PROJECT

National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"

Національний технічний університет України «Київський політехнічний інститут імені Ігоря Сікорського»

APPROVED
by the Academic Council
of Igor Sikorsky Kyiv Politechnic Institute
(minutes of meeting №___of_____20__)
Chairman of the Academic Council
Mykhailo ILCHENKO

ЗАТВЕРДЖЕНО
Вченою радою
КПІ ім. Ігоря Сікорського
(протокол №___ від _____20___ р.)
Голова Вченої ради

_____ *Михайло ІЛЬЧЕНКО*

ІНТЕГРОВАНІ ІНФОРМАЦІЙНІ СИСТЕМИ
INTEGRATED INFORMATION SYSTEMS

ОСВІТНЬО-ПРОФЕСІЙНА ПРОГРАМА/

EDUCATIONAL PROFESSIONAL PROGRAMME

Перший (бакалаврський)
рівень вищої освіти
Спеціальність: F6 Інформаційні системи та технології
Галузі знань: F Інформаційні технології
Кваліфікація: Бакалавр з інформаційних систем та технологій

The first (bachelor)
level of higher education
Speciality: F6 Information Systems and Technologies
Knowledge branch: F Information Technologies
Qualification: Bachelor of Information Systems and Technologies

ЄДЕБО ID 28543

Введено в дію з 2022/2023 н. р. *наказом ректора №_____ від _____20___ р.*	*Enacted since 2022/2023 academic year* *by rector's order No. _____ of_____20_____*

Київ/Kyiv
2021

ПРЕАМБУЛА/PREAMBLE

РОЗРОБЛЕНО/ELABORATED:

Керівник групи/Team leader:

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Члени групи/Team members:

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Ясочка Максим Володимирович*, Engineering Director, R&D and Solutions Netcracker Technology, кандидат технічних наук/Maksym YASOCHKA, Engineering Director, R&D and Solutions Netcracker Technology, Candidate of Technical Sciences.*

Кирилов Іван Валерійович*, студент четвертого курсу кафедри інформаційних систем та технологій/Ivan KYRYLOV, Fourth-year student of the Department of Information Systems and Technologies.*

Ролік Олександр Іванович*, Завідувач кафедри інформаційних систем та технологій, доктор технічних наук, професор/Oleksandr ROLIK, Head of the Department of Information Systems and Technologies, Doctor of Technical Sciences, Professor*

ПОГОДЖЕНО/AGREED:

Науково-методичною комісією КПІ ім. Ігоря Сікорського зі спеціальності F6 Інформаційні системи та технології (протокол № 4 від «06» грудня 2021 р.)/The Scientific and Methodological Commission of the University on specialty F6 Information Systems and Technologies (minutes of meeting №_____of_____20__).

Голова НМКУ-F6/Chairman of the SMCU-F6

_____ Олександр РОЛІК/Oleksandr ROLIK

Методична рада КПІ ім. Ігоря Сікорського (протокол №___від__._.__ 20___ р.)/ The Methodological Council of Igor Sikorsky Kyiv Polytechnic Institute (minutes of meeting № ___ of _____ 20___).

Заступник голови Методичної ради/Deputy Chairman of the Methodological Council

_____ Анатолій МЕЛЬНИЧЕНКО/Anatolii MELNYCHENKO

ВРАХОВАНО/CONSIDERED:

Результати акредитації освітньої програми 2021 р.

Оновлення освітньої програми погоджено зі стейкхолдерами, надані на програму позитивні відгуки зберігають свою актуальність.

Стейкхолдери:

БИЧКОВ Олексій Сергійович, завідувач кафедри програмних систем і технологій. Київського державного університету ім. Т.Г. Шевченка, д.т.н., доцент.

ТЕРЕНТЬЄВ Віталій Васильєвич, директор ТОВ «Неткрекер»

ОХРІМЕНКО Дмитро Валерійович директор ТОВ «КіберБіонік Систематікс».

Після надходження всіх пропозицій від студентів, випускників, інтерв'ю з фахівцями ІТ-компаній сформовані підстави для оновлення ОПП, а саме:

- Оновлена та приведена у відповідність до стандартів вищої освіти структура освітньої програми та обсяг загальних та спеціальних(фахових) компетентностей;
- Оновлено перелік вибіркових дисциплін з урахуванням кон'юнктури ринку та запитів роботодавців;

•З метою підвищення рівня практичних складових компетентностей здобувачів вищої освіти, в склад освітніх компонентів добавлено курсові роботи з програмування, з баз даних, з технологій розроблення програмного забезпечення, з інформаційно-керуючих систем та курсова робота з електроніки та мікропроцесорної техніки.

Освітню програму обговорено після надходження всіх побажань та пропозицій схвалено на розширеному засіданні кафедри (протокол № 5 від 10.11.2021).

/

Accreditation results of the educational program in 2021.

Updates to the educational program have been agreed with stakeholders, and positive feedback on the program remains relevant.

Stakeholders:

Oleksii BYCHKOV, Head of the Department of Software Systems and Technologies, Taras Shevchenko National University of Kyiv, Doctor of Technical Sciences, Associate Professor.

Vitalii TERENTIEV, Director of Netcracker LLC.

Dmytro OKHRIMENKO, Director of CyberBionic Systematics LLC.

After receiving all the proposals from students, graduates, interviews with specialists of IT companies, the grounds for updating the EPP were formed, namely:

• The structure of the educational program and the scope of general and special (professional) competencies have been updated and brought in line with the standards of higher education;

• The list of elective disciplines has been updated, taking into account market conditions and employers' requests;

• In order to increase the level of practical components of the competencies of higher education applicants, term papers on programming, databases, software development technologies, information and control systems and course work on electronics and microprocessor technology were added to the educational components.

The educational program was discussed after receiving all wishes and proposals, approved at an expanded meeting of the department (minutes of meeting № 5 of 10.11.2021).

Еволюція ОП/Evolution of the EP:

Освітньо-професійна програма «Інтегровані інформаційні системи», у кваліфікації «Бакалавр з інформаційних систем та технологій» вперше була подана у 2018 році. З того часу зміст перетерпів значних змін як у формальному описі знань, результатів та компетентностей, так і в переліку дисциплін.

Останні зміни 2023/2024 року навчання торкнулися безпосередньо розділу з переліком освітніх компонентів, де була видалена така узагальнена дисципліна як «Системна інженерія», повернута дисципліна «Архітектура комп’ютерних систем», базова дисципліна «Теорія автоматичного керування» зменшена до необхідного мінімуму, а години розподілені на інші професійні дисципліни, тісно пов'язані з проєктуванням та розробкою (як то, цикл «Інженерія інформаційних систем»).

«Інженерія інформаційних систем» - це новий цикл, який гармонійно пов’язав такі дисципліни як «Інфраструктура інформаційних технологій» та «Інтелектуальні інформаційні системи».

Також, дисципліна «Технології розроблення програмного забезпечення» отримала зміни у частині освітнього компоненту курсового проєктування. Змінена курсова робота на курсовий проєкт, тим самим доданий кредит на поглиблене опанування практичної частини розробки.

Відбулися певні зміни відповідно до наказу №НОД/263/24 від 08.04.2024, які торкнулися розподілу годин та введенням англомовної версії ОПП. А також Положення про розроблення, затвердження, моніторинг та перегляд освітніх програм КПІ ім. Ігоря Сікорського https://osvita.kpi.ua/node/137 та Наказу міністерства освіти і науки України №1380 від 12.12.2018р. «Про затвердження стандарту вищої освіти за спеціальністю F6 «Інформаційні системи та технології» для першого бакалаврського рівня вищої освіти».

Також, були враховані вимоги, що стосуються Державної антикорупційної програми на 2023-2025 роки, згідно яких був змінений освітній компонент «Права і свободи людини» на «Права і свободи людини та протидія корупції», додані відповідні компетентності (К311) та програмні результати навчання (ПРН22)./

The educational professional program "Integrated information systems", in the qualification "Bachelor of information systems and technologies" was first submitted in 2018. Since then, the content has undergone significant changes both in the formal description of knowledge, results and competencies, and in the list of disciplines.

The latest changes in the 2023/2024 educational year directly affected the section with the list of educational components, where such a generalized discipline as "System Engineering" was removed, the discipline "Computer systems architecture" was returned, the basic discipline "Theory of automatic control" was reduced to the required minimum, and the hours were distributed to other professional disciplines closely related to design and development (to the new cycle "Information Systems Engineering").

"Information systems engineering" is a new cycle that harmoniously combines such disciplines as "Information technology infrastructure" and "Intelligent information systems".

Also, the discipline "Software development technologies" has received modifications in terms of the educational component of course design. The term work

has been changed to a term project, thereby adding a credit for in-depth mastery of the practical part of the development.

There were certain changes in accordance with the order № NOD/263/24 of 08.04.2024, which affected the distribution of hours and the introduction of the English version of the EPP. As well as the Regulations on the development, approval, monitoring and revision of educational programs of Igor Sikorsky Kyiv Polytechnic Institute and the Order of the Ministry of Education and Science of Ukraine No. 1380 dated 12.12.2018. "On Approval of the Standard of Higher Education in the Specialty F6 "Information Systems and Technologies" for the First Bachelor's Level of Higher Education".

Also, the requirements for the State Anti-Corruption Program for 2023-2025 were taken into account, according to which the educational component "Human Rights and Freedoms" was changed to "Human Rights and Freedoms and Anti-Corruption", relevant competencies (GC11) and program learning outcomes (EDO22) were added.

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1. EDUCATIONAL PROGRAM PROFILE

1 – Загальна інформація	
Full name of the HEI and institute/faculty.	National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute", Faculty of Computer Science and Computational Engineering
Educational level and Qualification	Level – bachelor Qualification – Bachelor of Information Systems and Technologies
The name of educational program	Integrated Information Systems
Type of diploma and scope of the educational program	Bachelor, 240 credits ECTS, educational period 3 years 10 months
Accreditation status	Certificate of accreditation for the educational program 1331, due to 01.07.2026
Cycle/level of higher education	NQF Ukraine – 6 Level QF- EHEA – first cycle EQF –LLL – 6 Level
Prerequisites	Possession of full general secondary education
Language(s) of teaching	Ukrainian
Duration of the educational program	Until the next accreditation
Internet address of the educational program	EPP F6 speciality (educational program) https://osvita.kpi.ua/ (educational programs)
2 – Goal of the educational program	
The aim of the educational program is to prepare professionals who deeply understand the current state of modern information systems and technologies, capable of developing comprehensive engineering solutions for creating components of integrated information systems and carrying out corresponding professional activities in various fields of human activity, national economy, and production. This is achieved through: • harmonious and multidimensional upbringing of future highly qualified technical professionals, capable of comprehensively and systematically analyzing problems of information systems and technologies, as well as related fields, understanding the nature of surrounding processes and phenomena, and ensuring and conducting intercultural communication; • fostering high adaptability of higher education seekers in the conditions of labor market transformation through interaction with employers and other stakeholders. The goal of the educational program aligns with the development strategy of Igor Sikorsky Kyiv Polytechnic Institute for 2020-2025 regarding the formation of a society of the future based on the principles of sustainable development.	

3 – Characteristics of the educational program	
Subject area	**Educational objects**: Theoretical and methodological foundations and instrumental tools for creating and using information systems and technologies; criteria for evaluating and ensuring the quality, reliability, fault tolerance, resilience, and longevity of information systems and technologies, as well as models, methods, and tools for optimization and decision-making in the creation and use of information systems and technologies. **Educational goals**: Formation and development of general and professional competencies in information systems and technologies contributing to the graduate's social stability and mobility in the job market; obtaining higher education for the development, implementation, and research of information systems and technologies. **Theoretical content of the subject area**: Concepts and principles of information management, system integration and administration of information systems, IT project management, architecture of enterprise IT infrastructure. Methods, methodologies, approaches, and technologies of fundamental and applied sciences, modeling. **Tools and equipment**: Computer hardware, measurement instruments, software and hardware complexes and tools, networking equipment, specialized software, modern programming languages, etc.
Orientation of the educational program	Educational-professional
The main focus of the educational program	Specialized education and professional training in the field of integrated information systems Keywords: process and system modeling, algorithm theory, information system design, software development technologies, information security and data protection, Internet of Things, fundamentals of information processes theory, operating systems, information technology infrastructure, computer networks, integrated information system strategy, systems engineering, electronics and microchip technology.
Features of the program	The program includes studying theoretical principles and acquiring practical skills for integration: • single-level components of information systems; • organizational-technical aggregate of software, computing, and telecommunication resources and their connections - creation of IT infrastructure; • components of different levels of the system into a single information management system. Such integration will ensure the development of the enterprise IT environment, increase its productivity, enable effective business management, and enhance competitiveness. The implementation of the program involves engaging professionals from the industry and representatives of employers in classroom sessions.

4 – Employability of graduates for employment and further education	
Employability	Bachelors in Information Systems and Technologies can work as professionals in the design, development, implementation, and effective application of components of integrated information systems in the field of information technology. According to the National Classifier of Professions DK 003:2010, graduates can work in the following professions: 3114 Telecommunications Specialist; 3121.2 Information Technology Specialist; 3121 Software Development and Testing Specialist; 3121 Computer Program Development Specialist. Professional certification is possible.
Further education	Opportunity for further education at the second (master's) level of higher education. Acquisition of additional qualifications in the system of postgraduate education.
5 – Teaching and assessment	
Teaching and learning	- Student-centered learning, self-learning, problem-oriented learning; - Information and modern technologies are taught in elements of a wide range of modern engineering applications in various scientific and applied fields. - Students have the opportunity to test and discuss their research at the International Scientific and Practical Conference, which is held at the IST Department.
Assessment	Current and semester control in the form of laboratory reports, presentations, reports, written and oral exams, and credits are evaluated according to the defined criteria of the Rating Assessment System. Decree No. 1-273 dated September 14, 2020, "On Approval of the Regulations on the Assessment System of Learning Outcomes at Igor Sikorsky Kyiv Polytechnic Institute" - https://document.kpi.ua/2020_1-273
6 – Program competencies	
Integrated competency	Ability to solve complex specialized tasks and practical problems in the field of information systems and technologies, or in the learning process, characterized by complexity and uncertainty of conditions, requiring the application of theories and methods of information technologies.
General competencies (GC)	
GC 1	Ability for abstract thinking, analysis, and synthesis.
GC 2	Ability to apply knowledge in practical situations.
GC 3	Ability to understand the subject area and professional activity.
GC 4	Ability to communicate in a foreign language.
GC 5	Ability to learn and acquire modern knowledge.
GC 6	Ability to search, process, and summarize information from various sources.
GC 7	Ability to develop and manage projects.
GC 8	Ability to evaluate and ensure the quality of work performed.
GC 9	Ability to exercise one's rights and fulfill duties as a member of society, recognize the values of a civil (free democratic) society and the necessity of its sustainable development, supremacy of the law, and rights and freedoms of individuals and citizens in Ukraine.
GC 10	Ability to preserve and enhance moral, cultural, and scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society, and in the development of society, technology, and technologies; to use various types and forms of physical activity for active leisure and maintaining a healthy lifestyle.

GC 11	Ability to make decisions and act in compliance with the principle of inadmissibility of corruption and any other manifestations of dishonesty
Specialized (professional, subject-specific) competencies (PC):	
PC 1	Ability to analyze the object of design or operation and its subject area.
PC 2	Ability to apply standards in the field of information systems and technologies in the development of functional profiles, construction, and integration of systems, products, services, and elements of organizational infrastructure.
PC 3	Ability to design, develop, debug, and improve system, communication, and hardware and software components of information systems and technologies, Internet of Things (IoT), computer-integrated systems, and systemic network structure, and manage them.
PC 4	Ability to design, develop, and use tools for the implementation of information systems, technologies, and infocommunications (methodological, informational, algorithmic, technical, programmatic, and others).
PC 5	Ability to evaluate and consider economic, social, technological, and environmental factors at all stages of the life cycle of infocommunication systems.
PC 6	Ability to use modern information systems and technologies (production, decision support, data analytics, etc.), methodologies, and techniques of cybersecurity while performing functional tasks and duties.
PC 7	Ability to apply information technologies in the creation, implementation, and operation of quality management systems and evaluate the costs of their development and maintenance.
PC 8	Ability to manage the quality of products and services of information systems and technologies throughout their life cycle.
PC 9	Ability to develop business solutions and evaluate new technological proposals.
PC 10	Ability to select, design, deploy, integrate, manage, administer, and support information systems, technologies, and infocommunications, services, and organizational infrastructure.
PC 11	Ability to analyze, synthesize, and optimize information systems and technologies using mathematical models and methods.
PC 12	Ability to manage and use modern information and communication systems and technologies (including those based on the Internet).
PC 13	Ability to conduct computational experiments, compare the results of experimental data and obtained solutions.
PC 14	Ability to generate new competitive ideas and implement them in projects (startups).
PC 15	Ability to analyze known implementations of lower-level components of information systems considering technological and business process requirements, perform synthesis of controllers, regulators, sensors, actuators, build adequate models of lower-level hierarchy of information systems, and integrate them.
PC 16	Ability to integrate software, technical, informational, and intellectual components of all levels of the hierarchy of information management systems into a single distributed system
PC 17	Ability to apply technologies and tools for developing web applications, web services, websites, and web interfaces with integration of external data and software products.
PC 18	Ability to solve integration tasks of information systems in the manufacturing and management sectors using methods of analysis and synthesis of information transmission, storage, and processing means, based on a service-oriented approach to servicing users of information systems, basic and applied information technologies, and IT infrastructure tools.

7 – Educational Outcomes (EDO)	
EDO 1	To know linear and vector algebra, differential and integral calculus, the theory of functions of several variables, series theory, differential equations for functions of one and several variables, operational calculus, probability theory, and mathematical statistics to the extent necessary for the development and use of information systems, technologies, and telecommunications, services, and organizational infrastructure.
EDO 2	To apply knowledge of fundamental and natural sciences, system analysis and modeling technologies, standard algorithms, and discrete analysis in solving problems of designing and using information systems and technologies.
EDO 3	To use basic knowledge of computer science and modern information systems and technologies, programming skills, secure work technologies in computer networks, methods of creating databases and internet resources, algorithm development, and high-level programming languages using object-oriented programming to solve problems of designing and using information systems and technologies.
EDO 4	To conduct a system analysis of design objects and justify the choice of structure, algorithms, and methods of information transmission in information systems and technologies.
EDO 5	To justify the choice of software and technical tools for creating information systems and technologies based on an analysis of their properties, purpose, and technical characteristics, taking into account the requirements of the system and operating conditions; to have skills in debugging and testing software and technical tools for information systems and technologies
EDO 6	To demonstrate knowledge of the current level of information system technologies, practical programming skills, and the use of applied and specialized computer systems and environments for their implementation in professional activities.
EDO 7	To justify the choice of technical structure and develop corresponding software components that are part of information systems and technologies.
EDO 8	To apply rules for formatting project materials of information systems and technologies, to know the composition and sequence of performing project work in accordance with the requirements of relevant regulatory documents for implementation in professional activities.
EDO 9	To conduct a systemic analysis of the enterprise architecture and its IT infrastructure, to carry out the development and improvement of its elemental base and structure.
EDO 10	To understand and consider social, environmental, ethical, economic aspects, labor protection requirements, industrial sanitation, fire safety, and existing state and international standards when forming technical tasks and solutions.
EDO 11	To demonstrate the ability to develop techno-economic justification for the development of information systems and technologies and to evaluate the economic efficiency of their implementation.
EDO 12	To apply knowledge of the composition, structure, implementation principles, and functioning of information management systems and perform the development, support, and maintenance of information and software and hardware tools, assessing the effectiveness of using information management systems in enterprises.
EDO 13	To apply knowledge of fundamental sciences, systems analysis, modeling technologies, and perform the synthesis of control systems for lower-level components of information systems.
EDO 14	To demonstrate the ability to analyze requirements and develop web applications, web services, websites using basic principles, modern technologies, and programming languages for creating web applications as an interface to access IT infrastructure services.

EDO 15	To demonstrate knowledge of the principles and methods of constructing fault-tolerant codes, the ability to evaluate the amount of information, the bandwidth of communication channels, and develop software and hardware tools for transmission, storage, and processing of information in integrated information systems.
EDO 16	To apply knowledge of relevant programming languages and effectively utilize machine learning methods in tasks involving the creation of artificial intelligence components in information systems, using analysis and evaluation of algorithm complexity.
EDO 17	Based on knowledge of physics processes, principles of operation, characteristics, and features of semiconductor devices and integrated circuits; architecture, command systems, properties of microprocessor peripherals, and microcontroller peripherals, to be able to select, calculate, and program individual modules of hardware-software complexes for lower-level integrated information systems.
EDO 18	To demonstrate knowledge of basic components of all levels of integrated information systems, conduct research on component characteristics and the system as a whole in accordance with the life cycle and standards of systems engineering.
EDO 19	To apply basic and applied information technologies and tools to determine the composition, structure, and interaction schemes of IT infrastructure components, organize and maintain service-oriented user support for information systems.
EDO 20	To demonstrate knowledge of the fundamental concepts of modeling theory, structural-informational, mathematical, and simulation models of integrated information system components, justify the choice of modeling method, build adequate models, and analyze modeling results.
EDO 21	Understanding the technology, principles of organization, and operation of IoT, being able to design IoT systems, demonstrating knowledge of microcontrollers, configuration platforms, programming of endpoint devices, and creating embedded and server-side software.
EDO 22	Know the basics of preventing corruption, public and academic integrity at the level necessary to form intolerance to corruption and manifestations of dishonest behavior among students and be able to apply them in professional activities
EDO 23	Realize the need and use various forms of physical activity aimed at physical development, functional improvement of the body for successful subsequent professional activity
EDO 24	Know foreign languages to the extent sufficient for general and professional communication
EDO 25	Know the basics of philosophy, jurisprudence, which contribute to the development of general culture and socialization of the individual, a tendency to logical thinking
EDO 26	Know and possess the skills and abilities of language activities, the ability to communicate in a dialogue mode in the field of professional activity with colleagues and experts in subject areas
8 – Resource provision for program implementation	
Staffing provision	According to the staffing requirements for ensuring educational activities at the respective level of higher education, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015, No. 1187 in the current version. Engaging specialists from international IT companies in teaching.
Material-technical support	In accordance with the technological requirements for the material and technical support of educational activities at the respective level of higher education, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015, No. 1187 in the current version. Conducting lectures, laboratory work, and computer workshops in specialized laboratories of leading IT companies.

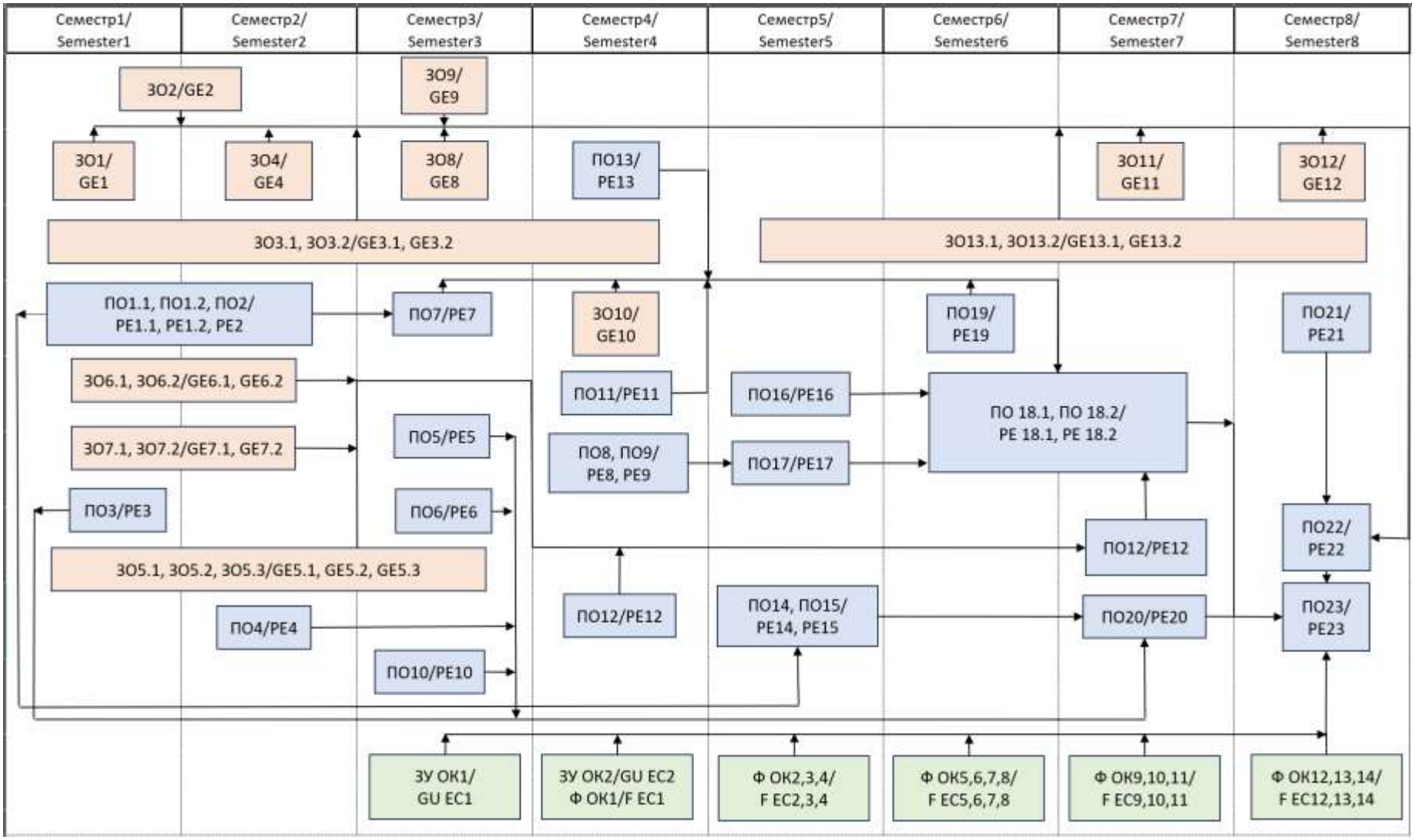
Information and educational-methodical support	In accordance with the technological requirements for educational and methodological as well as informational support of educational activities at the respective level of higher education, approved by the Resolution of the Cabinet of Ministers of Ukraine dated December 30, 2015, No. 1187 in the current version. The university provides access for students to informational resources and the electronic repository by the Scientific and Technical Library named after H.I. Denysenko at Igor Sikorsky Kyiv Polytechnic Institute for organizing scientific research, free access to internet tools such as ORCID, Scopus, Web of Science, etc., and to the copyrighted developments of the university's academic staff.
9 – Academic mobility	
National credit mobility	Possibility of entering into agreements on academic mobility, double degree programs.
International credit mobility	Possibility of entering into agreements on international academic mobility (Erasmus+ K2, double degree programs).
Education of foreign students	Possibility of teaching in Ukrainian in general academic groups or in English with provision for the study of Ukrainian as a foreign language.

2. EDUCATIONAL PROGRAM COMPONENTS

Code	Components of the educational program (academic disciplines, term projects/works, internships, qualification work)	Credits	Form of final assessment
1	2	3	4
1. NORMATIVE educational components			
1.1. Cycle of general training			
GE 1	History of science and technology	2	test
GE 2	Basics of healthy lifestyle	3	test
GE 3.1	Practical foreign language course. Part 1	3	test
GE 3.2	Practical foreign language course. Part 2	3	test
GE 4	Ukrainian language for professional direction	2	test
GE 5.1	Higher mathematics. Part 1. Linear algebra and analytical geometry. Differential and integral calculus of functions of one variable	5	exam
GE 5.2	Higher mathematics. Part 2. Differential and integral calculus of functions of many variables	5	exam
GE 5.3	Higher mathematics. Part 3. Rows. Operational calculus	5	exam
GE 6.1	Physics. Part 1. General physics I	4	test
GE 6.2	Physics. Part 2. General physics II	4	test
GE 7.1	Special sections of mathematics. Part 1. Discrete mathematics	6	exam
GE 7.2	Special sections of mathematics. Part 2. Numerical methods	4	test
GE 8	Human rights, freedoms and Anti-Corruption	2	test
GE 9	Introduction to philosophy	2	test
GE 10	Probability theory and mathematical statistics	4	test
GE 11	Economics and entrepreneurship	3	test
GE 12	Ecological and natural-technogenic safety	2	test
GE 13.1	Practical course of foreign language for professional direction. Part 1	3	test
GE 13.2	Practical course of foreign language for professional direction. Part 2	3	test
1.2. Cycle of professional training			
PE 1.1	Programming. Part 1. Fundamentals of programming	6	exam
PE 1.2	Programming. Part 2. Data structures and algorithms	5	exam
PE 2	Programming. Term work	1	test
PE 3	Operating systems	4	test
PE 4	Algorithm theory	6	exam
PE 5	Computer networks	5	exam
PE 6	Databases	5	exam
PE 7	Web application development	5	test
PE 8	Electronics and microprocessor technology	6	exam
PE 9	Electronics and microprocessor technology. Term project	2	test
PE 10	Computer systems architecture	4	test
PE 11	Modeling of integrated information system components	4	test
PE 12	Theory of automatic control	4	exam
PE 13	Information theory and coding	5	exam
PE 14	Software development technologies	5	exam
PE 15	Software development technologies. Term project	2	test
PE 16	Information systems security	5	exam
PE 17	Internet of things engineering	5	exam
PE 18.1	Information systems engineering. Part 1. Information technology infrastructure	7	exam

1	2	3	4
PE 18.2	Information systems engineering. Part 2. Intelligent information systems	3	test
PE 19	Systems theory and systems analysis	5	exam
PE 20	Information systems design	5	exam
PE 21	Project management	4	test
PE 22	Pre-diploma internship	6	test
PE 23	Diploma project	6	defense
2. SELECTIVE educational components			
2.1 Cycle of general training (selective educational components from the university-wide catalog)			
GS 1	Educational component 1 GU-catalog	2	test
GS 2	Educational component 2 GU-catalog	2	test
2.2 Cycle of professional training (selective educational components from the interfaculty/faculty/departmental catalogs)			
PS 1	Educational component 1 F-catalog	4	test
PS 2	Educational component 2 F-catalog	4	test
PS 3	Educational component 3 F-catalog	4	test
PS 4	Educational component 4 F-catalog	4	test
PS 5	Educational component 5 F-catalog	4	test
PS 6	Educational component 6 F-catalog	4	test
PS 7	Educational component 7 F-catalog	4	test
PS 8	Educational component 8 F-catalog	4	test
PS 9	Educational component 9 F-catalog	4	test
PS 10	Educational component 10 F-catalog	4	test
PS 11	Educational component 11 F-catalog	4	test
PS 12	Educational component 12 F-catalog	4	test
PS 13	Educational component 13 F-catalog	4	test
PS 14	Educational component 14 F-catalog	4	test
Total count of normative educational components:		180	
Total count of selective educational components:		60	
Count of educational components providing the acquisition of competencies as defined by SHE:		128	
TOTAL COUNT OF EDUCATIONAL PROGRAM		**240**	

3. EDUCATIONAL PROGRAM STRUCTURE



4. FORM OF HIGHER EDUCATION STUDENTS CERTIFICATION

Certification of higher education students in the educational-professional program "Integrated Information Systems" in the specialty F6 Information Systems and Technologies is carried out in the form of a public defense of the qualification work. Certification concludes with the issuance of a document of the established sample awarding the student a bachelor's degree with qualification: Bachelor of Information Systems and Technologies for the Educational-Professional Program "Integrated Information Systems."

The qualification work should not contain academic plagiarism.

The qualification work must be published on the official website of the higher education institution or its structural unit, or in the repository of the higher education institution.

5. THE CORRESPONDENCE MATRIX OF PROGRAM COMPETECIES TO EDUCATIONAL PROGRAM COMPONENTS

	GE1	GE2	GE3	GE4	GE5	GE6	GE7	GE8	GE9	GE10	GE11	GE12	GE13	PE1	PE2	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10	PE11	PE12	PE13	PE14	PE15	PE16	PE17	PE18	PE19	PE20	PE21	PE22	PE23
GC1					+	+	+		+	+															+							+			+
GC2						+	+								+				+	+		+	+					+					+		+	+
GC3															+				+	+		+						+				+	+		+	+
GC4			+										+																							
GC5			+	+									+		+							+	+												+	+
GC6			+	+									+		+							+					+								+	+
GC7																																		+		+
GC8																																		+		+
GC9				+				+																												
GC10	+	+		+					+																											
GC 11								+																												
PC1						+																										+	+		+	+
PC2																										+	+			+		+		+	+
PC3														+	+	+		+			+	+	+				+	+		+	+		+		+	+
PC4														+	+	+	+	+	+				+				+	+					+		+	+
PC5											+	+																					+			
PC6																			+									+							+	+
PC7																											+	+					+		+	+
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PC16																															+					+
PC17														+		+				+																+
PC18																										+					+	+	+	+		+

6. THE MATRIX ENSURING ALIGNMENT OF PROGRAM LEARNING OUTCOMES WITH SPECIFIC EDUCATIONAL PROGRAM COMPONENTS

	GE 1	GE 2	GE 3	GE 4	GE 5	GE 6	GE 7	GE 8	GE 9	GE 10	GE 11	GE 12	GE 13	PE 1	PE 2	PE 3	PE 4	PE 5	PE 6	PE 7	PE 8	PE 9	PE 10	PE 11	PE 12	PE 13	PE 14	PE 15	PE 16	PE 17	PE 18	PE 19	PE 20	PE 21	PE 22	PE 23
EDO1					+		+			+																											
EDO2					+	+	+										+							+								+	+		+	+
EDO3														+	+	+	+	+	+								+	+	+						+	+
EDO4																	+	+													+	+	+		+	+
EDO5														+	+	+		+			+	+	+		+		+	+					+		+	+
EDO6														+	+			+	+				+				+	+							+	+
EDO7														+	+			+									+	+					+			+
EDO8															+												+	+					+	+		+
EDO9																		+													+	+	+	+	+	+
EDO10	+			+				+			+	+																								+
EDO11											+																							+		+
EDO12														+							+	+		+	+		+				+					
EDO13																								+	+							+				
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EDO25									+																											
EDO26				+																																