

COMPUTER SCIENCE STUDY PROGRAMME

first-cycle studies, practical profile

1. GENERAL CHARACTERISTICS OF THE STUDY PROGRAMME			
Faculty:		Faculty of Transport and Computer Science	
1.1 Study programme/field of study/specialities	Computer Science, specialities to be selected: 1. Software engineering and mobile technologies, 2. Cybersecurity and network technologies		
1.2 Level of study	First-cycle studies		
1.3 Level of the Polish Qualification Framework	6th level of the Polish Qualification Framework		
1.4 Profile of study	Practical		
1.5 Form of study	Full-time studies, part-time studies		
1.6 Number of semesters and ECTS credits necessary for the completion of studies	7 semesters, 210 ECTS credits		
1.7 Total number of teaching hours on full-time studies	2650 – teaching hours on full-time studies; 1850 - teaching hours on part-time studies; including 6-month student work placements on full-time studies and part-time studies		
1.8 Total number of ECTS credits for humanities or social sciences classes	13 ECTS credits		
1.9 Title awarded to graduates, ISCED CODE. Synthetic description of job characteristics, a list of job positions for the graduate	<p>Engineer's degree; ISCED Code: ICT subgroup 061; The holder of these qualifications has general and practical knowledge in the field of computer science, telecommunications and electrical engineering needed to develop specialist competencies related to a variety of IT systems, both in terms of the theory of operation and design as well as their practical application in economy, business and administration. The graduate is in a position to use the acquired competences to form and resolve complex and unusual problems of a practical nature in the field of computer science, in particular the tasks related to:</p> <ul style="list-style-type: none"> • software engineering as well as the selection of software environments and tools for the design, implementation and testing of IT systems, including online applications, • design, implementation and management of modern multimedia applications, including those operating in a wide range of ICT services delivery areas; • design, implementation and maintenance of computer networks and computer/IT systems, with special regard to their security; • analysis of the operation of computer and network systems and their diagnosis with the use of available software and hardware tools; • design and management of complex ICT projects. <p>The holder of the above qualifications is prepared to work in companies/entities with various scopes of business activity, in particular in :</p> <ul style="list-style-type: none"> • IT companies and telecommunications network operators, • public administration, • financial and insurance institutions, in particular where BI Class analytical systems are used • companies involved in the development and implementation of application software • companies that use modern information technologies in practice, <p>in the following positions:</p> <ul style="list-style-type: none"> • IT systems and web applications programmer; • computer system designer; • IT system tester; • computer specialist; • Head of IT Department; • sale and diagnosis of computer hardware specialist; • computer networks and IT systems administrator; • security of IT systems and networks specialist; • designer, programmer and database administrator; • independent entrepreneur running his/her own IT company. 		
2. LEARNING OUTCOMES AND SCIENTIFIC DISCIPLINES AS DEFINED IN THE STUDY PROGRAMME			
2.1 Disciplines of science			
Field of science: Engineering and technology			
No.	Discipline of science	ECTS credits	%
1.	Information and communication technology	210	100
Total number of ECTS credits and the percentage of ECTS in the study programme		210	100
2.2 Learning outcomes for the field of study with reference to the Polish Qualifications Framework (PQF)			
Field of study:	Computer science		
Level of study:	LEVEL 6 of PQF – first-cycle studies		
Profile of study:	Practical	Reference:	

Learning outcomes symbol for the study programme	Learning outcomes after completing first-cycle studies in Computer Science	universal characteristics for a given PQF level	Characteristics for second – cycle studies learning outcomes for qualifications at PQF levels 6-7	
			Level 6	Engineering competencies
KNOWLEDGE The graduate knows and understands:				
K_W01	at an advanced level, the key issues related to the scientific discipline of Computer Engineering and Telecommunications that are essential for: <ul style="list-style-type: none"> description and analysis of algorithms and data structures, description and analysis of the operation of IT systems, description and analysis of the operation of analogue and digital systems as well as the practical application of that knowledge in professional life related to the Computer Science field of study, the first-cycle programme 	P6U_W	P6S_WG	P6S_WG
K_W02	at an advanced level, issues in electrical engineering, electronics and measurements necessary to understand the basics of computer and telecommunications systems and methods of data recording, processing and transmission.	P6U_W	P6S_WG	P6S_WG
K_W03	at an advanced level, issues related to technical and mathematical basics of computer science, and is also able to apply that knowledge in professional life related to the field of study	P6U_W	P6S_WG	P6S_WG
K_W04	at an advanced level, issues and terminology for computer architecture, peripherals and network devices used in professional life	P6U_W	P6S_WG	P6S_WG
K_W05	at an advanced level, and puts software design methodology as well as languages of the description of IT systems into practice	P6U_W	P6S_WG	P6S_WG
K_W06	at an advanced level, computer system software issues (high and low-level languages)	P6U_W	P6S_WG	P6S_WG
K_W07	to a bigger extent, aspects of computer architecture and networks, as well as operating systems, necessary for the installation, configuration, operation and maintenance of these systems	P6U_W	P6S_WG	P6S_WG
K_W08	to an advanced extent, the issues in electrical engineering for the operation of devices forming part of ICT networks and the configuration of such devices in local and wide area networks	P6U_W	P6S_WG	P6S_WG
K_W09	advanced issues related to the design and operation of database systems used in professional life	P6U_W	P6S_WG	P6S_WG
K_W10	at an advanced level, and demonstrates practical application of software engineering issues	P6U_W	P6S_WG	P6S_WG
K_W11	to an advanced extent, issues related to the safety of computer systems and networks	P6U_W	P6S_WG	P6S_WG
K_W12	at an advanced level, issues related to data structures and algorithms of information processing, data analysis, machine learning	P6U_W	P6S_WG	P6S_WG
K_W13	at an advanced level, and puts processes of digital information processing into practice	P6U_W	P6S_WG	P6S_WG
K_W14	at an advanced level, and demonstrates practical application of the processes for selecting the relevant hardware components of computer and network systems	P6U_W	P6S_WG	P6S_WG
K_W15	at an advanced level, issues related to technical standards and norms for computer science and electrical engineering; is familiar with English terminology in the field of IT at B2 level of the Common European Framework of Reference for Languages	P6U_W	P6S_WG	P6S_WG
K_W16	at an advanced level, issues related to the life cycle of computer and network devices as well as software components; has knowledge of active and healthy lifestyle necessary to pursue a profession of an IT specialist	P6U_W	P6S_WG	P6S_WG
K_W17	issues necessary to understand non-technical conditions for engineering activities; basic principles of health and safety at work for an IT specialist and knowledge of physical education	P6U_W	P6S_WK	P6S_WK

K_W18	issues related to protection of industrial property, intellectual property and patent and copyright law, as well as professional ethics issues	P6U_W	P6S_WK	P6S_WK
K_W19	aspects of management and conduct of business activities, including IT-profile business	P6U_W	P6S_WK	P6S_WK
K_W20	general principles for the creation and development of forms of individual entrepreneurship	P6U_W	P6S_WK	P6S_WK
SKILLS				
The graduate is able to:				
K_U01	obtain information from literature, databases and other sources; can integrate, interpret, draw conclusions on the basis of the information acquired, as well as formulating and justifying opinions	P6U_U	P6S_UU	
K_U02	work individually and in a team; estimate the time needed for the task to be carried out; can draw up and implement a work schedule to ensure that the deadlines are met and knows how to be in good health and keep fit	P6U_U	P6S_UO	
K_U03	prepare documentation on the implementation of the engineering task	P6U_U	P6S_UW	P6S_UW
K_U04	prepare, present and discuss a short presentation on the results of the engineering task and take part in a debate	P6U_U	P6S_UW	P6S_UW
K_U05	communicate in English at B2 level, including the ability to read technical documentation used in professional life	P6U_U	P6S_UK	P6S_UK
K_U06	identify further learning pathways and conduct a self-study	P6U_U	P6S_UU	
K_U07	use known mathematical methods as well as computer simulations to analyse and evaluate the operation of computer systems	P6U_U	P6S_UW	P6S_UW
K_U08	critically analyse the operating activity of computer and network systems with the use of available software and hardware tools, as well as diagnosing those systems by means of software and hardware tools available	P6U_U	P6S_UW	P6S_UW
K_U09	compare the components of computer systems and networks based on the economic criteria adopted (safety, reliability, speed of operation, cost, etc.)	P6U_U	P6S_UW	P6S_UW
K_U10	use well-selected programming environments and tools for the design, development and testing of IT systems, including online applications	P6U_U	P6S_UW	P6S_UW
K_U11	plan and perform simulations and measurements of the characteristics of devices forming part of computer and ICT systems	P6U_U	P6S_UW	P6S_UW
K_U12	formulate the specification of IT systems using UML	P6U_U	P6S_UW	P6S_UW
K_U13	design individual software components through the appropriate selection of methods and tools	P6U_U	P6S_UW	P6S_UW
K_U14	design computer networks by correctly selecting methods and tools	P6U_U	P6S_UW	P6S_UW
K_U15	use catalogue cards and application notes to select the appropriate hardware components of the designed computer networks and software	P6U_U	P6S_UW	P6S_UW
K_U16	design websites and online services through the appropriate selection of methods and tools	P6U_U	P6S_UW	P6S_UW
K_U17	plan the implementation of utility software; can pre-estimate its costs	P6U_U	P6S_UW	P6S_UW
K_U18	build, configure, run and test the designed computer network	P6U_U	P6S_UW	P6S_UW
K_U19	configure computer and communication devices in local (wire and radio) ICT networks; can manage hardware and software in local networks and monitor the safety level and detect potential incidents	P6U_U	P6S_UW	P6S_UW
K_U20	formulate an information processing algorithm, use high and low-level programming languages by applying appropriate IT tools	P6U_U	P6S_UW	P6S_UW

K_U21	recognise non-technical aspects, including environmental, economic and legal aspects, when formulating and resolving tasks involving the design and production of IT systems	P6U_U	P6S_UW	P6S_UW
K_U22	work in an industrial environment, especially in the IT sector, and can safely perform work duties by applying OHS regulations	P6U_U	P6S_UW	P6S_UW
K_U23	assess the suitability of typical methods and tools to solve IT engineering tasks and select and use appropriate methods and tools	P6U_U	P6S_UW	P6S_UW
K_U24	use available software to process multimedia data for e.g. online advertising and promotion	P6U_U	P6S_UW	P6S_UW
K_U25	design databases; formulate databases queries using appropriate tools	P6U_U	P6S_UW	P6S_UW
K_U26	apply applicable standards for the design, implementation, testing and use in the field of IT and electrical engineering	P6U_U	P6S_UW	P6S_UW
K_U27	use technical norms and adapt their activities to the applicable legal regulations, and process and archive data, including measurement data.	P6U_U	P6S_UW	P6S_UW
Social Competence The graduate is ready to:				
K_K01	pursue continuous education (second-cycle and PhD studies, postgraduate studies, courses) in order to improve professional, personal and social competences	P6U_K	P6S_KK	
K_K02	demonstrate critical respect for non-technical aspects and impact of engineering activities, including their effect on the environment	P6U_K	P6S_KO	
K_K03	behave in a professional way, comply with work ethics and show respect for the diversity of views and cultures, promote social and cultural importance of sport	P6U_K	P6S_KR	
K_K04	be responsible for their own work and comply with the rules of teamwork taking responsibility for decisions and task execution	P6U_K	P6S_KO	
K_K05	think and act in an entrepreneurial way	P6U_K	P6S_KO	
K_K06	critically formulate and transfer, e.g. using mass media, information and opinions on the achievements in the field of computer science, electrical engineering and other aspects of engineering activity to the public; is willing to provide such information and opinions in a widely understandable manner, also in a foreign language.	P6U_K	P6S_KK	

2.3	Method of learning outcomes verification and evaluation	<p>Written exams, written tests, projects, presentations, reports including presentations of their results, a diploma seminar and, in addition, an assessment of the student's conduct and involvement in the course are used to verify the learning outcomes at the module level of the Computer Science study programme.</p> <p>The verification covers all areas (knowledge, skills, and social competences) and the learning outcomes will form the basis for determining the educational content and its place in the specific modules. For each module, the verification of the learning outcomes will take place at two levels: through formative assessment made during a semester, which will serve both the student and the lecturer as a tool to estimate the learning progress and the validation of learning methods, and through summative assessment at the end of a semester, used to determine whether and to what extent the student has achieved the expected learning outcomes.</p> <p>The relevance of the learning outcomes adopted to the field of study will be assessed not only by students themselves (e.g. by means of an evaluation questionnaire), but also by academics conducting particular modules, and employers involved in the work of the Faculty Board for Ensuring Educational Content and Teaching Quality. The assessment of the learning outcomes verification obtained from tracing the careers of WSEI graduates is also taken into account.</p> <p>WSEI in Lublin has developed tools to verify the assumed learning outcomes used to validate the learning outcomes for each field of study. The process will be reinforced by measuring the degree of implementation of the students' achieved learning outcomes, which have been divided into two groups:</p> <ul style="list-style-type: none"> • quantitative measures; • qualitative measures. <p>In the light of the above, the verification of the assumed learning outcomes for each field of study will be held at two main levels: a module level and a programme level. In the former, the level of implementation of the modular learning outcomes is analysed, whereas in the latter, the learning outcomes specific for a field of study and defined for the relevant field of study and the level of education (6th level of the PQF) are assessed.</p>
2.4	Analysis of the compatibility of the	The learning outcomes for each field of study fully meet the expectations of a broad range of employers and provide the basis for graduates to run their own businesses. The analysis of the compatibility of the assumed learning

assumed learning outcomes with the needs of the labour market and the findings of the monitoring analysis	outcomes with the needs of the labour market is conducted in a progressive manner, with the participation of academics, students, graduates and employers, and the conclusions drawn from the monitoring analysis serve the purpose of improving the study programme.
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3. LIST OF COURSES/MODULES, DETAILED STUDY PROGRAMME

3.1	Classes or groups of classes (modules) with the assigned ECTS credits and hours	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #e1eef6;"> <th colspan="2" style="text-align: left;">Modules</th> <th>ECTS credits</th> <th>ECTS 'practical' credits</th> <th>Form of course completion</th> </tr> </thead> <tbody> <tr style="background-color: #ffff00;"> <td colspan="2">General university modules</td> <td>18</td> <td>5</td> <td></td> </tr> <tr> <td style="text-align: left;">1</td> <td>General module (OSH, basics of intellectual property protection, library, IT)</td> <td>5</td> <td>0</td> <td>CREDIT</td> </tr> <tr> <td style="text-align: left;">2</td> <td>Foreign Language Module (to be selected: English, Russian, German)</td> <td>8</td> <td>5</td> <td>EXAM</td> </tr> <tr> <td style="text-align: left;">3</td> <td>Humanistic and Social Module (to be selected: professional ethics, sociology, psychology, philosophy)</td> 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<td>GRADED CREDIT</td> </tr> <tr> <td style="text-align: left;">31a</td> <td>Advanced methods of software engineering</td> <td>6</td> <td>5</td> <td>EXAM</td> </tr> <tr style="background-color: #ffff00;"> <td colspan="2">Speciality 2: Cybersecurity and network technologies</td> <td>60</td> <td>50</td> <td></td> </tr> </tbody> </table>	Modules		ECTS credits	ECTS 'practical' credits	Form of course completion	General university modules		18	5		1	General module (OSH, basics of intellectual property protection, library, IT)	5	0	CREDIT	2	Foreign Language Module (to be selected: English, Russian, German)	8	5	EXAM	3	Humanistic and Social Module (to be selected: professional ethics, sociology, psychology, philosophy)	5	0	GRADED CREDIT	4	Physical Education Module	0	0	CREDIT	Field of study-related modules		80	30		5	Mathematical analysis with linear algebra	5	1	GRADED CREDIT	6	Operating systems	5	2	GRADED CREDIT	7	Fundamentals of programming	5	2	EXAM	8	Algorithms and data structures	5	2	EXAM	9	Electrical engineering and electronics	5	2	GRADED CREDIT	10	Computer systems architecture	5	2	EXAM	11	Basics of structured programming with C / C++	5	2	EXAM	12	Design of web systems with computer graphics elements	5	2	GRADED CREDIT	13	IT project management	5	2	GRADED CREDIT	14	Introduction to computer networks	5	2	EXAM	15	Software engineering	5	2	EXAM	16	ICT and multimedia systems	5	2	GRADED CREDIT	17	Discrete mathematics	5	1	GRADED CREDIT	18	Database systems	5	2	GRADED CREDIT	19	Fundamentals of object oriented programming in Java	5	2	EXAM	20	Fundamentals of artificial intelligence	5	2	EXAM	Optional modules		5	5		21	Entrepreneurship/ Company Management	5	5	CREDIT	Speciality 1: Software engineering and mobile technologies		60	50		22a	IT technologies and design templates	6	5	GRADED CREDIT	23a	Parallel programming	6	5	GRADED CREDIT	24a	Programming of mobile devices	6	5	EXAM	25a	Programming of mobile devices	6	5	GRADED CREDIT	26a	Design of IT systems	6	5	GRADED 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25a	Programming of mobile devices	6	5	GRADED CREDIT																																																																																																																																																																																							
26a	Design of IT systems	6	5	GRADED CREDIT																																																																																																																																																																																							
27a	Communication security and cryptography	6	5	EXAM																																																																																																																																																																																							
28a	Cyberattacks on infrastructure – techniques and counteracting	6	5	EXAM																																																																																																																																																																																							
29a	Application testing	6	5	GRADED CREDIT																																																																																																																																																																																							
30a	Virtualization techniques, Containerization	6	5	GRADED CREDIT																																																																																																																																																																																							
31a	Advanced methods of software engineering	6	5	EXAM																																																																																																																																																																																							
Speciality 2: Cybersecurity and network technologies		60	50																																																																																																																																																																																								

		22b	Introduction to cybersecurity	6	5	GRADED CREDIT
		23b	Design of IT systems	6	5	GRADED CREDIT
		24b	Networking fundamentals of LAN	6	5	EXAM
		25b	Advanced databases	6	5	GRADED CREDIT
		26b	Scaling networks: CISCO	6	5	GRADED CREDIT
		27b	Network security and cryptography	6	5	EXAM
		28b	Cyberattacks on infrastructure – techniques and contering	6	5	EXAM
		29b	Network monitoring and incident detection	6	5	EXAM
		30b	Virtualization techniques, Containerization	6	5	GRADED CREDIT
		31b	Internet phone services	6	5	GRADED CREDIT
		Seminar and degree examination		15	15	
		34	Seminar and degree examination	15	15	EXAM
		6- month student work placements		32	32	
		35	6- month student work placements	32	32	CREDIT
		Total no. of hours and ECTS credits		210	137	

3.2 Detailed study programme, ECTS credits

The detailed study programme is available either in paper form in the Faculty of Transport and Computer Science or in electronic form uploaded on the e-learning platform.

4. DURATION, PRINCIPLES AND FORMS OF STUDENT WORK PLACEMENT, ECTS CREDITS FOR PRACTICAL STUDIES

Student work placements are conducted for a duration of 6 months (32 ECTS), with the specific learning outcomes, as defined in the Student Work Placement Programme for the first-cycle studies in the field of Computer Science, practical profile.

The rules of obtaining credit for the achievement of the placement learning outcomes by the WSEI students are laid down by the Senate Resolution and the Regulation of the Rector of WSEI in Lublin, on the basis of which the student placement is divided into three parts:

1. **General student work placement;**
2. **Student work placement related to the field of study;**
3. **Student work placement related to the speciality.**

Within the university framework, the students can undergo placements in three possible ways, i.e.:

4. **A placement is held in a company selected by the student provided that the company's business activity is in line with the field of study and has been accepted by the WSEI Student Work Placement Coordinator;**
5. **A placement organised by the University.**

During the second and the third part of the placement, the student conducts projects under the employer's supervision whose practical application can be found in the company's business activity.

5. SELECTION OF MODULES INCORPORATED INTO THE STUDY PROGRAMME

The number of ECTS credits obtained by the student for the courses selected: 96 ECTS credits, representing 46 % of the total number of ECTS credits in the programme. The student can choose from the following modules:

- foreign language (English, Russian, German) – 8 ECTS credits
- humanistic and social module (the following courses to be selected by the student: ethics, sociology, psychology, philosophy) -5 ECTS credits
- optional modules- 36 ECTS credits
- a seminar and a degree examination -15 ECTS credits
- student work placements -32 ECTS credits

6. NUMBER OF ECTS CREDITS FOR DEVELOPING PRACTICAL SKILLS IN THE STUDY PROGRAMME, PRACTICAL PROFILE

In the Computer Science study programme, practical profile, 137 ECTS credits have been assigned to develop practical skills.

7. CONDITIONS FOR RUNNING THE STUDIES

7.1	Organisation and implementation of the education process	<p>First-cycle studies in computer science have a practical profile and are run according to a module-based system. The study programme incorporates 33 modules, including:</p> <ul style="list-style-type: none"> • general university modules and courses, • field of study-related modules and courses, • speciality modules, • optional modules (Entrepreneurship/ Company Management) • seminar module and a degree exam, • 6- month student work placements. <p>The module-based system combines the process of acquiring practical skills with gaining theoretical knowledge necessary for its application in specific professional contexts. Classes run by practitioners are an integral part of the module, which allows for a smoother implementation of the education process, as the student has an opportunity to master more practical skills.</p>
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		<p>It also gives the student a possibility to use the acquired knowledge in laboratory and project classes, and while undergoing work placements. In addition, it facilitates the process of establishing a direct contact with the employer, so as to gain insight into the realities of the labour market and get work experience during studies. Part of the classes on particular course subjects are conducted by practitioners, with many years of professional experience in enhancing the learning outcomes in the field of computer science.</p> <p>First-cycle studies in Computer Science comprise 2 specialities:</p> <ul style="list-style-type: none"> • Software engineering and mobile technologies, • Cybersecurity and network technologies.
7.2	Conducting classes with the aim of developing practical skills	<p>Practical classes, incorporated into the Computer Science study programme, first-cycle studies, practical profile, are conducted:</p> <p>1) in the conditions appropriate for the scope of a professional activity; 2) in such a way that students can perform practical activities.</p> <p>For this purpose, the classes are held in the following laboratories at WSEI:</p> <ul style="list-style-type: none"> • Network services security laboratory; • Implementation of audio/video recordings and multimedia applications laboratory; • IP network service laboratory; • Audio-visual and multimedia laboratory; • Cybersecurity laboratory; • 10 computer labs with a total of 240 computers <p>The student is also given an opportunity to perform certain practical activities during study visits on the employer's premises and during 6 months' student work placements.</p>
7.3	Selected indicators specific to the study programme	<p>The study programme:</p> <ul style="list-style-type: none"> • gives the total number of 106 ECTS credits to be obtained by the student from classes run in a direct contact by academics or other persons at full-time studies; • specifies the number of ECTS credits to be assigned to the student for humanities or social sciences classes, i.e. 13 ECTS credits; • specifies the number of Physical Education classes at full-time studies, which shall not be less than 60 hours, with no ECTS credits assigned; • gives the total number of 137 ECTS credits for practical classes;
7.4	Systematic evaluation and improvement of study programmes	<p>The study programme is systematically assessed by academics, students, graduates and employers, and the conclusions drawn are used to improve it.</p> <p>The Faculty Board for Ensuring Educational Content and Teaching Quality ensures that the proper changes are made providing they cannot constitute more than 30 % of the total number of the learning outcomes specified in the study programme.</p> <p>Changes to the study programme are introduced at the beginning of a new cycle of studies and amendments may only be made:</p> <ul style="list-style-type: none"> • in the selection of educational content provided to students during classes, taking into account the recent developments in professional or scientific activity; • when it is necessary to correct the irregularities identified by the Polish Accreditation Committee; • when the need arises to adapt the study programme to the changes in the applicable legal regulations. <p>Changes to the study programme made in the course of a cycle of studies are published in the Public Information Bulletin available on the university website at least one month before the beginning of a semester to which they refer to.</p>
8.	Library resources	<p>The university has a modern computerised library, with reference books recommended for a particular field of study, which gives access to the electronic resources available in Poland and abroad.</p>
9.	Conducting classes	<p>Full-time studies – classes are held between 8a.m. and 4p.m. from Monday to Friday; Part-time studies – classes are held every two weeks, on Saturdays and Sundays between 8a.m. and 8p.m.</p> <p>The classes preparing for the engineer's profession can be conducted on the premises of the University or outside the University, including the premises of an entity responsible for carrying out training as part of practical classes and student work placements, also with the use of IT technologies that ensure monitoring of the achieved learning outcomes verification process and its registration.</p>