

INTRODUCTION

The Computer Science and Technology educational and professional program of the first (Bachelor) level of higher education, specialty: 122 Computer Science, is developed according to the Law of Ukraine On Higher Education dd. July 1, 2014, No. 1556-VII (as amended and supplemented), Resolutions of the Cabinet of Ministers of Ukraine: Approval of the National Qualifications Frameworks dd. November 23, 2011, No. 1341 (as amended by the Resolution of the Cabinet of Ministers of Ukraine dd. June 25, 2020, No. 519), About Approval of Licensing Conditions for Conducting Educational Activities dd. December 30, 2015, No. 1387 (as amended).

The educational and professional program is based on the Higher Education Standard of Ukraine in the specialty: 122 Computer Science, knowledge area: 12 Information Technology, of the first (Bachelor) level of higher education approved and put into effect by the Order of the Ministry of Education and Science of Ukraine No. 962 dd. July 10, 2019.

The educational and professional program stipulates the background for access to study, focus and key focus, the amount of ECTS credits required to gain a Bachelor's degree, the list of general and specialized (professional) competencies, the normative and variable content of student training specified in learning outcomes terms and requirements for higher education quality control.

The educational and professional program is developed by the working group of International European University, consisting of:

No.	Full name	Place of work, position
1	Zoia Sherman (guarantor of the educational program)	PhD in Physics and Mathematics, Associate Professor, Associate Professor at the Department of Fundamental, Medical and Preventive Disciplines of International European University
2	Oleksandr Nesterenko	Doctor of Technical Sciences, Professor, Professor at the Department of Information Technology of International European University
3	Oleksandr Falovskyi	PhD in Technical Sciences, Associate Professor at the Department of Information Technology of International European University
4	Volodymyr Fedorov	PhD in Physics and Mathematics, Associate Professor at the Department of Information Technology of International European University

External stakeholders involved in the development of the educational program:

No.	Full name	Place of work, position
1	Vasyl Trysniuk	Institute of Telecommunications and Global Information Space of the National Academy of Science of Ukraine, Head of the Department, Doctor of Technical Sciences, Professor
2	Viktor Shevchenko	Institute of Software Systems of the National Academy of Sciences of Ukraine, Deputy Director, Doctor of Technical Sciences, Professor

1. PROFILE OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM

1 – General information	
<i>Full name of the higher education institution and structural unit</i>	International European University Education and Research Institute “European Business School” Department of Information Technology
<i>Degree of higher education and qualification in the original language</i>	Bachelor of Computer Science
<i>Official name of the educational program</i>	Computer Science and Technology
<i>Type of diploma and capacity of the educational program</i>	Bachelor’s Degree Diploma, single, 240 ECTS credits, Period of study: 3 years and 10 months.
<i>Cycle/level</i>	NQF of Ukraine – 6 th level FQ-EHEA – first cycle EQF-LLL – 6 th level
<i>Background</i>	Complete general secondary education or a degree of Junior Bachelor, Professional Junior Bachelor (Junior Specialist). Based on the degree of Junior Bachelor (Junior Specialist), the higher education institution has the right to recognize and re-credit no more than 120 ECTS credits received as part of the previous educational program of Junior Bachelor (Junior Specialist) in specialties of the 12 Information Technology knowledge area and no more than 60 ECTS credits received as part of the previous educational program of Junior Bachelor (Junior Specialist) in other specialties; based on the degree of Professional Junior Bachelor, the higher education institution has the right to recognize and re-credit no more than 60 ECTS credits received as part of the previous educational program of professional pre-higher education. Admission based on the degrees of Junior Bachelor, Professional Junior Bachelor, or Junior Specialist is carried out according to the results of the external independent testing in the manner prescribed by law.
<i>Language(s) of instruction</i>	Ukrainian, English
<i>Validity of the educational program</i>	Until the next accreditation
<i>Internet address of constant placement of educational program description</i>	https://business.ieu.edu.ua/kafedry/kafedra-informatsiinykh-tekhnohii
2 – Goal of the educational program	
To train professionals based on the principles of creativity and academic integrity, who will be able to think critically, adopt innovations and integrate into the European community, who are proficient in programming, computer science, information system and technology development and modeling methods, who have general and professional competencies facilitating the competitiveness of graduates in computer science research and the development of information technologies.	
3 – Characteristics of the educational program	

<p>Subject area (<i>knowledge area, specialty, specialization (if any)</i>)</p>	<p>Knowledge area: 12 Information Technology Specialty: 122 Computer Science</p> <p>The program is aimed at training specialists in modeling, designing, and developing information systems and technologies, particularly in data analysis and intellectualization tools. Graduates possess the skills and abilities to produce high-quality IT products for various activity areas.</p> <p>Learning objectives: to train highly qualified specialists capable of solving theoretical and practical tasks and problems related to acquiring, presenting, processing, analyzing, transmitting, and storing data in information systems using modern technological tools and industry innovations.</p> <p>Theoretical content of the subject area: basic mathematical, technological, and linguistic concepts, system approach, algorithm theory, systems modeling, fundamentals of databases and knowledge, CASE tools for designing information technologies and systems, web technologies, high-performance computing, intelligent decision support systems, and project management.</p> <p>Methods, techniques and technologies: subject area analysis and modeling methods; definition of information needs, data classification and analysis; information system and technology design; methods of information system and technology model analysis and construction; methods of integration of information systems; methods of intellectualization of information systems; models and methods for IT project management.</p> <p>Tools and equipment: software, hardware, instrumental, resource, and documentation tools for computer system and technology development.</p>
<p>Focus of the educational program</p>	<p>Educational and professional program.</p> <p>The program is based on generally known scientific and practical research results in information system and technology development, taking into account its current state, and focused on relevant specializations for potential further professional and scientific career.</p> <p>The program has an applied focus on training specialists able to efficiently and reasonably solve problems of information system and technology design and development in various activity areas.</p>
<p>Key focus of the educational program and specialization</p>	<p>Special education and professional training in the theoretical foundations of computer science, information systems and technologies, as well as modern models, methods, algorithms, and technologies for processing, analyzing, transmitting, and storing data in information systems in various activity areas.</p>
<p>Program features</p>	<p>The part of professional disciplines can be taught in English (bilingual education). The part of relevant professional topics can be taught by representatives of leading IT companies and scientific institutions in the form of workshops or virtual internships.</p> <p>The program implies the integration of theoretical and practical training with the work of the University Digitalization Center where students can acquire practical skills in producing application software and information technology.</p>
<p>4 – Graduates’ ability to employment and further study</p>	
<p>Employability</p>	<p>Specialists can hold the following primary positions (according to the National Classifier of Ukraine DK 003:2010):</p> <p>213 Computing Professionals 2131 Professionals in Computing Systems:</p>

	<p>2131.2 Computing System Developers: 2131.2 Data Administrator; 2131.2 Task Administrator; 2131.2 System Administrator. 2131.2 Computer Systems Analyst 2131.2 Computer Data Bank Analyst 2131.2 Database Administrator 2131.2 Computer Software Engineer 2132 Programmers 2132.2 Software Engineer 2139 Professionals in Other Computing Fields (Computerization) Employment opportunities: Specialists at IT companies, IT Departments of medium and large enterprises, technological and information institutes (researcher, data support, management support).</p>
Further study	A possibility to continue study at the second level of higher education (Master's program). Acquisition of additional qualifications in the postgraduate education system.
5 – Teaching and assessment	
Teaching and learning	Learning style: active, which allows students to choose the subject and organize their time. Lectures, laboratory works, seminars, practical classes in small groups, independent work based on textbooks and lecture notes, consultations with lecturers. The use of electronic means, such as the University e-learning platform. Within the past year, most of the time is devoted to a Bachelor's thesis presented and defended before the board of scientists.
Assessment	The student progress is assessed according to the national scale and the 100-point ECTS scale.
6 – Program competencies	
Integral competence	Ability to solve complicated specialized tasks and practical problems in the development of information systems and technologies characterized by complexity and uncertainty of conditions using theories and methods of computer science.
General competencies (GC)	<p>GC01. Ability to abstract thinking, analysis and synthesis. GC02. Ability to apply knowledge in practical situations. GC03. Ability to talk in a state language both orally and in written form. GC04. Ability to communicate in a foreign language both orally and in written form. GC05. Ability to learn and acquire contemporary knowledge. GC06. Ability to generate new ideas (creativity). GC07. Ability to find, process and analyze information from different sources. GC08. Ability to work in a team. GC09. Ability to act based on ethical considerations. GC10. Desire to preserve the environment. GC11. Ability to act in a socially conscious manner. GC 12. Ability to exercise your rights and obligations as a member of society, realize values of civil (democratic) society and need for its steady growth, supremacy of law, rights and freedoms of individuals and citizens in Ukraine. GC 13. Ability to keep and multiply moral, cultural, scientific values and achievements of society based on the understanding of history and regularities of subject area development, its place in the general system</p>

	of knowledge about nature and society and in the evolution of society, engineering and technologies, as well as to use different types and forms of physical activity for outdoor activities and a healthy lifestyle.
<i>Specialized (professional) competencies (SC)</i>	<p>SC01. The ability to analyze the subject area, identify, and classify the research and development object.</p> <p>SC02. Ability to take part in information system and technology design, including modeling of their structure, behavior and operational processes.</p> <p>SC03. Ability to develop architectures of information systems.</p> <p>SC04. The ability to mathematically formulate and investigate continuous and discrete mathematical models, justify the choice of approaches for solving theoretical and applied problems in computer science.</p> <p>SC05. The ability to identify statistical patterns of non-deterministic phenomena, apply methods of computational intelligence, including statistical, neural network, and fuzzy data processing, machine learning methods, evolutionary programming, etc.</p> <p>SC06. Ability to analyze, select and apply methods and tools for information security (including cybersecurity) of information systems and technologies.</p> <p>SC07. To know data information models, ability to develop technologies to store, mine, process, and analyze data.</p> <p>SC08. Ability to apply fundamental and interdisciplinary knowledge to successfully solve problems related to the development of information systems and technologies.</p> <p>SC09. The ability to formalize the description of operational research tasks in organizational, technical, social and economic systems of various purposes, determine their best solutions, build the most appropriate control models considering changing situations, and optimize management processes in systems of various purposes and hierarchy levels.</p> <p>SC10. The ability to think systematically and apply system analysis methodology to study complex problems of various natures, methods of formalization, and solving systemic problems involving conflicting goals, uncertainties, and risks.</p> <p>SC11. The ability to conduct intelligent data analysis based on computational intelligence methods with large and poorly structured data, perform operational processing, and visualize analysis results in the process of solving practical problems.</p> <p>SC12. The ability to design and develop software using various programming paradigms: generic, object-oriented, functional, logical, etc.</p> <p>SC13. The ability to reasonably choose and effectively master software and technological tools for developing information systems and technologies.</p> <p>SC14. The ability to ensure the organization of computing processes in information systems of various purposes, considering architecture, configuration, and performance indicators of operating systems and system software.</p> <p>SC15. The ability to implement high-performance computing based on cloud services and technologies, as well as parallel and distributed computing.</p>
7 – Program learning outcomes (PLO)	

- PLO1. To analyze, intentionally search for and select information and reference resources and knowledge required to solve professional problems, taking into account current scientific and technological achievements.
- PLO2. To know the code of professional ethics, understand the social significance and cultural aspects of developing information systems and technologies, as well as observe them in professional activities.
- PLO3. To apply knowledge of fundamental forms and laws of abstract and logical thinking, the basics of scientific methodology, and the forms and methods of analysis, processing, and synthesis of information in computer science.
- PLO4. To know and apply professional standards, international recommendations, and other regulatory documents in the development of information systems and technologies.
- PLO5. To know and apply appropriate mathematical concepts, methods of domain, system and object-oriented analysis and mathematical modeling of information systems and technologies.
- PLO6. Ability to select and use the appropriate methodology for developing information systems and technologies.
- PLO7. To know and apply the fundamental concepts, paradigms and key operational principles of language, instrumental and computational information system and technology tools in practice.
- PLO8. To use modern mathematical tools of continuous and discrete analysis, linear algebra, and analytical geometry in professional activities to solve theoretical and applied problems in the process of designing and implementing information technology objects.
- PLO9. To know and be able to use methods and tools of system analysis for objects, processes, and systems to analyze, forecast, manage, and design dynamic processes in technical, technological, and other domains.
- PLO10. To be able to design, develop, and analyze algorithms for solving computational and logical problems, and to evaluate the efficiency and complexity of algorithms based on formal models of algorithms and computational functions.
- PLO11. To be able to select input data for design guided by formal methods for describing information systems.
- PLO12. To be able to use methods of computational intelligence, machine learning, neural network and fuzzy data processing, and evolutionary programming for solving tasks of object recognition, forecasting, classification, and identification.
- PLO13. To know and apply methods for developing algorithms, data structures, and knowledge.
- PLO14. To understand the principles of modeling organizational and technical systems and operations; to use methods of operations research, and to solve single- and multi-criteria optimization problems in linear, integer, nonlinear, and stochastic programming.
- PLO15. To be able to reason and select programming languages and development technologies for solving tasks related to the development and maintenance of information systems and technologies.
- PLO16. To apply methods and algorithms of computational intelligence and intellectual data analysis in tasks of classification, forecasting, cluster analysis, and finding association rules using software tools for

	<p>multidimensional data analysis based on Data Mining, Text Mining, and Web Mining technologies.</p> <p>PLO17. To understand the concept of information and cybersecurity, principles of secure software design, and to ensure the security of computer networks in the context of incomplete and uncertain input data.</p> <p>PLO18. To perform parallel and distributed computations, apply numerical methods and algorithms for parallel structures, and use parallel programming languages in the development of parallel and distributed software.</p> <p>PLO19. To know, analyze, select and skillfully apply information security (including cybersecurity) and data integrity tools according to the application tasks and software systems to be created.</p> <p>PLO20. To ensure the coordination, preparation, and release of all types of technical documentation and to present the results of information system development.</p> <p>PLO21. To be proficient in system programming languages and methods for developing programs that interact with computer system components, understand network technologies and computer network architectures, and have practical skills in network administration technology and its software.</p>
8 – Resource support of program implementation	
Staffing	<p>Guarantor: Zoia Sherman, PhD in Physics and Mathematics, Associate Professor.</p> <p>The qualification of the academic staff engaged in the educational and professional program corresponds to the profile and area of the taught discipline. They have appropriate professional achievements. Professionals with research and/or professional experience, as well as English-speaking lecturers, are involved in the organization of the educational process.</p>
Material and technical support	<p>The material and technical support of the Department of Information Technology at the Education and Research Institute “European Business School” has a sufficient classroom fund. Professional laboratory and practical works are performed in specialized classrooms of the Department of Information Technology: 1 computer lab per 15 workplaces fitted with two displays, server room, classroom for self-study of students. All rooms have Wi-Fi points.</p>
Information, educational and methodical support	<p>The University’s virtual training environment (based on Dspace and Moodle software) includes digitized library collections of the educational electronic library and author’s distance learning courses developed by lecturers of the Department of Information Technology. Besides, one applies cloud technology elements from Google Cloud resources and Google Classroom technologies.</p> <p>Official website of the Department of Information Technology containing key information about the educational program and educational and methodical support.</p>
9 – Academic mobility	
National credit mobility	<p>Based on bilateral cooperation agreements between IEU and Ukrainian higher education institutions.</p>
International credit mobility	<p>Based on bilateral cooperation agreements with the world’s leading IT companies and universities.</p>

Training of foreign students	Training of foreign students is provided in case of undertaking additional language training.
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2. LIST OF COMPONENTS OF THE EDUCATIONAL AND PROFESSIONAL PROGRAM AND THEIR LOGICAL SEQUENCE

2.1. List of EP components

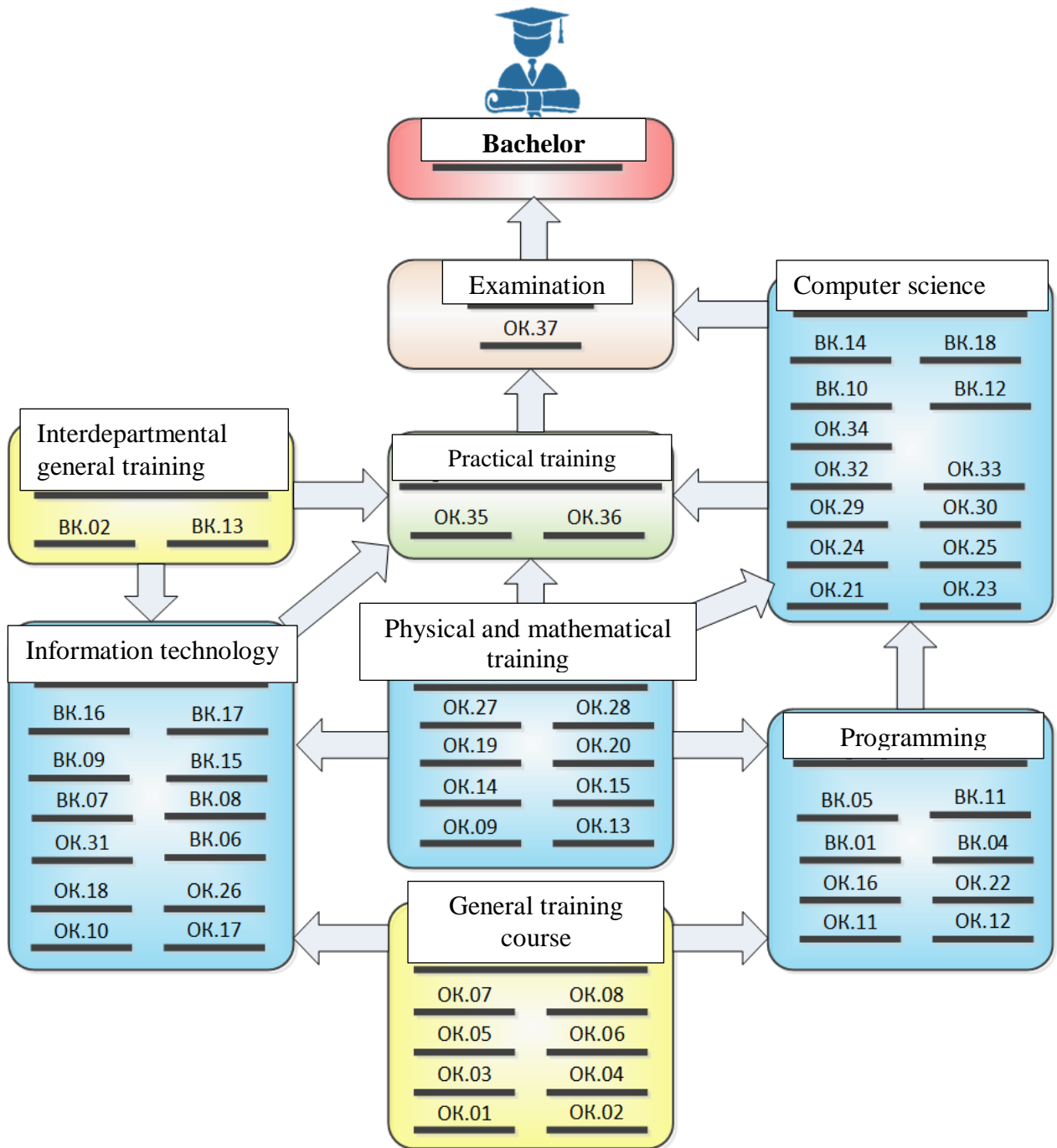
Discipline code	Components of the educational program (academic disciplines, term papers, practical training, qualifying paper)	Number of credits	Form of final control
1	2	3	4
1. Obligatory components			
<i>General training course</i>			
OC1	History of Ukrainian Statehood and Culture	4	exam
OC2	Academic Integrity and Basics of Scientific Research	4	exam
OC3	Ukrainian (Professional)	4	exam
OC4	Health and Safety, Labor Protection and Civil Defense	3	Pass/Fail test
OC5	Foreign Language (Professional)	21	Pass/Fail test, exam
OC6	Philosophy, Ethics and Aesthetics	3	Pass/Fail test
OC7	Law	4	Pass/Fail test
OC8	Digital Technologies for Learning and Professional Activities	4	exam
<i>Professional training course</i>			
OC9	Higher and Applied Mathematics	8	Pass/Fail test, exam
OC10	Methods and Tools of Computer Information Technology	4	Pass/Fail test
OC11	Fundamentals of Programming	8	Pass/Fail test, exam
OC12	Data Algorithms and Structures	4	exam
OC13	Computer-Based Discrete Mathematics	4	exam
OC14	Linear Algebra and Analytical Geometry	4	Pass/Fail test
OC15	Operations Optimization and Research Methods	3	Pass/Fail test
OC16	Object-Oriented Programming	8	Pass/Fail test, exam
OC17	Organization of Databases and Knowledge Bases	8	Pass/Fail test, exam, term paper
OC18	Computer Networking Organization	4	exam
OC19	Probability Theory and Mathematical Statistics	4	exam
OC20	Physics (Selected Sections)	4	exam
OC21	Organization of Computing Processes	4	Pass/Fail test
OC22	Operating Systems	4	exam
OC23	Fundamentals of Artificial Intelligence	5	exam
OC24	Computer Architecture	3	exam
OC25	Modeling of Information Systems	5	exam
OC26	Computer-Aided Design and Modeling Technologies	3	exam
OC27	Decision Theory	4	Pass/Fail test
OC28	System Analysis	4	exam
OC29	Data Analytics and Big Data	3	exam
OC30	Methodologies for Designing Software and Information Systems	5	exam, term paper
OC31	Software and Data Security	5	exam

OC32	Intelligent Data Analysis	4	exam
OC33	High-Performance Computing Technologies	3	exam
OC34	Methods and Tools for Intelligent Information Systems and Technologies	4	exam
<i>Practical training</i>			
OC35	On-the-Job Training	4	Pass/Fail test
OC36	Pre-Graduation Practical Training	4	Pass/Fail test
Student examination			
OC37	Qualifying paper	6	defense
Total number of obligatory components:		180	
Total number of elective components:		60	
TOTAL CAPACITY OF THE EDUCATIONAL PROGRAM		240	

2.2. Structural and logical scheme of the allocation of educational components by semesters

	General training course	Professional training course	Practical training	Examination
8 th semester		BK.17 BK.16 BK.15 OK.34 BK.14 OK.33 BK.13		OK.37
7 th semester	OK.5	BK.12 BK.11 OK.32 BK.10 OK.31 BK.09	OK.36	
6 th semester	OK.5	OK.30 BK.08 OK.29 BK.07 OK.28 BK.06	OK.35	
5 th semester	OK.5	OK.27 OK.26 OK.25 OK.24 BK.05 OK.23 BK.04		
4 th semester	OK.5	OK.22 OK.21 BK.03 OK.17 BK.02 OK.16 BK.01		
3 rd semester	OK.5	OK.20 OK.19 OK.18 OK.17 OK.16 OK.15 OK.12		
2 nd semester	OK.7 OK.6 OK.5	OK.14 OK.13 OK.11 OK.10 OK.09		
1 st semester	OK.8 OK.5 OK.4 OK.3 OK.2 OK.1	OK.11 OK.09		

2.2. Structural and logical scheme of the educational program



2. FORM OF STUDENT EXAMINATION

Forms of student examination	The examination of graduates of the Computer Science and Technology educational and professional program in 122 Computer Science and Technology specialty is conducted in the form of public defense of the qualifying paper.
Qualifying paper requirements (if any)	<p>A qualifying paper should solve a specialized task or practical application problem in software engineering characterized by complexity of conditions using theories and methods of information technology.</p> <p>The qualifying paper should not contain academic plagiarism, falsification and copying.</p> <p>The qualifying paper should be published on the official website of International European University or on the website of the European Business School.</p> <p>The publication of qualifying papers containing restricted access information should be carried out in accordance with the current legislation.</p>

3. REQUIREMENTS FOR THE SYSTEM OF INTERNAL HIGHER EDUCATION QUALITY ASSURANCE

International European University has the system of internal higher education quality assurance (internal quality assurance system) that includes the following procedures and measures:

- definition of principles and procedures of higher education quality assurance;
- monitoring and periodical review of educational programs;
- annual assessment of students, academic and teaching staff of the University and regular announcement of the assessment results on the official website of the University, information stands or in any other way;
- advanced training of the teaching, scientific and academic staff;
- availability of resources required to organize the educational process, including independent work of students in each educational program;
- availability of information systems for efficient management of the educational process;
- publicity of information about educational programs, higher education degrees and qualifications;
- compliance with academic integrity among the University personnel and students, including creation and functioning of the efficient system for preventing and detecting academic plagiarism;
- other procedures and measures.

The system of internal higher education quality assurance (internal quality assurance system) is assessed as requested by the University by the National Agency for Higher Education Quality Assurance (NAQA) or independent institutions of higher education quality assessment and assurance accredited by NAQA for its compliance with the requirements of the higher education quality assurance system approved by NAQA, international standards and recommendations for higher education quality assurance.

Matrix of providing program learning outcomes (PLO) with relevant components of the educational program

Components of the educational program (discipline), practical training, individual tasks																					
	Program learning outcomes																				
	PLO 01	PLO 02	PLO 03	PLO 04	PLO 05	PLO 06	PLO 07	PLO 08	PLO 09	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15	PLO 16	PLO 17	PLO 18	PLO 19	PLO 20	PLO 21
OC1		*																			
OC2		*	*																	*	
OC3		*																		*	
OC4		*		*																	
OC5		*																			
OC6		*	*																		
OC7		*		*																	
OC8	*																				
OC9					*			*													
OC10	*			*		*									*						
OC11				*			*			*											
OC12										*			*								
OC13	*				*			*				*						*			
OC14					*			*													
OC15								*	*			*		*		*					
OC16				*			*			*					*						

Components of the educational program (discipline), practical training, individual tasks																					
	Program learning outcomes																				
	PLO 01	PLO 02	PLO 03	PLO 04	PLO 05	PLO 06	PLO 07	PLO 08	PLO 09	PLO 10	PLO 11	PLO 12	PLO 13	PLO 14	PLO 15	PLO 16	PLO 17	PLO 18	PLO 19	PLO 20	PLO 21
OC17	*			*						*	*		*								
OC18				*			*										*				*
OC19					*			*								*					
OC20			*				*														
OC21																		*			*
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OC27		*	*						*							*					
OC28			*		*				*					*		*					
OC29	*												*			*					
OC30		*	*	*	*	*	*				*									*	
OC31				*													*		*		*
OC32	*												*			*					
OC33																		*			
OC34					*	*	*					*			*						
OC35	*	*	*	*		*	*			*	*									*	
OC36	*	*	*	*		*	*			*	*									*	
OC37	*	*	*	*	*	*		*	*	*	*		*	*	*					*	

