

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
National Aerospace University named after M.E.Jukovsky
Kharkiv Aviation Institute**

APPROVED

Scientific Council
National Aerospace University named
after M.E.Jukovsky
Kharkiv Aviation Institute
" _____ " 2020, protocol __ __

EDUCATIONAL PROFESSIONAL PROGRAM

Artificial intelligence and information systems

Level of higher education -first (bachelor's)

field of knowledge 12 "Information Technology"

specialty 126 "Information systems and technologies"

Qualification: Bachelor in information systems and technologies
according to the program "Artificial Intelligence and Information Systems"

(as amended in accordance with the decision:
Scientific Council of KhAI protocol № _____ from _____)

The educational program is put into
operation from "01" September 2020

Rector of the National Aerospace
University named after M. E.Jukovsky
Kharkiv Aviation Institute

_____ M.V. Nechiporuk

order № ____ from " __ " _____ 2020

PREFACE

Educational and professional program "Artificial Intelligence and Information Systems" for the preparation of applicants for the first (bachelor's) level of higher education in the specialty 126 "Information Systems and Technologies" at the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" was updated in connection with:

– the redistribution of ECTS credits between the components of the educational and professional program and updating the content of the description of the educational program (approved by the decision of the Scientific Council of KHAI protocol № ____ from _____).

Update of the educational and professional program "Engineering and programming of infocommunication systems" is conducted by the development and support group of the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" consisting of:

- | | | | |
|---|---|---------------|--|
| 1 | Head (guarantor) of the educational program | Rubel O.S. | - Cand. tech. Sciences, Associate Professor,
Department of
information and communication technologies
named after O.O. Zelensky |
| 2 | Group members: | Naumenko V.V. | - Cand. tech. Sciences, Associate Professor,
Department of
information and communication technologies
named after O.O. Zelensky |
| 3 | | Zriakhov M.S. | - Cand. tech. Sciences, Associate Professor,
Department of
information and communication technologies
named after O.O. Zelensky |

Reviews of external stakeholders (if available):

- 1
- 2
- 3

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INTRODUCTION

According to Art. 1 "Basic terms and their definitions" of the Law of Ukraine "On Higher Education" of 01.07.2014 № 1556-VII (as amended), educational program is a system of educational components at the appropriate level of higher education within the specialty that determines the requirements for the level of education persons who can start training under this program, the list of disciplines and the logical sequence of their study, the number of ECTS credits required for this program, as well as the expected learning outcomes (competencies) that must be mastered by the applicant.

The educational program is used during:

- accreditation of the educational program, inspection of educational activities by specialty and specialization;
- development of curriculum, programs of disciplines and practices;
- development of diagnostic tools for the quality of higher education;
- determining the content of training in the system of retraining and advanced training;
- professional orientation of applicants.

The educational and professional program takes into account the requirements of the Law of Ukraine "On Higher Education" dated 01.07.2014 № 1556-VII (as amended), the Resolution of the Cabinet of Ministers of Ukraine "On approval of the National Qualifications Framework" dated 23.11.2011 № 1341 and establishes:

- the amount and duration of bachelor's degree;
- general competencies;
- professional competencies;
- program learning outcomes;
- the list and scope of academic disciplines for mastering the competencies of the educational-professional program;
- requirements for the structure of academic disciplines.

Educational and professional program is used for:

- drawing up curricula and working curricula;
- formation of individual plans of students;
- formation of working programs of academic disciplines, practices;
- determination of the information base for the formation of diagnostic tools;
- accreditation of educational and professional program;
- internal and external quality control of training;
- certification of bachelors in the educational-professional program "Artificial Intelligence and Information Systems" in the specialty 126 "Information Systems and Technologies".

Users of the educational and professional program are:

- applicants for higher education studying at the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute";
- scientific and pedagogical workers who train bachelors in educational and professional programs "Artificial Intelligence and Information Systems" in the specialty 126 "Information Systems and Technologies";
- examination commission of specialty 126 "Information systems and technologies";
- Admissions Committee of the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute".

The educational and professional program extends to the departments of the University involved in the training of bachelor's degree specialists in the educational and professional program "Artificial Intelligence and Information Systems" in the specialty 126 "Information Systems and Technologies".

1 REGULATORY REFERENCES

The educational and professional program is developed on the basis of the following normative documents and recommendations:

1.1 Law of Ukraine "On Higher Education". № 1556-UII dated 01.07.2014 (as amended).

1.2 Law of Ukraine "On Telecommunications" (as amended).

1.3 Resolution of the Cabinet of Ministers of Ukraine "On approval of the National Qualifications Framework" of 23.11.2011 № 1341.

1.4 Resolution of the Cabinet of Ministers of Ukraine "On approval of the list of branches of knowledge and specialties in which the training of applicants for higher education" from 29.04.2015 № 266.

1.5 Resolution of the Cabinet of Ministers of Ukraine "On approval of the Regulations on the implementation of the right to academic mobility" from 12.08.2015 № 579.

1.6 National Classifier of Ukraine. Classifier of professions DK 003: 2010, approved by the order of Derzhspozhyvstandart of Ukraine dated 28.07.2010 № 327 (as amended).

1.7 Methodical recommendations for the development of higher education standards approved by the higher education sector of the Scientific and Methodological Council of the Ministry of Education and Science of Ukraine Minutes of 21.06.2019 № 3 (approved by the order of the Ministry of Education and Science of Ukraine of 01.10.2019 № 1254).

1.8 Regulation "On the organization of the educational process" SUYA KHAI-NMV-P / 002: 2020 of the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute", approved by the Academic Council of the University from 27.05.2020 protocol № 11.

1.9 A Tuning Guide to Formulating Degree Program Profiles Including Program Competences and Program Learning Outcomes. - Bilbao, Groningen and The Hague, 2010.

1.10A TUNING-AHELO conceptual framework of expected / desired learning outcomes in engineering. OECD Education Working Papers, no. 60, OECD Publishing 2011.<http://dx.doi.org/10.1787/5kghtchn8mbn-en>

1.11Development of educational programs. Methodical recommendations / Author: VM Zakharchenko, VI Lugovyi, Yu. M. Rashkevich, Zh. V. Talanova / Edited by V.G. Kremen'. - Kyiv: State Enterprise "Priorities", 2014. - 120 p.

1.12Order of the Ministry of Education and Science of Ukraine "On the peculiarities of the introduction of the list of branches of knowledge and specialties for which higher education students are trained, approved by the Cabinet of Ministers of Ukraine dated April 29, 2015 № 266" from 06.11.2015 № 1151.

1.13Classification of economic activities: DK 009: 2010. - Valid from 01.01.2012. - (National Classification of Ukraine).

1.14Classifier of professions: DK 003: 2010. - Valid from 01.11.2010. - (National Classification of Ukraine).

1.15National educational glossary: higher education / 2nd ed., Revised. idop. / Author: V.M. Zakharchenko, S.A. Kalashnikov, V.I. Lugovyi, A.V. Stavitsky, Yu. M. Rashkevich, Zh. V. Talanova / Ed. Flint. - Kyiv: Pleiades Publishing House LLC, 2014. - 100 p.

2 PROFILE OF THE EDUCATIONAL PROFESSIONAL PROGRAM INTELLIGENCE AND INFORMATION SYSTEMS"FROM THE SPECIALTY 126 "INFORMATION SYSTEMS AND TECHNOLOGIES"

1 - General information	
Full name of the higher educational institution and structural unit	National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" Department of Information and Communication Technologies named after O.O. Zelensky
Degree of higher education and title of qualification in the original language	Degree of higher education - bachelor Field of knowledge: 12 «Information Technology» Specialty: 126 «Information systems and technologies» Bachelor`s Degree Field of Study:Information technologies Software Subject Area:Information systems and technologies
The official name of the educational and professional program	Artificial intelligence and information systems Artificial Intelligence and Information Systems
Type of diploma and scope of educational and professional program	Bachelor's degree, single, term of study 3 years 10 months: – on the basis of complete general secondary education - 240 ECTS credits; – on the basis of the degree of junior bachelor (educational qualification level "Junior Specialist") - 240 ECTS credits. KhAI recognizes and re-credits no more than 120 ECTS credits received within the previous educational program for junior bachelor (junior specialist).
Availability of accreditation	Entered into force in 2020
Cycle / level	The first (bachelor's) level NRC of Ukraine - level 7, FQ-EHEA - first cycle, QF-LLL - level 6
Prerequisites	A person has the right to obtain a bachelor's degree if he/she has completed general secondary education and/or primary level (short cycle) of higher education (junior bachelor, professional junior bachelor, educational qualification level "Junior Specialist").
Language (s) of instruction	The language of instruction is the state language. In order to create conditions for international academic mobility, it may be decided to teach one or more disciplines in English and/or other foreign languages, while providing students with knowledge of the discipline in the state language.
Validity of the educational and professional program	The educational program is reviewed at least once every 5 years or at the request of stakeholders. In order to improve or modernize, the guarantor of the educational program may make the necessary changes or additions during this period, taking into account the proposals of different groups of stakeholders.
Internet address of the	https://khai.edu/ua/education/osvitni-programi-i-komponenti/osvitni-

permanent posting of the description of the educational-professional program	programi-bakalavriv/
2 - The purpose of the educational program	
<p>1. To provide theoretical knowledge and practical skills sufficient to solve specialized problems in the field of information systems and technologies with the involvement of elements of artificial intelligence; to provide the ability to solve practical problems in professional activities aimed at creating intelligent information systems and services.</p> <p>2. To train highly qualified specialists (bachelors) in the field of information systems and technologies, whose competencies meet the modern requirements of employers and the prospects of the labor market in the fields of aviation, aerospace, mechanical engineering, information technology and related fields.</p> <p>3. To form the personality of a specialist who is able to use professional knowledge and practical skills to solve innovative problems in the field of electronics and telecommunications, to adapt to changing requirements of the labor market and technology.</p>	
3 - Characteristics of the educational and professional program	
Subject area	<p>Objects of study: theoretical and methodological bases and tools for creating and using information systems and technologies; evaluation criteria and methods for ensuring the quality, reliability, fault tolerance, survivability 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.</p> <p>The purpose of training: formation and development of general and professional competencies in information systems and technologies that contribute to the social stability and mobility of graduates in the labor market; obtaining higher education for the development, implementation and research of information systems and technologies.</p> <p>The theoretical content of the subject area includes:</p> <ul style="list-style-type: none"> – methods and means of information systems and technologies; – concepts and principles of information management, system integration and administration of information systems; – basics of IT project management theory; – enterprise IT infrastructure architecture. <p>Methods, techniques, approaches and technologies: General theoretical methods, techniques, approaches and technologies of basic and applied sciences, modeling methods.</p> <p>Tools and equipment: computer equipment, control and measuring devices, software and hardware complexes and means, network equipment, specialized software, modern programming languages, etc.</p>
Orientation of the program	Educational and professional program
The main focus of the educational and professional program (specialization)	<p>Special education with artificial intelligence and information systems, specialty 126 "Information systems and technologies" of the bachelor's degree</p> <p>Key words: artificial intelligence, information technologies, data analysis, intelligent systems, software</p>
Features of the program	The program provides a study of the theoretical foundations of computer science and information systems, the acquisition of relevant knowledge and competencies in classical and modern advances in computer science, in-depth knowledge of modern models, methods and algorithms, as well

	as technologies, processes and methods , processing, analysis, transmission and storage of data in information systems. Training of specialists capable of applying mathematical foundations and algorithmic principles in modeling, design, development and maintenance of computer systems, as well as development, implementation and maintenance of data analysis and processing systems in organizational and technical systems using elements of artificial intelligence and machine learning . Structural and object-oriented approaches to the development of intelligent computer, expert and decision support systems are presented.
4 - Suitability of graduates for employment and further study	
Suitability for employment	The specialist is able to perform professional work according to the codes of DK 003: 2010: 31 - Technical specialists in the field of applied sciences and technology. 312 - Computer technicians. 3121 - Software Technician, Information Technology Specialist, Computer Software Development Specialist, Software Development and Testing Specialist, System Administration Technician.
Further training	Continuation of 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-study, problem-oriented learning aimed at the development of critical and creative thinking, learning through laboratory practice, distance education and more. Lectures, multimedia lectures, laboratory work, seminars, practical classes in small groups, independent work based on textbooks and abstracts, consultations with teachers, preparation of qualifying work.
Evaluation	Written exams, practice reports, essays, presentations, current (modular) control, bachelor's thesis and its defense.
6 - Program competencies	
Integral competence	Ability to solve complex specialized problems and practical problems in the field of information systems and technologies, or in the learning process, characterized by complexity and uncertainty of conditions that require the application of theories and methods of information technology.
General Competences (GQ)	GQ1. Ability to abstract thinking, analysis and synthesis. GQ2. Ability to apply knowledge in practical situations. GQ3. Ability to understand the subject area and professional activity. GQ4. Ability to communicate in a foreign language. GQ5. Ability to learn and master modern knowledge. GQ6. Ability to search, process and summarize information from various sources. GQ7. Ability to develop and manage projects. GQ8. Ability to evaluate and ensure the quality of work performed. GQ9. Ability to exercise their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine. GQ10. Ability to preserve and increase moral, cultural, 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, techniques and technologies. active recreation and healthy living.
Special subject) (SC)	(professional, competencies)	<p>SC1. Ability to analyze the object of design or operation and its subject area.</p> <p>SC2. 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 infrastructure elements of the organization.</p> <p>SC3. Ability to design, develop, set up and improve system, communication and software and hardware of information systems and technologies, the Internet of Things (IoT), computer-integrated systems and system network structure, their management.</p> <p>SC4. Ability to design, develop and use tools for the implementation of information systems, technologies and infocommunications (methodological, informational, algorithmic, technical, software and others).</p> <p>SC5. Ability to assess and take into account economic, social, technological and environmental factors at all stages of the life cycle of infocommunication systems.</p> <p>SC6. Ability to use modern information systems and technologies (production, decision support, data mining, etc.), cybersecurity techniques and techniques in the performance of functional tasks and responsibilities.</p> <p>SC7. Ability to apply information technology during the creation, implementation and operation of a quality management system and estimate the costs of its development and provision.</p> <p>SC8. Ability to manage the quality of products and services of information systems and technologies during their life cycle.</p> <p>SC9. Ability to develop business solutions and evaluate new technological proposals.</p> <p>SC10. Ability to select, design, deploy, integrate, manage, administer and maintain information systems, technologies and infocommunications, services and infrastructure of the organization</p> <p>SC11. Ability to analyze, synthesize and optimize information systems and technologies using mathematical models and methods.</p> <p>SC12. Ability to manage and use modern information and communication systems and technologies (including those based on the use of the Internet).</p> <p>SC13. Ability to perform computational experiments, compare the results of experimental data and solutions.</p> <p>SC14. Ability to form new competitive ideas and implement them in projects (startups).</p>
7- Program learning outcomes		
		PLO1. To know linear and vector algebra, differential and integral calculus, theory of functions of many variables, series theory, differential equations for functions of one and many variables, operational calculus, probability theory and mathematical statistics to the extent necessary for the development and use of information systems, technologies and infocommunications , services and infrastructure of the organization.

	<p>PLO2. To apply knowledge of basic and natural sciences, systems analysis and modeling technologies, standard algorithms and discrete analysis in solving problems of design and use of information systems and technologies.</p> <p>PLO3. To use basic knowledge of computer science and modern information systems and technologies, programming skills, technologies for secure work in computer networks, methods of creating databases and Internet resources, technologies for developing algorithms and computer programs in high-level languages using object-oriented programming to solve problems of design and use of information systems and technologies.</p> <p>PLO4. To conduct a systematic analysis of design objects and justify the choice of structure, algorithms and methods of information transfer in information systems and technologies.</p> <p>PLO5. To argue the choice of software and hardware for the creation of information systems and technologies based on the analysis of their properties, purpose and technical characteristics, taking into account the requirements for the system and operating conditions; have the skills to debug and test software and hardware information systems and technologies.</p> <p>PLO6. To demonstrate knowledge of the current level of information systems technology, practical skills of programming and use of applied and specialized computer systems and environments for their implementation in professional activities.</p> <p>PLO7. To justify the choice of technical structure and develop appropriate software that is part of information systems and technologies.</p> <p>PLO8. To apply the rules of design materials for information systems and technologies, know the composition and sequence of design work, taking into account the requirements of relevant legal documents for implementation in professional activities.</p> <p>PLO9. To carry out a systematic analysis of the architecture of the enterprise and its IT infrastructure, to develop and improve its element base and structure.</p> <p>PLO10. To understand and take into account social, environmental, ethical, economic aspects, labor protection requirements, industrial sanitation, fire safety and existing national and foreign standards when formulating technical tasks and solutions.</p> <p>PLO11. To demonstrate the ability to develop a feasibility study for the development of information systems and technologies and be able to assess the economic efficiency of their implementation.</p>
8 - Resource support for program implementation	
Staffing	<p>Staffing is formed mainly at the expense of scientific and pedagogical staff of the Department of Information and Communication Technologies named after O.O. Zelensky, whose teaching staff consists of a sufficient number of doctors of technical sciences, professors, candidates of technical sciences and associate professors. Other departments of the National Aerospace University are also involved in teaching disciplines. Research and teaching staff involved in the implementation of the educational program meet the requirements for educational activities in higher education in accordance with current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of</p>

	licensing conditions for educational activities of educational institutions" from 30.12.2015 № 1187).
Logistics	<p>Logistics meets the requirements of the Licensing Conditions for educational activities in the field of higher education in accordance with current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of licensing conditions for educational activities of educational institutions" from 30.12.2015 № 1187 as amended) and provides all types of training sessions and practices provided for in the curriculum.</p> <p>The total area where the premises of the Department of Information and Communication Technologies named after O.O. Zelensky is 838.9 m². Training is carried out in training laboratories, computer classes: 302, 311, 312, 314, 315, 316, 317, 318, 512 auditorium of the radio building. The educational area where the educational process takes place is 572.9 m². Territorially, the premises of the department are located in one educational building. All premises provide comfortable conditions for the training of applicants and the work of teachers.</p> <p>Department of Information and Communication Technologies named after O.O. Zelensky has its own computer laboratories with an area of 191.8 m², equipped with 32 computers (connected to the Internet), 4 multimedia projectors for higher education. Training facilities for hardware laboratory work are also located in specialized laboratories.</p>
Information and methodological support	<p>In accordance with the requirements of the Licensing Conditions for Educational Activities in Higher Education in accordance with current legislation of Ukraine (Resolution of the Cabinet of Ministers of Ukraine "On approval of licensing conditions for educational activities of educational institutions" of December 30, 2015 № 1187 as amended) the support includes library resources, electronic educational resources, the site of the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" and the site of the Department of Information and Communication Technologies named after O.O. Zelensky, which contains basic information on educational activities.</p> <p>Using:</p> <ul style="list-style-type: none"> - virtual learning environment of the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute"; - author's developments of scientific and pedagogical staff of the department of information and communication technologies named after O.O. Zelensky; - CISCO training materials and technologies for face-to-face and distance learning.
9 - Academic mobility	
National credit mobility	Based on bilateral agreements between the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" and technical institutions of Ukraine.
International credit mobility	<p>Based on bilateral agreements between the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" and educational institutions of partner countries.</p> <p>Agreement with the educational institution HRPower (Research & Development Center LG Electronis Wroclaw Sp. Zoo) Poland dated 24.05.17</p> <p>Agreement with the Ecole Centrale de Nantes, Nantes, France from</p>

	01.09.2017
Training of foreign applicants for higher education	Education of foreign citizens is carried out in the state or English languages. If education is conducted in the state language, then in certain cases it may be decided to teach one or more disciplines in English and / or other foreign languages, while ensuring that students in the relevant discipline know the state language.

3 LIST OF COMPONENTS OF THE EDUCATIONAL PROFESSIONAL PROGRAM(CEP) AND THEIR LOGICAL SEQUENCE

3.1 List of EP components

CEP code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of loans	Form of final control
1	2	3	4
Mandatory components of the EP			
OK1	Basics of infocommunications	4.5	Test
OK2	Higher mathematics	15	Exam
OK3	Discrete Math	5	Exam
OK4	Basics of programming	9.5	Credit, Exam
OK5	Physics	5	Test
OK6	Algorithms and data structures	4	Test
OK7	Educational practice	3	Test
OK8	Object-oriented programming and effective practices	5 / 4.5 ^{**)}	Test
OK9	System analysis and mathematical modeling of information systems	5.5	Exam
OK10	Fundamentals of network technologies	5.5	Exam
OK11	UNIX-like operating systems	4	Test
OK12	Databases ^{*)}	5	Test
OK13	Digital data processing	5.5	Exam
OK14	Digital Data Processing (CD)	1 / 1.5 ^{**)}	Diff. test
OK15	Routing and switching in information networks	4.5	Exam
OK16	Administration of information systems	4.5	Exam
OK17	Introductory practice	3	Test
OK18	Multimedia data processing	4.5	Exam
OK19	Multimedia data processing (CP)	1	Diff. test
OK20	Information protection in infocommunications	4	Exam
OK21	Automation and security of corporate networks	5	Exam
OK22	Front-end programming	4.5	Test
OK23	Fundamentals of machine learning	4.5	Test
OK24	Machine learning and data analysis	10	Exam
OK25	Machine learning and data analysis (CP)	2	Diff. test
OK26	Multiplatform programming	4.5	Test
OK27	Optimization methods in machine learning	4	Exam
OK28	Mobile application programming	4	Exam
OK29	Back-end programming	4.5	Test
OK30	Internship	3	Test
OK31	Internet of Things	8.5	Credit, Exam
OK32	Technologies of continuous integration and deployment of	5.5	Exam

CEP code	Components of the educational program (academic disciplines, course projects (works), practices, qualification work)	Number of loans	Form of final control
1	2	3	4
	information systems		
OK33	Economics of IT projects	2.5	Test
OK34	Deep learning	5	Exam
OK35	Deep learning (DE)	1	Diff. test
OK36	Human factor engineering	2.5	Test
OK37	Bachelor's thesis	9	Protection
Total amount of mandatory components:		179	
Selective components of the OP			
VOK1	Language competences (foreign language)	6	Test, Diff. test
VOK2	Ukrainian studies	3	Test
VOK3	Legal competence	3	Test
VOK4	Formation of a systemic scientific worldview	3	Test
VOK5	Development of communications	3	Test
VK1	Humanitarian or economic discipline of your choice	3	Test
VK2	Mathematical and technical unit to choose from	5	Test
VK3	Discipline of individual choice 1	5	Exam
VK4	Discipline of individual choice 2	5	Exam
VK5	Discipline of individual choice 3	5	Exam
VK6	Minor. Discipline 1	5	Exam
VK7	Minor. Discipline 2	5	Exam
VK8	Minor. Discipline 3	5	Exam
VK9	Minor. Discipline 4	5	Exam
The total amount of sample components:		61	
TOTAL VOLUME OF THE EDUCATIONAL PROGRAM		240	

***)For this discipline on the basis of the Regulation "On the re-enrollment of disciplines and the definition of academic differences in the National Aerospace University named after M.E.Jukovsky "Kharkiv Aviation Institute" "recalculates the actual difference in the amount of ECTS credits allocated for the study of this discipline in the curriculum for bachelors on a full and short term, respectively.**

****)For applicants who study part-time.**

The applicant can choose any block of disciplines of professional orientation (Minor). Blocks of disciplines of professional orientation can be increased and updated by the decision of the branch NMC.

The general university block of elective disciplines consists of disciplines offered by the departments of the University or other departments according to the directions of their activity or scientific directions/schools.

The applicant, who is enrolled on the basis of complete general secondary education, carries out an educational-professional program in the amount of 240 ECTS credits.

The applicant, who is enrolled on the basis of the degree of junior bachelor (educational qualification level "Junior Specialist"), performs an educational and professional program in the

amount of 240 ECTS credits. At the same time, KHAI recognizes and re-credits no more than 120 ECTS credits received within the previous educational program for junior bachelor (junior specialist).

According to the principles of the competence approach to higher education, the re-enrollment of the results of previously completed disciplines in accordance with the individual curriculum is carried out at the request of the applicant on the basis of the Regulation "On re-enrollment of disciplines of "Kharkiv Aviation Institute" (<https://khai.edu.ua/university/normativna-baza/polozheniya/polozhennya-yaki-regulyuyut-poryadok-zdijsnennya-osvitnogo-procesu/polozhennya-pro-poryadok-perezarahuvannya/>) by comparison: compliance with the content of the discipline of educational and professional program (OPP); planned learning outcomes in the relevant discipline; total hours and ECTS credits; forms of final control, etc.

3.2 Structural and logical scheme of Educational Program (EP)

The structural and logical scheme (Appendix A) of the educational program reflects the sequence of studying its components, both mandatory and optional. All components of the EP in accordance with the logic of their assimilation are given in the form of an oriented graph, where solid arrows indicate a strictly defined sequence of study disciplines. Courses with the recommended sequence are connected by dotted arrows. Disciplines whose sequence of study is not defined (may be arbitrary) are not linked by arrows.

Disciplines that are recalculated for applicants who are enrolled on the basis of a bachelor's degree (educational qualification level "Junior Specialist") are indicated on the structural and logical scheme of the EP (Appendix A) as follows:

- disciplines that are fully credited:



- disciplines that are partially credited:



Applicants for higher education are selected individual trajectory of study, which is realized through the selection as separate elective disciplines (disciplines of individual choice) and blocks (blocks of disciplines of minor specialization). Alternative elective components provide for the choice of a student of one discipline from the list of disciplines included in the relevant specialized unit in the structure of educational training. For students studying on the basis of complete general secondary education are the following selective components of the socio-humanitarian block: "Language competences (foreign language)", "Ukrainian studies", "Legal competence", "Formation of a systematic scientific worldview", "Development of communications". For students studying on the basis of the educational and qualification level of the Junior Specialist – these are selective components of the humanitarian block "Language competences (foreign language)".

The number and scope of disciplines of free choice of the student for a particular semester is indicated in the curriculum. Thus, the right of students to "choose disciplines within the limits provided by the relevant educational program and work curriculum, in the amount of not less than 25% of the total number of ECTS credits provided for this level of higher education" [Law of Ukraine education "].

The results of the student's choice of disciplines of the variable part are the basis for the formation of an individual student curriculum, which in accordance with the requirements of the European credit transfer system of the educational process is the main working document of the student. The individual curriculum of the student is developed for the academic year on the basis of the working curriculum and includes all normative and elective disciplines chosen by the student, with

mandatory compliance with the normatively established deadlines for training first (bachelor) academic disciplines that determine the content of education in the specialty, and assessment systems (current, modular and final control of knowledge, defense of qualifying work).

Elective components, their content, formation of competencies (professional, special) and definition of program learning outcomes are presented in the work programs of disciplines and syllabuses on the site in the section "Short description, structure and educational components of educational programs and components". information systems "specialty 126" Information systems and technologies".

<https://khai.edu.ua/education/osvitni-programi-i-komponenti/osvitni-programi-bakalavriv/>

3.2.1 The sequence of studying the educational components of the educational program

1 year of study	
1 semester	2nd semester
VOK1Language competences (foreign language)	VOK1Language competences (foreign language)
VOK2Ukrainian studies	VOK3Legal competence
VK1Humanitarian or economic discipline of your choice	OK5Physics
OK1Basics of infocommunications	OK6Algorithms and data structures
OK2Higher mathematics	OK2Higher mathematics
OK3Discrete Math	OK7Educational practice
OK4Basics of programming	OK4Basics of programming
	OK11UNIX-like operating systems
2 years of study	
3rd semester	4th semester
VOK4Formation of a systemic scientific worldview	VOK5Development of communications
VOK1Language competences (foreign language) ^{*)}	VOK1Language competences (foreign language) ^{*)}
OK2Higher mathematics	VK2Mathematical and technical unit to choose from
OK8Object-oriented programming and effective practices	OK12Databases
OK4Basics of programming *)	OK4Basics of programming *)
OK9System analysis and mathematical modeling of information systems	OK13Digital data processing
OK10Fundamentals of network technologies	OK14Digital Data Processing (CD)
OK22Front-end programming	OK15Routing and switching in information networks
	OK16Administration of information systems
	OK17Introductory practice
3 years of study	

5th semester	6 semester
VK6 Minor. Discipline 1	VK7 Minor. Discipline 2
OK18 Multimedia data processing	VK3 Discipline of individual choice 1
OK19 Multimedia data processing (CD)	OK24 Machine learning and data analysis
OK20 Information protection in infocommunications	OK25 Machine learning and data analysis (CP)
OK21 Automation and security of corporate networks	OK27 Methods of optimization in machine learning
OK26 Multiplatform programming	OK28 Mobile application programming
OK8 Object-oriented programming and effective practices *)	OK12 Databases*)
OK23 Fundamentals of machine learning	OK29 Back-end programming
	OK30 Internship
4 years of study	
7 semester	8 semester
VK8 Minor. Discipline 3	VK9 Minor. Discipline 4
VK4 Discipline of individual choice 2	VK5 Discipline of individual choice 3
OK24 Machine learning and data analysis	OK34 Deep learning
OK25 Machine learning and data analysis (CP)	OK35 Deep learning (DE)
OK31 Internet of Things	OK31 Internet of Things
OK32 Technologies of continuous integration and deployment of information systems	OK36 Human factor engineering
OK33 Economics of IT projects	OK37 Bachelor's thesis

*) For applicants who study part-time.

4 FORM OF CERTIFICATION OF HIGHER EDUCATION ACCESSORIES

Attestation of graduates in the educational-professional program "Artificial Intelligence and Information Systems" in the specialty 126 "Information Systems and Technologies" is carried out in the form of defense of bachelor's thesis and ends with the issuance of a standard document on awarding him a bachelor's degree with bachelor's degree: and technologies in the educational program "Artificial Intelligence and Information Systems".

Certification is carried out openly and publicly.

5 MATRIX OF CONFORMITY OF PROGRAM COMPETENCES TO THE COMPONENTS OF THE EDUCATIONAL PROFESSIONAL PROGRAM

Components of the educational program	Program competencies																								
	GQ1	GQ2	GQ3	GQ4	GQ5	GQ6	GQ7	GQ8	GQ9	GQ10	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12	SC13	SC14	
OK1	+		+		+						+	+				+						+			
OK2	+				+	+					+														
OK3	+				+	+					+														
OK4	+	+			+	+								+									+		
OK5	+	+			+						+														
OK6	+	+			+	+						+		+		+					+	+	+		
OK7		+	+									+	+	+		+						+	+		
OK8	+	+			+	+								+								+			
OK9	+		+		+	+					+		+	+			+				+	+	+		
OK10		+	+		+	+					+	+			+	+				+	+	+			
OK11		+	+		+	+					+	+	+			+	+					+			
OK12	+	+	+			+	+				+	+	+	+	+	+					+	+			
OK13	+	+	+		+	+							+	+		+					+		+		
OK14	+	+	+		+	+							+	+		+					+		+		
OK15		+	+		+	+		+			+	+	+		+	+	+	+	+	+		+			
OK16	+	+	+		+		+				+	+	+	+	+	+	+	+			+		+		
OK17		+	+									+	+	+		+						+	+		
OK18	+	+	+		+	+							+	+		+						+		+	
OK19	+	+	+		+	+							+	+		+						+		+	
OK20		+	+			+						+		+	+	+					+	+			
OK21		+	+		+	+		+			+	+	+	+	+	+	+	+	+	+		+			
OK22	+	+	+			+	+				+	+		+	+	+	+			+	+		+	+	
OK23		+			+		+	+			+		+	+		+						+	+	+	+
OK24		+			+		+	+			+		+	+		+						+	+	+	+
OK25		+			+		+	+			+		+	+		+						+	+	+	+
OK26	+	+	+			+	+				+			+		+				+	+		+	+	
OK27		+			+		+	+			+		+	+	+	+		+			+		+	+	
OK28	+	+	+			+	+				+	+	+	+	+	+			+	+		+		+	

Components of the educational program	Program competencies																							
	GQ1	GQ2	GQ3	GQ4	GQ5	GQ6	GQ7	GQ8	GQ9	GQ10	SC1	SC2	SC3	SC4	SC5	SC6	SC7	SC8	SC9	SC10	SC11	SC12	SC13	SC14
OK29	+	+	+			+	+				+	+	+	+	+	+			+	+		+		+
OK30		+	+									+	+	+		+						+	+	
OK31		+	+									+	+	+		+	+		+			+		+
OK32		+	+				+	+			+	+		+		+	+	+	+	+		+		+
OK33		+					+			+					+				+					+
OK34		+			+		+	+			+		+	+		+					+	+	+	+
OK35		+			+		+	+			+		+	+		+					+	+	+	+
OK36		+								+					+									
OK37		+	+		+	+	+	+			+	+	+	+	+	+	+	+		+	+	+	+	+
VOK1		+		+	+																			
VOK2					+	+			+															
VOK3						+			+															
VOK4					+	+			+	+					+									
VOK5		+			+	+			+	+					+									
VK1									+	+														
VK2	+	+			+						+													
VK3					+	+																		
VK4					+	+																		
VK5					+	+																		
VK6		+	+																				+	
VK7		+	+																				+	
VK8		+	+																				+	
VK9		+	+																				+	

Note. The actual list of general and special competencies for the elective components will be determined by the results of the selection of applicants for higher education disciplines of the variable part of the educational and professional program.

**6 MATRIX OF CONFORMITY OF SOFTWARE LEARNING RESULTS (PRN)
RELEVANT COMPONENTS OF THE EDUCATIONAL PROFESSIONAL PROGRAM**

Components of the educational program	Program learning outcomes										
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11
OK1			+								
OK2	+										
OK3		+									
OK4			+			+					
OK5		+									
OK6		+	+	+							
OK7			+								
OK8			+			+					
OK9		+		+					+		
OK10					+				+		
OK11					+	+		+	+		
OK12			+			+					
OK13				+		+		+			
OK14				+		+		+			
OK15					+			+	+		
OK16					+			+	+		
OK17					+	+					
OK18				+		+		+			
OK19				+		+		+			
OK20			+					+			
OK21					+			+	+		
OK22			+			+	+				
OK23						+		+			
OK24						+		+			
OK25						+		+			
OK26			+			+	+				

Components of the educational program	Program learning outcomes										
	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11
OK27				+		+					
OK28			+			+	+				
OK29			+			+	+				
OK30											+
OK31							+	+	+		
OK32					+			+	+		
OK33										+	+
OK34						+		+			
OK35						+		+			
OK36										+	
OK37		+	+			+		+			+
VOK1											
VOK2											
VOK3								+			
VOK4										+	
VOK5										+	
VK1										+	
VK2	+										
VK3		+									
VK4		+									
VK5		+									
VK6		+	+	+	+						
VK7		+	+	+	+						
VK8		+	+	+	+						
VK9		+	+	+	+						

Note. The actual list of program learning outcomes for the optional components will be determined by the results of the selection of applicants for higher education in the disciplines of the variable part of the educational-professional program.

Appendix A

STRUCTURAL AND LOGICAL SCHEME OF THE EDUCATIONAL PROFESSIONAL PROGRAM

