InzA_W01, InzA_W05, T1A_W03, T1A_W04, T1A_W05, T1A_W06, X1A_W01, X1A_W04, X1A_W05
K_W15	has basic knowledge of security hazards in typical network/system environments and knows how to secure against and counteract them	InzA_W02, InzA_W05, T1A_W02, T1A_W05, T1A_W07, X1A_W01, X1A_W05
K_W16	knows the algebra of relational databases and the relational database model, knows the basics of algebra, commands classified into functional groups and the composition of the structured query language (SQL), has basic knowledge of data modeling and database design, knows selected computer-aided design (CASE) tools for relational databases and the rules of their use; has the necessary knowledge of database security and administration	InzA_W01, InzA_W02, InzA_W05, T1A_W03, T1A_W04, T1A_W05, T1A_W06, T1A_W07, X1A_W01, X1A_W02, X1A_W03, X1A_W04
K_W18	has basic knowledge of economic, legal and ethical conditions related to the activity of an IT engineer, knows the basic principles of occupational health and safety	InzA_W03, InzA_W04, T1A_W08, T1A_W11, X1A_W06, X1A_W07
K_W19	knows and understands basic concepts and principles of industrial property protection, copyright and patent law; can use patent information resources	InzA_W03, T1A_W08, T1A_W10, X1A_W08
K_W20	has basic knowledge of management and operating a business, knows the general principles of creating and developing forms of individual entrepreneurship	InzA_W03, InzA_W04, T1A_W08, T1A_W09, T1A_W11, X1A_W09
K_W23	has extended knowledge of the issues discussed during the specialist module	InzA_W02, T1A_W04, T1A_W05, T1A_W07
SKILLS		
K_U01	is able to formulate theorems and definitions in a correct and comprehensible manner, both orally and in writing; has the ability to use mathematical methods to solve simple IT problems; can use mathematical formalism to precisely describe practical IT tasks	InzA_U01, InzA_U05, InzA_U07, T1A_U08, T1A_U09, T1A_U13, T1A_U15, X1A_U01, X1A_U02, X1A_U05, X1A_U06
K_U02	can use numerical methods to solve mathematical problems; can use software packages to support such calculations	InzA_U01, InzA_U05, InzA_U07, T1A_U08, T1A_U09, T1A_U15, X1A_U04
K_U03	can construct algorithms using classic data structures and basic algorithmic techniques; can write classic algorithms in the form of a block diagram, a list of steps, in a pseudo-code and in a selected programming language; can use mathematical methods to evaluate the effectiveness of simple algorithms	InzA_U05, T1A_U09, T1A_U13, T1A_U14, T1A_U15, T1A_U16, X1A_U01, X1A_U02

K_U04	has the ability to create and process graphics using available applications	InzA_U01, InzA_U02, InzA_U07, T1A_U09, T1A_U15, T1A_U16, X1A_U04
K_U05	can describe and analyse basic physical phenomena using an appropriate mathematical apparatus; can verify real-world models as well as predict events and states based on known models	InzA_U01, InzA_U02, InzA_U07, T1A_U08, T1A_U09, T1A_U15, X1A_U01, X1A_U02, X1A_U06
K_U06	is able to analyse an electrical circuit using an appropriate method, to carry out measurements and interpret the results obtained for different electrical quantities	InzA_U01, InzA_U02, InzA_U05, InzA_U07, InzA_U08, T1A_U08, T1A_U09, T1A_U13, T1A_U15, T1A_U16
K_U07	is able to design and implement typical applications in the selected programming language, including those using graphical and communication interfaces	InzA_U02, InzA_U03, InzA_U05, InzA_U06, InzA_U07, InzA_U08, T1A_U09, T1A_U10, T1A_U13, T1A_U14, T1A_U15, T1A_U16, X1A_U01, X1A_U04, X1A_U05
K_U08	has basic skills in low-level and system programming, including programming of microprocessors and microcontrollers for embedded systems	InzA_U05, InzA_U06, InzA_U07, InzA_U08, T1A_U09, T1A_U13, T1A_U14, T1A_U15, T1A_U16, X1A_U01, X1A_U04
K_U09	is able to design and build simple measuring systems and simple devices incorporating automatic control systems	InzA_U02, InzA_U05, InzA_U08, T1A_U09, T1A_U13, T1A_U15, T1A_U16
K_U10	is able to create applications implementing algorithms of measurement data acquisition, processing and presentation	InzA_U01, InzA_U02, InzA_U05, InzA_U07, InzA_U08, T1A_U08, T1A_U09, T1A_U13, T1A_U15, T1A_U16
K_U11	is able to prepare simple mechanical models and electronic systems using appropriate CAD packages	InzA_U01, T1A_U07, T1A_U09
K_U12	is able to identify and estimate factors affecting the performance of a computer system, microprocessor or microcontroller and to experimentally determine appropriate parameters	InzA_U01, InzA_U02, InzA_U05, InzA_U07, T1A_U08, T1A_U09, T1A_U13, T1A_U15, X1A_U02, X1A_U03, X1A_U04
K_U13	is able to take advantage of the functionality of typical operating systems, in particular Unix systems, system shells and shell scripts; is able to use the capabilities of an operating system to manage data sets	InzA_U02, InzA_U06, InzA_U07, T1A_U02, T1A_U07, T1A_U09, T1A_U14, T1A_U15, X1A_U01, X1A_U04
K_U14	is able to design and implement simple configuration of a local network with access to the Internet, based on typical active devices and transmission media; can perform basic diagnostic tests of status and functionality for a typical computer network and typical network services	InzA_U02, InzA_U05, InzA_U07, InzA_U08, T1A_U09, T1A_U13, T1A_U15, T1A_U16, X1A_U01, X1A_U02, X1A_U03, X1A_U04
K_U15	is able to assess threats in information systems and apply appropriate methods to eliminate them	InzA_U03, InzA_U07, T1A_U10, T1A_U11, T1A_U15
K_U16	can solve data exploration issues with the use of relational database algebra; can construct correct and optimal SQL queries for databases; can operate and use databases, including as a source of database applications; can design correct and integral relational databases, including using selected computer-aided design (CASE) tools; can develop correct and transparent documentation for a relational database project; can administer databases and take care of data security	InzA_U02, InzA_U05, InzA_U06, InzA_U07, InzA_U08, T1A_U09, T1A_U13, T1A_U14, T1A_U15, T1A_U16, X1A_U01, X1A_U02, X1A_U04, X1A_U05, X1A_U06

K_U17	has the ability to describe the problem area; has the ability to match the heuristic search algorithm to the specificity of the problem, and to implement it	InzA_U02, InzA_U06, InzA_U07, InzA_U08, T1A_U02, T1A_U09, T1A_U14, T1A_U15, T1A_U16, X1A_U01, X1A_U04
K_U18	has the ability to prepare and deliver oral presentations on specific IT issues with the support of multimedia; has the ability to prepare typical written work on specific IT issues using a variety of information sources	InzA_U02, InzA_U06, InzA_U07, T1A_U01, T1A_U02, T1A_U03, T1A_U04, T1A_U07, T1A_U14, T1A_U15, X1A_U08, X1A_U09
K_U21	has the ability to implement basic algorithms of raster and vector graphics, both 2D and 3D; can properly use various programming libraries; can properly select hardware solutions specific to computer graphics	InzA_U02, T1A_U07, T1A_U09
K_U23	is able to use and apply, in engineering practice, extended knowledge of selected issues discussed in the specialist module	InzA_U01, InzA_U02, InzA_U03, InzA_U06, InzA_U07, InzA_U08, T1A_U07, T1A_U08, T1A_U09, T1A_U10, T1A_U15, T1A_U16
K_U24	is able to identify alternatives and/or compromise solutions for engineering activities, taking into account the results of the preliminary economic analysis	InzA_U03, InzA_U04, T1A_U10, T1A_U12
SOCIAL COMPETENCES		
K_K03	recognises and appreciates the role and importance of IT for the development of civilisation, science and technology; understands the interdisciplinary character of IT; recognises and appreciates the role and importance of open systems and free software for the development of information technologies, and makes efforts to promote free software	InzA_K01, T1A_K02, T1A_K05, T1A_K07, X1A_K06
K_K04	understands non-technical aspects of the application of acquired knowledge and skills and the associated responsibilities; understands and appreciates the importance of intellectual honesty in one's actions and in those of others; acts ethically	InzA_K01, T1A_K02, T1A_K05, X1A_K02, X1A_K03, X1A_K04, X1A_K06
K_K05	can think and act in terms of entrepreneurship, taking into account costs, economic effects, income statement, profitability, compromise solutions	InzA_K02, T1A_K05, T1A_K06, X1A_K07