Ministry of Education and Science of Ukraine

INTERNATIONAL EUROPEAN UNIVERSITY

Education and Research Institute "European Business School"

EDUCATIONAL AND PROFESSIONAL PROGRAM:

SOFTWARE ENGINEERING

First (Bachelor) level

Specialty: 121 Software engineering
(code, name)
Knowledge area: 12 Information technology
(code, name)
Qualification: Bachelor of Software Engineering
(name)

APPROVED
By the Decision of the Academic Council of International European University
dd. May 30, 2023, No. 4

Chair of the Academic Council,
_____ Oleh PADALKA

Educational and professional program becomes effective by the order of the Acting Rector of International European University
dd. June 5, 2023, No. 41-OD

Kyiv 2023

INTRODUCTION

The Software Engineering educational and professional program of the first (Bachelor) level of higher education, specialty: 121 Software engineering, 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: "About 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 Licensed conditions of implementation of educational activities" dd. December 30, 2015, No. 1187 (as amended).

The educational and professional program is based on the Higher Education Standard of Ukraine in the specialty: 121 Software engineering, 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. 1166 dd. October 29, 2018.

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	Oleksandr Nesterenko (guarantor of the educational program)	Doctor of Technology, associate professor, Head of the Department of Information Technology of International European University
2	Oleksandr Falovskyi	PhD in Technology, associate professor at the Department of Information Technology of International European University
3	Zoia Sherman	PhD in Physics and Mathematics, associate professor, 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	Serhii Zharinov	The Ukrainian Scientific Centre for Development of Information Technology, Director
2	Andrii Sidliarenko	Genesis IT Company, Academic Innovations Lead

CONSIDERED:

Professional expertise was conducted by:

Viktor Shevchenko, Doctor of Technology, professor, Deputy Director at the Institute of Software Systems of the National Academy of Sciences of Ukraine

1. Profile of the educational and professional program

1 – General information	
Full name of the higher education institution and structural unit	International European University Education and Research Institute "European Business School" Department of Information Technology
Degree of higher education and qualification in the original language	Bachelor Educational qualification: Bachelor of Software Engineering
Official name of the educational program	Software Engineering
Type of diploma and capacity of the educational program	Bachelor's Degree Diploma, single, 240 ECTS credits, Period of study: 3 years and 10 months.
Cycle/level	NQF of Ukraine – 6th level FQ-EHEA – first cycle EQF-LLL – 6th level
Background	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.
Language(s) of instruction	Ukrainian
Validity of the educational program	Until the next accreditation
Internet address of constant placement of educational program description	https://business.ieu.edu.ua/kafedry/kafedra-informatsiinykh-tekhnolihii
2 – Goal of the educational program	
To train professionals by providing students with comprehensive training in programming and IT product software development based on mastery of software engineering methods to develop software, taking into account the requirements for its quality, reliability, production and user characteristics.	
3 – Characteristics of the educational program	
Subject area (knowledge area,	Knowledge area: 12 Information technology Specialty: 121 Software engineering

specialty, specialization *(if any)**)***	The program is aimed at training software developers able to produce high-quality IT products for various activity areas, in particular, to design information systems in the field of management and decision making. **Learning objectives:** to train specialists able to solve tasks and problems in the development, quality assurance, integration and maintenance of software tools based on state-of-the-art tools and industry-specific innovations. **Theoretical content of the subject area:** basic mathematical, technological, linguistic, resource and economic conceptual regulations on software development and maintenance engineering and software quality assurance. **Methods, techniques and technologies:** applied analysis and modeling methods, definition of information needs, data classification and analysis for software design; methods for developing software requirements; methods of software model analysis and construction; methods of software design, construction, integration, testing and verification; methods of software component modification; models and methods of software engineering reliability and quality; methods of software project management. **Tools and equipment:** software, hardware, instrumental, resource and documentation tools for software engineering processes.
Focus of the educational program	Educational and professional program. The program is based on generally known scientific and practical results of software engineering, taking into account its current state, and focused on relevant specializations for potential further professional and scientific career. The program has an applied focus on training specialists able to efficiently and reasonably solve problems of high-quality IT product software design and development, in particular, information systems in the field of management and decision making.
Key focus of the educational program and specialization	Special education and professional training in IT product software engineering, information systems in the field of management and decision making. ***Keywords:*** Requirements Analysis, Software Construction, Software Engineering, Software, Software Product, Software Design, Architectural Design, Top-Level Design, Software Requirements Specification, Software Testing, Software Quality, Project Management, Software Engineering Management, Information System.
Program features	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 in the form of workshops. The program implies the integration of theoretical and practical training with the general university center for informatization of university's activity areas where students produce application software on request of university units.
4 – Graduates' ability to employment and further study	
Employability	Specialists can hold the following primary positions (according to the National Classifier of Ukraine DK 003:2010): 2131.2 – Database administrator 2132.2 – Software engineer 2132.2 – Programmer (database) 2132.2 – Application programmer

	3121.2 – Software development and testing specialist Positions of programmer and tester at IT companies, small and large enterprises, technological and information institutes (researcher, quality assurance, commerce, management).
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 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 software engineering characterized by complexity and uncertainty of conditions using theories and methods of information technology.
General competencies (GC)	GC 1. Ability to abstract thinking, analysis and synthesis. GC 2. Ability to apply knowledge in practical situations. GC 3. Ability to talk in a state language both orally and in written form. GC 4. Ability to communicate in a foreign language both orally and in written form. GC 5. Ability to learn and acquire contemporary knowledge. GC 6. Ability to find, process and analyze information from different sources. GC 7. Ability to work in a team. GC 8. Ability to act based on ethical considerations. GC 9. Desire to preserve the environment. GC 10. Ability to act in a socially conscious manner. GC 11. 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 12. 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 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.
Specialized (professional) competencies (SC)	SC 1. Ability to identify, classify and formulate software requirements. SC 2. Ability to take part in software design, including modeling (formal description) of its structure, behavior and operational processes. SC 3. Ability to develop architectures, modules and components of software systems. SC 4. Ability to formulate and ensure software quality requirements in accordance with customer requirements, terms of reference and standards. SC 5. Ability to comply with specifications, standards, rules and

	guidelines in the professional sector when implementing software life cycle processes. SC 6. Ability to analyze, select and apply methods and tools for information security (including cybersecurity). SC 7. To know data information models, ability to develop software to store, mine and process data. SC 8. Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems. SC 9. Ability to assess and consider economic, social, technological and environmental factors affecting professional activities. SC 10. Ability to accumulate, process and systematize professional knowledge of software engineering and maintenance; to recognize the importance of lifelong learning. SC 11. Ability to implement phases and iterations of the life cycle of software systems and information technology based on appropriate software development models and approaches. SC 12. Ability to conduct the system integration process, apply change management standards and procedures to maintain software integrity, overall functionality and reliability. SC 13. Ability to reasonably select and learn software development and maintenance tools. SC 14. Ability to think algorithmically and logically.
7 – Program learning outcomes (PLO)	
	PLO 1. 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. PLO 2. To know the code of professional ethics, understand the social significance and cultural aspects of software engineering, as well as observe them in professional activities. PLO 3. To know basic processes, phases and iterations of the software life cycle. PLO 4. To know and apply professional standards and other regulatory documents in the software engineering sector. PLO 5. To know and apply appropriate mathematical concepts, methods of domain, system and object-oriented analysis and mathematical modeling for software development. PLO 6. Ability to select and use the appropriate software development methodology. PLO 7. To know and apply the fundamental concepts, paradigms and key operational principles of language, instrumental and computational software engineering tools in practice. PLO 8. To be able to develop a human-machine interface. PLO 9. To know and be able to use methods and tools for collecting, formulating and analyzing software requirements. PLO 10. To conduct a pre-project examination of the subject area and the system analysis of the design object. PLO 11. To select design input data using formal methods of requirements description and modeling. PLO 12. To apply efficient software design approaches in practice. PLO 13. To know and apply methods of algorithm design, software design, as well as data and knowledge structures.

	PLO 14. To apply instrumental software tools for domain analysis, design, testing, visualization, measurement and documentation in practice. PLO 15. To be motivated in selecting programming languages and development technologies to solve problems of creating and maintaining software. PLO 16. To have skills of team development, coordination, design and release of all types of software documents. PLO 17. To be able to apply component-based software development techniques. PLO 18. To know and be able to use information technology to process, store and transmit data. PLO 19. To know and be able to apply software verification and validation methods. PLO 20. To know approaches to software quality assessment and assurance. PLO 21. 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. PLO 22. To know and be able to apply project management techniques and tools. PLO 23. To be able to document and present the results of software development. PLO 24. To be able to calculate the economic efficiency of software systems.
8 – Resource support for program implementation	
Staffing	Guarantor: Oleksandr Nesterenko, Doctor of Technology, associate professor. 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 professional experience, as well as English-speaking lecturers, are involved in the organization of the educational process.
Material and technical support	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 fitted with 40 displays, Server room, Space classroom for self-study of students. All rooms have Wi-Fi points.
Information and educational and methodical support	The university's virtual training environment 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 Azure, AWS and Google Cloud resources. Official website of the Department of Information Technology containing key information about the educational program and educational and methodical support.
9 – Academic mobility	
National credit mobility	Based on bilateral cooperation agreements between IEU and Ukrainian higher education institutions.

International credit mobility	Based on bilateral cooperation agreements with the world's leading IT companies and universities.
Training of foreign students	Training of foreign students is provided in case of undertaking additional language training.

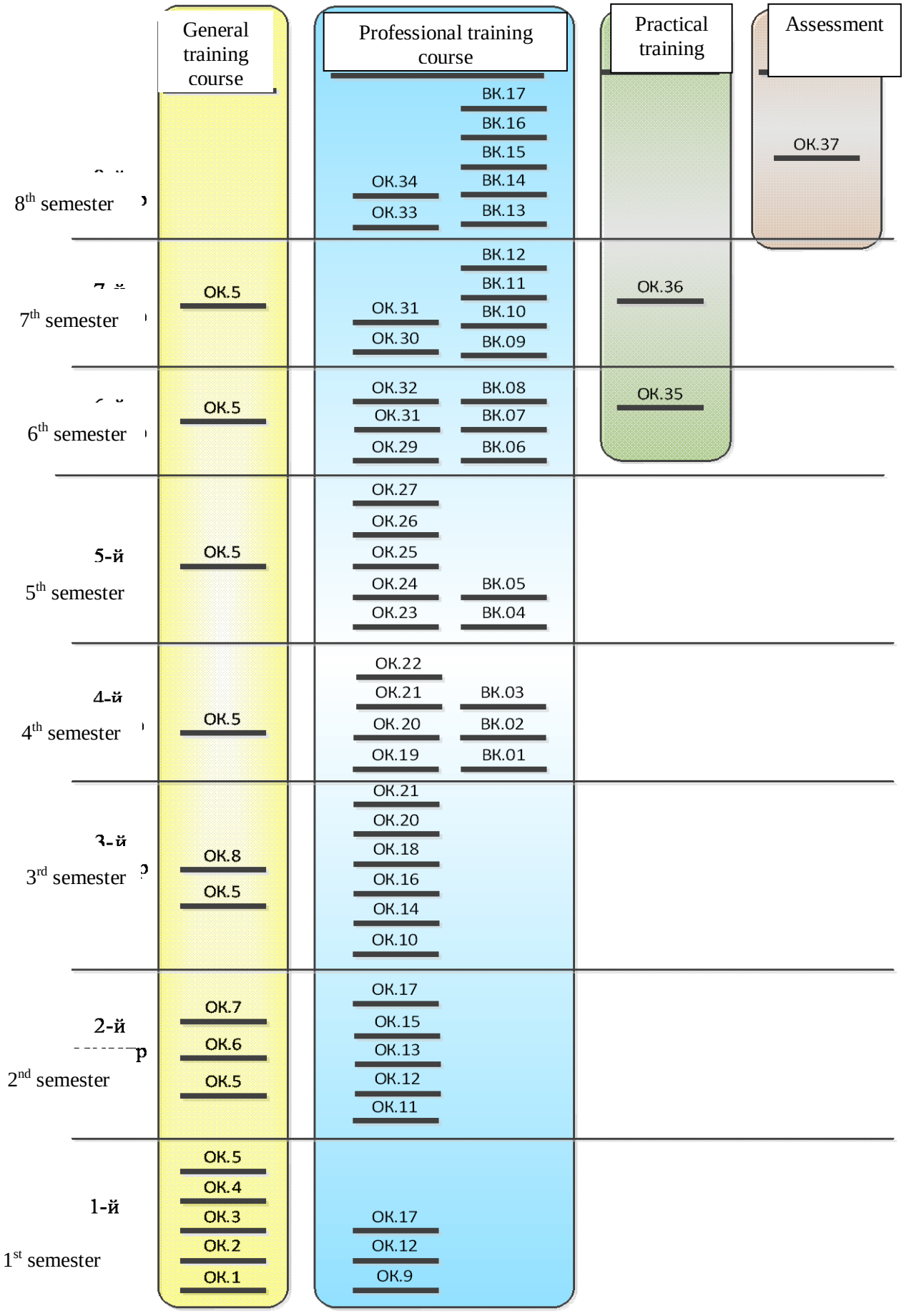
2. List of components of the educational and professional program and their logical sequence

2.1. List of EP components

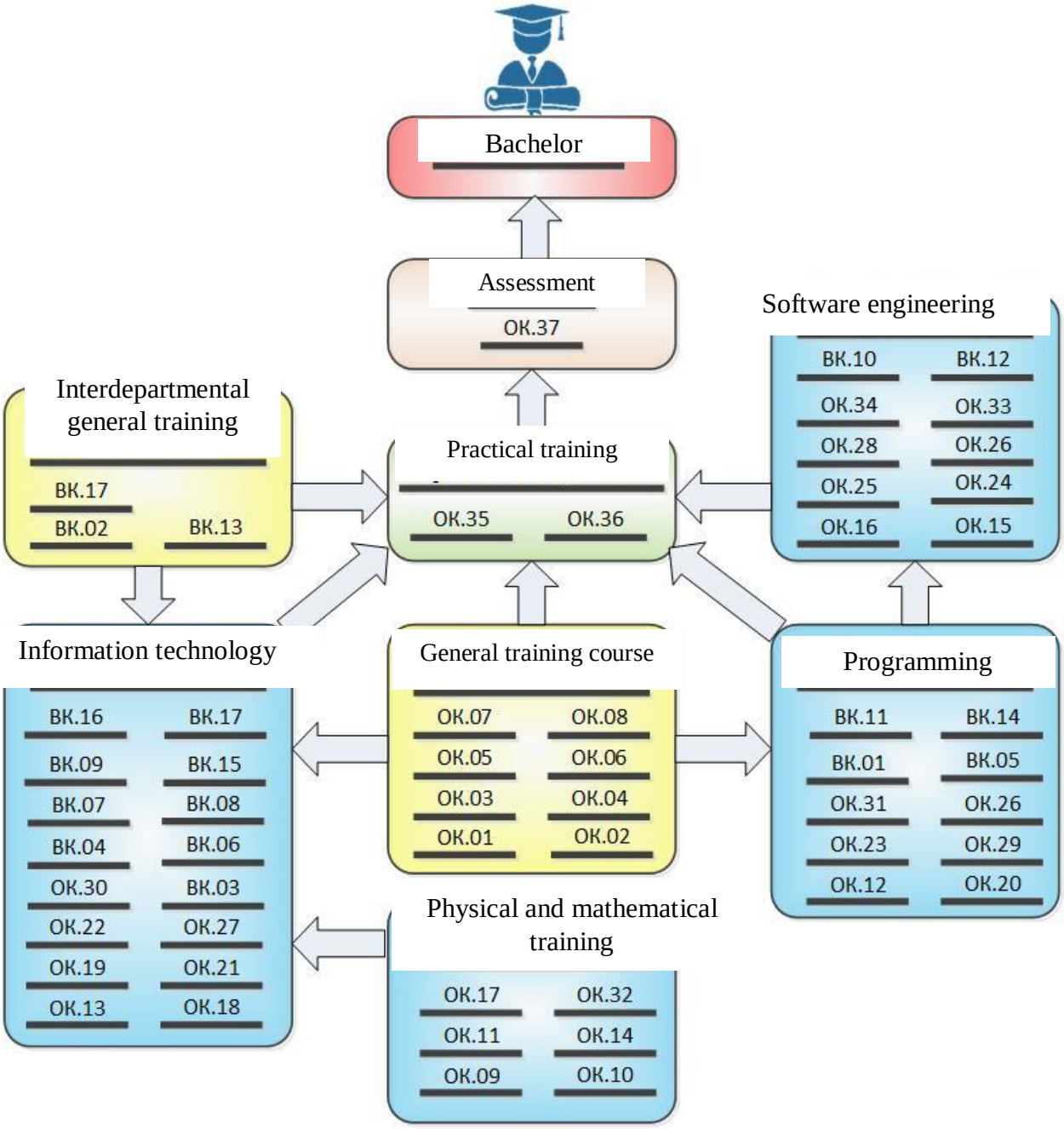
Discipline code	Components of the educational program (academic disciplines, term papers, practical training, qualifying paper)	Number of credits	Form of final control
1	2	3	4
1. Obligatory components			
General training *course*			
OC1	History of Ukrainian statehood and culture	4	exam
OC2	Academic integrity 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	Business psychology	3	Pass/Fail test
Professional training *course*			
OC9	Linear algebra and analytic geometry	4	exam
OC10	Physics (selected sections)	4	exam
OC11	Computer-based discrete mathematics	4	exam
OC12	Fundamentals of programming	8	Pass/Fail test, exam
OC13	Methods and tools of computer information technology	4	Pass/Fail test
OC14	Probability theory and mathematical statistics	4	exam
OC15	Fundamentals of software engineering	4	Pass/Fail test
OC16	Group dynamics and communications	4	Pass/Fail test
OC17	Higher and applied mathematics	8	Pass/Fail test, exam
OC18	Operating systems	4	exam
OC19	Computer networking organization	4	exam
OC20	Object-oriented programming	8	Pass/Fail test, exam
OC21	Organization of databases and knowledge bases	8	Pass/Fail test, exam, term paper
OC22	Data algorithms and structures	4	exam
OC23	Online app programming	3	Pass/Fail test
OC24	Analysis of software requirements	5	exam
OC25	Software architecture and design	5	exam
OC26	Software quality and testing	4	Pass/Fail test
OC27	Computer architecture	3	exam
OC28	Software project management	4	exam
OC29	Software modeling and analysis	5	exam, term paper

OC30	Software and data security	5	exam
OC31	Software construction	4	exam
OC32	Mathematical fundamentals of software engineering	3	exam
1	2	3	4
OC33	Economics and documentation of software products	3	exam
OC34	Empirical software engineering methods	4	exam
Practical training			
OC35	On-the-job practical training	4	Pass/Fail test
OC36	Pre-graduation practical training	4	Pass/Fail test
Student assessment			
OC37	Execution and defense of the qualifying paper	6	
Total amount of obligatory components:		**180**	
Total amount 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



2.2. Structural and logical scheme of the educational program



3. Form of student assessment

Forms of student assessment	Assessment of graduates of the educational and professional program "Software engineering" in 121 Software engineering specialty is conducted in the form of public defense of the qualifying paper.
Qualifying paper requirements (if any)	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. The qualifying paper should not contain academic plagiarism, falsification and copying. The qualifying paper should be published on the official website of International European University or on the website of the European Business School. The publication of qualifying papers containing restricted access information should be carried out in accordance with the current legislation.

4. 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 due to 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.

LETTER OF MONITORING OF THE EDUCATIONAL PROGRAM

No.	Date of changes	Justification of changes	Full name and signature of the person introducing changes
1.	April 2023	Updating the goal of the educational program and its specialization, taking into account the product IT sector, arranging current components of the general training course cycle, updating the list of components of the professional training course	O.V. Nesterenko

2. Elective components			
EL01	Cross-platform programming / Parallel programming	4	Pass/Fail test
EL02	Ecology / Synecology	3	Pass/Fail test
EL03	Data analysis / Basics of Big Data management	4	Pass/Fail test
EL04	Data and knowledge storage technologies / Distributed database design	3	Pass/Fail test
EL05	.NET software platform architecture / Development of Internet apps based on ASP.NET	4	Pass/Fail test
EL06	Web technology and web design / Mobile app development	3	Pass/Fail test
EL07	System analysis / Intelligent data analysis	4	Pass/Fail test
EL08	Computer modeling / Basics of computer graphics	4	Pass/Fail test
EL09	Electronics / Digital electronics	4	Pass/Fail test
EL10	Functional software testing / Testing automation	3	Pass/Fail test
EL11	Mobile app development / Corporate app development	3	Pass/Fail test
EL12	Embedded system engineering / Microcontroller programming	4	Pass/Fail test
EL13	Copyright / Intellectual property	3	Pass/Fail test
EL14	Desktop app development / REST APIs development	4	Pass/Fail test
EL15	Security of web resources / Basics of Internet security	3	Pass/Fail test
EL16	IT in businesses / IT in enterprise management	4	Pass/Fail test
EL17	Medical software systems / E -commerce software systems	3	Pass/Fail test