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Chairman of the Educational and Methodological Council JSC «International University of Information Technologies»

A.K. Mustafina 2023

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Rector JSC «International University of Information Technologies»



A.K. Khikmetov 2023

DOUBLE DEGREE EDUCATIONAL PROGRAM

6B06304 «Computer security»

Education Area Code and Classification: 6B06 – Information and Communication Technologies
Code and Classification: 6B061 – Information and Communication Technologies
Group of education programs: B063 – Information security
Level according to the International Standard Classification of Education (ISCE): 6
Level according National Qualifications Framework (NQF): 6
Level according Industry Qualifications Framework (IQ): 6
Duration of study: 4 years
Credits: 240

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Director of the Chairman of the ALE «Kazakhstan Information Security Association»



V.V. Pokusov 2023

APPROVE

Director of the National Innovation Center



2023

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## List of abbreviations and symbols

IN	Higher education
GOSO	State obligatory standard of education
ECR	European Qualifications Framework
ETF	European Education Foundation
ZUN	Knowledge, skills, skills
NKZ	National Classifier of Occupations
NRK	National Qualifications Framework
NSC	National system of qualifications
OGM	General humanitarian module
OM	General module
OP	Educational program
OPM	General professional module
ORC	Sectoral Qualifications Framework
PS	professional standard
air defense	Postgraduate education
PC	Professional competence
PM	Professional module
WG	Working group
RK	The Republic of Kazakhstan
RO	Learning Outcome
CM	Special module
QMS	Quality Management System
SAM	Socio-economic module
TVE	Technical and Vocational Education
TVET	Technical and vocational education and post-secondary education
UNESCO	United Nations Educational, Scientific and Cultural Organization/
UNESCO	specialized agency of the United Nations Educational, Scientific and Cultural Affairs.
Cedefop	European Center for the Development of Vocational Training
DACUM	from English. Developing Curriculum
ECVET	European Credit System for vocational education and training
EQAVET	European Quality Assurance in Vocational Education and Training
ENQA	European Association for Quality Assurance in Higher Education/European-Russian Association for Quality Assurance in Higher Education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
FIBAA	International agency (non-profit foundation) for accreditation and examination of the quality of higher education (Bonn, Germany)
IQM-HE	Internal Quality Management in Higher Education
TACIS	Technical Assistance for the Commonwealth of Independent States
WSI	WorldSkills International

## 1. Description of the educational program

The program is designed to implement the principles of the democratic nature of education management, expanding the boundaries of academic freedom and the powers of educational institutions, which will ensure the training of elite, initiative-taking personnel for innovative and knowledge-intensive sectors of the economy.

The educational program ensures the application of an individual approach to students, ensures the transformation of professional competencies from professional standards and qualification standards into learning outcomes. Student-centered learning is provided - the principle of education, which implies a shift in emphasis in the educational process from teaching (as the main role of the teaching staff in the "transmission" of knowledge) to learning (as an active educational activity of the student).

The educational program "6B06304 - Computer Security" is to provide practice-oriented training of graduates in the field of creation, use and protection of information technologies designed to work in various industries and in business. This educational program was written on the basis of the recommendations of the Professional Standards of the Republic of Kazakhstan "Specialists-professionals in the security of information infrastructure and IT" (Annex No. 11 to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 of 05.12.2022), follows new trends from the Atlas of new professions, Regional standards, the National Qualifications Framework and the Sectoral Qualifications Framework in accordance with level 6.

**Specialist** By computer security - an employee involved in ensuring computer security at the enterprise. The main activity of a computer security specialist is related to secure computer systems and means of processing, storing, and transmitting information; information security services; mathematical models of processes arising in the process of information protection.

The educational program "Computer Security" was developed based on the analysis of labor functions of professional standards in the field of information security and information and communication technologies for the 6th level of qualification (bachelor, practical experience). The developed EP "Computer Security" meets the needs of stakeholders (students, employers, the state) and external qualification requirements.

## 2. Purpose and objectives of the educational program

**Purpose of the OP-** Provide practice-oriented training of graduates in the field of creation, use and protection of information technologies designed for work in various industries and businesses.

### **Tasks of the OP:**

1. Prepare graduates for professional activities in the field of protecting applications and programs from modifications.
2. To meet the needs of the market with computer security specialists.
3. Create conditions for continuous professional self-improvement.
4. Create conditions for the development of social and personal qualities of graduates (purposefulness, organization, diligence, communication skills, ability to work in a team, responsibility for the result of their professional activities, civic responsibility, tolerance), social mobility and competitiveness in the labor market.

## 3. Requirements for evaluating the learning outcomes of an educational program

The following forms of exams are used as an assessment of learning outcomes: computer testing, written exam (answers on sheets), oral exam, project (passing a course project), practical (open questions on a computer, solving problems on a computer), complex (test / written / oral + others). In accordance with table 1, the following ratio of exam forms is recommended:

Table 1

No.	Exam form	Recommended share, %
1	Computer testing	20%
2	Writing	10%
3	Oral	5%
4	Project	30%
5	Practical	30%
6	Complex	5%

The final certification ends with the defense of the graduation project.

#### 4. Passport of the educational program

##### 4.1 General information

No	Field name	Note
1	Code and classification of the field of education	6B06 - Information and communication technologies
2	Code and classification of areas of study	6B063 - Information security
3	Group of educational programs	B058 - Information security
4	Name of the educational program	6B06304 "Computer security" (Computer security)
5	Brief description of the educational program	The educational program "Computer Security" is to provide practice-oriented training of graduates in the field of creation, use and protection of information technologies designed for work in various industries and in business.
6	Purpose of the OP	The goal of the Educational Program "Computer Security" is to prepare graduates for professional activities in the field of protection of applications and programs from modifications.
7	ISCED level	6
8	NQF level	6
9	ORC level	6
10	<p><b>List of competencies of the educational program:</b></p> <p>CC1. The ability to understand the driving forces and patterns of the historical process, the place of a person in the historical process, understanding philosophy as a methodology of human activity, readiness for self-knowledge, self-activity, development of cultural wealth as a factor in the harmonization of personal and interpersonal relationships, find organizational and managerial solutions in non-standard conditions and in the conditions of different opinions and readiness to bear responsibility for them, to systematize knowledge about the world and Kazakhstani legislation in the field of information security.</p> <p>CC2. The ability to form and develop skills and competencies in the field of organization, planning and production management, apply the knowledge gained to comprehend the surrounding environmental reality, generalize, analyze, predict when setting goals in the professional field and choose ways to achieve them using scientific research methodology.</p> <p>CC3. The ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology, and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.</p>	

	<p>CC4. The ability for written and oral communication in the state language and the language of interethnic communication, to use foreign sources of information, to have communication skills, to public speaking, argumentation, discussion, and polemics in a foreign language.</p> <p>CC5. The ability to be competent in choosing mathematical modeling methods for solving specific engineering problems, the ability to be ready to identify the natural scientific essence of problems that arise during professional activity, and the ability to involve the appropriate mathematical apparatus for its solution.</p> <p>PC1. The ability to apply diagnostic and testing tools for equipment, dismantle damaged hardware devices, troubleshoot technological processes and technical systems.</p> <p>PC2. The ability to use programming languages and tools for developing secure software and mobile applications, find coding errors in the developed information and computing system, create, test, debug and execute programs in different programming languages.</p> <p>PC3. Ability to install and configure software and hardware for data collection, analyze the market for modern database management systems and databases, configure and protect databases.</p> <p>PC4. The ability to fix and analyze failures in the operation of server and network equipment, eliminate network vulnerabilities, and administer servers.</p> <p>PC5. The ability to set limits on the degree of resource use, work with remote users of the system, be competent in the organization of operating systems, the architecture of the design principles, operation, and administration of operating systems.</p> <p>PC6. The ability to draw up technical specifications in accordance with the requirements of state, industry and corporate standards, comply with the norms of work execution time, prepare materials for presentation to the customer, use modern information and communication technologies in subject activities, own project management methods and implement them using modern information and communication technologies, use an information approach to assess the quality of information security systems functioning.</p> <p>PC7. The ability to configure systems and software on servers, optimize program code using specialized software tools, develop, maintain, and evaluate secure applications and programs, and protect them from modification.</p> <p>PC8. The ability to master the methodology for developing measures to protect confidential information, apply technical means of ensuring information security, the use of cryptanalysis.</p> <p>PC9. The ability to audit the information security of an enterprise, apply international, national, and corporate standards, identify possible ways of leaking confidential information, comply with the instructions for ensuring information security of the department, apply digital forensics methods to investigate computer incidents of the enterprise. Use blockchain technology to protect information.</p>
11	<p>LO1. Ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology, and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.</p> <p>LO2. The ability for written and oral communication in the state language and the language of interethnic communication, the ability to use foreign sources of information, to have communication skills, to public speaking, argumentation, discussion, and polemics in a foreign language</p> <p>LO3. The ability to form and develop skills and intercultural competencies in the field of organization, planning and management of production, the ability to generalize, analyze, predict when setting goals in the professional field and choose ways to achieve them using scientific research methodology, as well as apply psychological techniques for social advancement</p> <p>LO4. The ability to be competent in choosing methods of mathematical modeling for solving specific engineering problems, the ability to be ready to identify the natural scientific essence of problems that arise during professional activity, and the ability to involve the appropriate mathematical apparatus to solve it</p>

	<p>LO5. The ability to find organizational and managerial solutions in non-standard conditions and in the conditions of various opinions and the willingness to bear responsibility for them, the ability to systematize knowledge about the world and Kazakhstan legislation in the field of information security</p> <p>LO6. The ability to use programming languages and tools for developing secure software, the ability to find coding errors in the information and computing system being developed, the ability to create, test, debug and execute programs in different programming languages, as well as reverse-engineer program code</p> <p>LO7. Master the mathematical apparatus for engineering calculations in the field of design and modeling of software and AO, as well as use data science to develop advanced application software in the field of information security and be able to use artificial intelligence and machine learning methods</p> <p>LO8. The ability to master the methodology for developing measures to protect confidential information, apply technical means of ensuring information security, the use of cryptanalysis. Ability to apply blockchain technology to solve various problems</p> <p>LO9. The ability to master the methodology for developing measures to protect confidential information, apply technical means of ensuring information security, the use of cryptanalysis. Ability to apply blockchain technology to solve various problems</p> <p>LO10. The ability to master the methodology for developing measures to protect confidential information, apply technical means of ensuring information security, the use of cryptanalysis. Ability to apply blockchain technology to solve various problems</p> <p>LO11. The ability to develop user interfaces for web applications and mobile applications, organize tools and methods for their protection from modifications, the ability to develop database models and solutions using cloud computing, the ability to develop components of software systems, protect databases and cloud storage, use modern tools and programming technologies, the ability to organize the interaction of devices, the architecture of components, as well as organize the processing and visualization of data necessary for this</p> <p>LO12. The ability to apply the theory and principles of design, organization, administration, and security of operating systems, debugging wired and wireless networks, the ability to install, debug network devices and system software components, configure hardware and element base for putting information systems into operation</p>	
12	Form of study	full-time
13	Languages of instruction	English
14	Volume of loans	240
15	Awarded Academic Degree	Bachelors in information security under the educational program "6B06301-Computer Security"
16	Developer(s) and authors:	<p>JSC "International University of Information Technologies", Department of Cybersecurity:</p> <ul style="list-style-type: none"> <li>- Amanzholova S.T. associated professor, Ph.D.</li> <li>- Sagymbekova A.O. senior lecturer</li> <li>- Makilenov Sh.N. senior lecturer</li> </ul>

#### 4.2 Matrix for correlating the learning outcomes of the educational program with the competencies being formed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12
PC1						V						
PC2						V		V		V		
PC3	V		V	V								V
PC4		V	V		V						V	

PC5			V	V							V	
PC6		V			V					V		
PC7	V							V		V		V
PC8	V		V	V	V						V	
PC9							V	V	V	V		

**4.3. Information about modules / disciplines (if there are modules, it is necessary to highlight them)**

No.	Name of the discipline	Brief description of the discipline (30–50 words)	Number of credits	Formed competencies (codes)	Prerequisites	Postrequisites
<b>Cycle of general education disciplines Required Component</b>						
1	History of Kazakhstan	The course "History of Kazakhstan" is the most important general educational discipline of the university component, studied by 1st year students of all educational programs. The history of Kazakhstan is an integral and integral part of world history, all events and cultural monuments are an important component of world history and culture. In the course of studying this course, students will acquire knowledge, skills and abilities in all major periods and sub-periods of the history of Kazakhstan, which include the period of antiquity and the first state formations on the territory of Kazakhstan, the Middle Ages with the study of the era of the Turkic states, the Mongol invasion and a key point in our history - the emergence and flourishing of the Kazakh Khanate, the period of confrontation with the Dzhungars and the colonial period, the Soviet period and, finally, the modern era of the development of Kazakhstan, as an independent sovereign state. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural, and ideological ties between East and West, South and North, between Europe and Asia, between the largest	5	CC1	No	Philosophy



		<p>state formations of the Eurasian continent. At various stages of history, states with an original cultural history arose and developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural, and ideological ties between East and West, South and North, between Europe and Asia, between the largest state formations of the Eurasian continent. At various stages of history, states with an original cultural history arose and developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural, and ideological ties between East and West, South and North, between Europe and Asia, between the largest state formations of the Eurasian continent. At various stages of history, states with an original cultural history arose and developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan.</p>				
2	Philosophy	<p>The object of study of the discipline is philosophy as a special form of spiritual studies in its cultural and historical development and modern sound. The main directions and problems of world and domestic philosophy are studied. Philosophy is a special form of knowledge of the world, creating a system of knowledge of the general principles and foundations of human life, about the essential characteristics of a person's relationship to nature, society, and spiritual life, in all its main direction.</p>	5	CC1	History of Kazakhstan	Culturology
3	Foreign language (German) 1	<p>The course is designed to study the basic vocabulary of a common language, representing a neutral scientific style and professional vocabulary; the basic lexical and grammatical norms of a foreign language, the lexical minimum in the amount necessary to work with professional literature and interact in German;</p>	10	CC4	Professionally oriented foreign language	Foreign language

4	Foreign language	The course includes an intensive English language program focused on grammar and speaking skills. The course includes topics reflecting the latest developments in information technology, and a terminological dictionary makes them directly relevant to the needs of students.	10	CC4	No	Professional foreign language
5	Kazakh (Russian) language	The course occupies a special place in the system of training bachelors with an engineering education. For students at a technical university, the study of professional Kazakh / Russian languages is not only the improvement of the skills and abilities acquired at school, but also a means of mastering the future specialty.	10	CC4	No	Professional Kazakh (Russian) language
6	Information and Communication Technologies	In the course, information and communication technologies are considered as modern methods and means of communication between people in ordinary and professional activities using information technologies for searching, collecting, storing, processing, and disseminating information.	5	PC6	No	Fundamentals of computer networks, Fundamentals of Linux operating systems
7	Political science	The course provides a comprehensive coverage of all key elements, the study of sources and political relations, types of political systems, democratic and authoritarian systems, political mechanisms, political competition and power, political capital and values, survival of political ideas, nationalism, analysis of domestic and foreign policy, political growth, public policy in the world political system.	2	CC1	No	Culturology
8	Sociology	The course "Sociology" is 2 credits. It involves lectures, practical work, independent work of the student. During the course, various phenomena of social life are studied. At the same time, the study is conducted from various paradigms of social knowledge, using theories and scientific methods. Students who successfully complete the course will be able to: 1. Use qualitative and quantitative research methods that will be useful in the scientific and professional field. 2. Distinguish between scientific and non-scientific knowledge. 3. Understand and analyze social phenomena and problems from different points of view. 4. Ability to work in a team.	2	CC1	No	Psychology
9	Psychology	This course presents the issues of psychology in a broad educational and social context. The knowledge, abilities and skills acquired and formed because of mastering the course content give students the opportunity to apply them in practice in various areas of life:	2	CC1	Sociology	Culturology

		personal, family, professional, business, public, in collaborating with people - representatives of different social groups and age categories.				
10	Culturology	Knowledge in the field of cultural studies can serve as a basis for studying the entire complex of social and human sciences. At the same time, the discipline of cultural studies can serve as an addition to general courses in history and philosophy. The course material can serve as a methodological guide for a number of special disciplines: for example, ethics, cultural history, art styles, national management schools, negotiation strategy and tactics, cultural management. Teaching methods and technologies used in the process of program implementation: role-playing games and educational discussions of various formats; case study (analysis of specific situations); project method.	2	CC1	Sociology	Psychology
11	Physical Culture	The course is devoted to the formation of personal physical culture and the ability to use various means of physical culture for the preservation and promotion of health.	8	CC1	No	
<b>Cycle of general education disciplines</b>						
<b>University Component/Elective Component</b>						
12	Economics and organization production	New trends in economics and organization of production are discussed with examples from real life and practice. The structure of the national economy, the enterprise and the organization of its production are considered.	5	CC2	Mathematical analysis	Diploma design
<b>Cycle of basic disciplines</b>						
<b>Selectable Component</b>						
13	Algebra and geometry	The successful application of algebra and geometry to solve specific problems is primarily due to the rapid growth of computer technology. The course includes analytical geometry and linear algebra. Linear algebra is a branch of mathematics that studies matrices, vectors, vector spaces, linear transformations, and systems of linear equations. Analytic geometry is a section where the basic concepts are simple geometric shapes (points, lines, planes, curves, and surfaces of the second order). The main means of research in analytic geometry are the method of coordinates and the methods of elementary algebra.	4	CC5	No	Mathematical analysis
14	Mathematical analysis	The aim of the course is to introduce students to important branches of calculus and its applications in computer science. During the educational process, students should familiarize themselves with and be able to apply mathematical methods and tools to solve various applied problems. Moreover, they will learn fundamental methods for studying infinitesimal variables using analysis based on the theory of differential and integral calculations.	6	CC5	Algebra and geometry	Information theory

15	Physics	Study the basic laws of classical mechanics, special relativity, electromagnetic phenomena, quantum mechanics, thermodynamics in search of ways to solve physical problems	4	CC5	Mathematical analysis	Theory of electrical circuits
16	Algorithmization and programming	An introductory programming course that studies the linear, conditional, repetitive structures of algorithms, one-dimensional and two-dimensional arrays, and strings in the C++ programming language. Programming using procedures, functions and standard modules is considered.	6	PC2	Information and Communication Technologies	Object Oriented Programming (Java)
17	Legal basis for information security	A course to study politics and information security on a global scale. Study of Kazakhstani and international laws and regulations in the field of information security.	4	CC1	No	Technologies for protecting computer information
18	Mathematical foundations of information security	The course is aimed at studying the sections of discrete mathematics, as well as the theory of probability and mathematical statistics required to study the processes of information security	6	CC5	Mathematical analysis	Information theory
19	Object Oriented Programming (Java)	A course to learn how to write applications using Java technologies	6	PC2	Algorithmization and programming	Web technologies
20	Fundamentals of computer networks	The course is aimed at studying the principles of network technologies, gaining access to local and remote network resources.	6	PC4	Information and Communication Technologies	Fundamentals of Switching, Routing, and Wireless Networking
21	Professionally oriented foreign language	Includes a grammar course, lexical material of a professional nature and texts of a professional orientation.	2	CC4	Foreign language	Foreign language 1 (German)
22	Professional Kazakh (Russian) language	Training in the discipline "Professional Kazakh (Russian) Language" is aimed at developing students' in-depth linguistic and communicative competence based on the language of the specialty and professional terminology, which will contribute to the improvement of professional training and provide systematic self-training.	2	CC4	Kazakh (Russian) language	Diploma design
23	Web technologies	This course teaches the basics of developing websites using HTML, Cascading Style Sheets (CSS), JavaScript and jQuery. Learns to use the PHP programming language, master the basics of the MySQL database, and develop secure server-side client web applications.	4	PC2	Object Oriented Programming (Java)	Python programming language

24	Linux operating system basics	The course provides students with basic knowledge of working with Linux and basic Linux command line skills.	4	PC4, PC5	Information and Communication Technologies	Operating system security
25	Fundamentals of Switching, Routing, and Wireless Networking	Teach students how to configure routers and switches for advanced functionality, configure aggregation, redundancy, and routing protocols, troubleshoot devices, and fine-tune routing protocols	6	PC4	Fundamentals of computer networks	Introduction to Information Security Incident Investigations
26	Theory of electrical circuits	The study of physical laws and processes occurring in electric circuits of direct, harmonic, and non-harmonic current, methods for analyzing transient and steady processes occurring in linear circuits with lumped parameters; modes of operation of quadripoles and filters, physical processes occurring in electrical circuits with distributed parameters and in non-linear DC circuits.	4	PC1	Physics	Organization and architecture of computing systems
27	Information theory	Information theory is a subsection of applied mathematics and cybernetics aimed at the quantitative and qualitative measurement of information. The purpose of this course is to form a system of knowledge about the basics of information theory and its practical application in modern information systems. The objectives of the course are the formation of the concept and types of information systems, entropy, and methods for measuring and evaluating it, methods for measuring and evaluating the amount of information, theoretical and practical aspects of effective (optimal) coding, theoretical and practical aspects of noise-resistant coding, data transmission systems, signal modulation and demodulation.	4	PC6	Mathematical foundations of information security	Algebra and geometry
28	Organization and architecture of computing systems	The course introduces the basic principles of hardware concepts of computer hardware elements and methods for evaluating computer performance that are used in computer system design processes from the point of view of an assembler programmer, computer architect and logic designer. The course contains details of the components required to understand the concept of machine computing.	4	PC5	Linux operating system basics	Organization of database management systems
29	Organization of database management systems	The course provides knowledge and skills in database design, from the conceptual stage to physical implementation.	4	PC3	Organization and architecture of computing	data science

					ng systems	
30	Educational practice	The course is designed to study the basics of information security.	2	PC1, PC2	Algorithmization and programming	Internship
		<b>Cycle of major disciplines</b> <b>University Component/Elective Component</b>				
31	Internship	The study of information security technologies.	4	PC8	2 courses: Technologies for protecting computer information 3 course: Industrial practice 2 courses	Diploma design
32	Computer Information Protection Technologies	Basic technologies, methods, and principles of information security.	4	PC8	Legal basis for information security	Introduction to Information Security Incident Investigation
33	Python programming language	The course teaches how to use data structures, functions, modules, classes when programming in Python.	4	PC2, PC7	Web technologies	Operating system security
34	Introduction to Cybersecurity Incident Investigation	The course provides knowledge in confirming or refuting the fact of an incident, localizing and eliminating the consequences of an incident, identifying the perpetrators, their motivation, ensuring the possibility of being held accountable, analyzing incidents and taking measures to prevent similar incidents in the future, minimizing the consequences and reducing the risks resulting from incident implementation and improvement of effective incident response processes.	5	PC9	Technologies for protecting computer information	Legal basis for information security
35	Operating system security	The course is devoted to the study of the principles of construction, types and functions of operating systems and their protection system	4	PC4, PC5	Linux operating system basics	Organization and architecture of computing systems

36	Undergraduate practice	Collecting material for writing a graduation project	5	PC6, PC7, PC8, PC9	Disciplines 3 and 4 courses	Diploma design
37	Reverse engineering	Code reverse engineering is the process of analyzing the machine code of a program, which aims to understand the principle of operation, restore the algorithm, discover undocumented program features, etc. The main methods of reverse engineering are static or dynamic code analysis. In static analysis, the researcher disassembles the program code using special software, and then analyzes the assembler code. With dynamic analysis, the researcher runs the code in an isolated environment (sandbox) or debugger and analyzes the code in dynamics.	4	PC8, PC9	Blockchain technology	Diploma design
38	Blockchain technology	The course is dedicated to learning the basics of blockchain technology. The course examines the practice of applying blockchain technologies in bitcoin and ethereum cryptocurrencies, as well as other industries. The discipline is based on cryptographic knowledge and includes materials on the development of smart contracts, various consensus algorithms, etc.		PC9	Reverse engineering	Diploma design
39	Cloud computing	The discipline is aimed at obtaining practical skills in using modern cloud infrastructures, platforms, and services to create applications and solve typical problems. The course examines the concept and models of cloud computing, the architecture and implementation principles of scalable, universally available cloud-based applications, modern practices for developing cloud-native applications, as well as existing cloud solutions for organizing data storage and processing. The discipline has a practical focus and includes homework for developing, deploying, and testing applications in a real public cloud.	5	PC6	Information Security Center Analytics	Diploma design
40	Advanced Software Engineering	This course is devoted to the study of command programming, the correct distribution of workload and tasks, the modular implementation of projects and methods for integrating separately implemented modules.	5	PC7, PC3	Interdisciplinary software development project	Diploma design
41	Intercultural competence	Intercultural competence is part of a family of concepts including global competence, graduate qualities, employability skills, global citizenship, education for sustainable development, and global employment opportunities. At the heart of all these concepts is the recognition of globalization as a driver of change in all aspects of the modern world, as well as the importance of graduates being able to participate and act globally.	5	PC9	Culturology	Philosophy

42	Interdisciplinary software development project	Software projects are interdisciplinary in nature, relying on many diverse types of skills and knowledge, both IT-related (e.g., project management, analysis and design, user interfaces, coding, testing) and non-IT (e.g., domain knowledge). software applications, such as accounting, healthcare, or the arts).	5	PC8	Advanced Software Development	Diploma design
43	data science	This course is devoted to the study of methods for processing and extracting useful information from arrays of structured or unstructured data. The course includes a set of Cyber Threat Hunting techniques and techniques that are used to conduct hunting and that carry specific principles of working with data.	5	PC3	Organization of database management systems	Organization and architecture of computing systems
44	Applied AI	Introduction to the field of applied AI. The basic principles are taught, and the chosen methods and approaches are theoretically explained and evaluated in practice.	5	PC7	Biometric access control systems	Diploma design
45	Biometric access control systems	The course studies the theoretical foundations for the development and operation of biometric access protection tools, modern tasks, scientific terminology, methods and tools for choosing and substantiating technical solutions when building systems for protecting informatization objects, studying the main provisions of the theory of BSPD and methods for their use in the tasks of identification, authentication, control and access control based on the biometric characteristics of users and their application.	4	PC1, PC7	Applied AI	Diploma design
46	Information Security Center Analytics	The course focuses on learning the collection, analysis, and interpretation of data to identify and mitigate security threats. The goal of this discipline is to equip students with the knowledge and skills to collect and analyze data to identify and eliminate threats before they cause damage, thus providing organizations with an initiative-taking approach to security.	4	PC3, PC4	data science	Diploma design
47	Subject elective module 1	The elective is chosen from the following subjects <ul style="list-style-type: none"> <li>- Data Analysis and Data Mining (FWPM)</li> <li>- Deep Learning for Natural Language Understanding (FWPM)</li> <li>- Digital technology (FWPM)</li> <li>- Embedded Systems (FWPM)</li> <li>- Industry 4.0 in planning and production (FWPM)</li> <li>- Industrial Data Analysis (FWPM)</li> <li>- Cryptology (FWPM)</li> <li>- Project Management (FWPM)</li> <li>- RESTful Web Services (FWPM)</li> <li>- Corporate Governance (FUUP)</li> </ul>	5	PC2	Object Oriented Programming (Java)	Subject elective module 2
48	Subject elective module 2	The elective is chosen from the following subjects <ul style="list-style-type: none"> <li>- Data Analysis and Data Mining (FWPM)</li> <li>- Deep Learning for Natural Language Understanding (FWPM)</li> </ul>	5	PC2	Subject elective module 1	Subject elective module 3



		<ul style="list-style-type: none"> <li>- Digital technology (FWPM)</li> <li>- Embedded Systems (FWPM)</li> <li>- Industry 4.0 in planning and production (FWPM)</li> <li>- Industrial Data Analysis (FWPM)</li> <li>- Cryptology (FWPM)</li> <li>- Project Management (FWPM)</li> <li>- RESTful Web Services (FWPM)</li> <li>- Corporate Governance (FUUP)</li> </ul>				
49	Subject elective module 3	<p>The elective is selected from the following subjects:</p> <ul style="list-style-type: none"> <li>- .NET Programming in C# (FWPM)</li> <li>- Artificial Intelligence in Robotics (FWPM)</li> <li>- Introduction to Microsoft Dynamics NAV (FWPM)</li> <li>- Evaluation and selection of a standard software package (FWPM)</li> <li>- Geographic Information Systems (GIS)</li> <li>- Principles of Electrical Engineering (FWPM)</li> <li>- Internet of Things (FWPM)</li> <li>- IT security (FWPM)</li> <li>- Software Reverse Engineering (FWPM)</li> <li>- Web Technology and Web Marketing in the Cloud (FWPM)</li> </ul>	5	PC2	Subject elective module 2	Subject elective module 4
50	Subject elective module 4	<p>The elective is selected from the following subjects:</p> <ul style="list-style-type: none"> <li>- .NET Programming in C# (FWPM)</li> <li>- Artificial Intelligence in Robotics (FWPM)</li> <li>- Introduction to Microsoft Dynamics NAV (FWPM)</li> <li>- Evaluation and selection of a standard software package (FWPM)</li> <li>- Geographic Information Systems (GIS)</li> <li>- Principles of Electrical Engineering (FWPM)</li> <li>- Internet of Things (FWPM)</li> <li>- IT security (FWPM)</li> <li>- Software Reverse Engineering (FWPM)</li> <li>- Web Technology and Web Marketing in the Cloud (FWPM)</li> </ul>	5	PC2	Subject elective module 3	Diploma design

#### 4.4. List of modules and learning outcomes

Name of the educational program: \_\_\_\_\_ Computer security \_\_\_\_\_

Qualification: \_\_\_\_\_ Bachelor of Information Security \_\_\_\_\_

Module code / Module name	Learning Outcomes	Criteria for evaluating learning outcomes	Disciplines forming the module Code / Name
<b>GENERAL EDUCATIONAL MODULES</b>			
Humanitarian module	LO 4	where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.	History of Kazakhstan Philosophy Political science Sociology Intercultural competence Psychology Culturology
	LO 2	where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.	Foreign language Kazakh (Russian) language Foreign language 1 (German) Professional Kazakh (Russian) language Professionally oriented foreign language
ICT module	LO 5	where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.	Information and Communication Technologies
	<b>BASIC MODULES</b>		
Natural science module	LO 3	where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.	Algebra and geometry Mathematical analysis Physics Information theory Mathematical foundations of information security

				<p>Algorithmization and programming Object Oriented Programming (Java) Subject elective module 1 Subject elective module 2 Subject elective module 3 Subject elective module 4 Web technologies data science Organization of database management systems Python programming language</p>
	LO 7		<p><math>O \setminus u003d (F / P) * 100\%</math>, where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	
<b>Programming languages module</b>				
		LO 5, LO 11	<p><math>O \setminus u003d (F / P) * 100\%</math>, where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	<p>Theory of electrical circuits</p>
<b>Hardware module</b>				
		LO 8	<p><math>O \setminus u003d (F / P) * 100\%</math>, where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	<p>Fundamentals of computer networks</p>
<b>Computer Network Fundamentals Module</b>				
		LO 5, LO 11	<p><math>O \setminus u003d (F / P) * 100\%</math>, where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	<p>Fundamentals of Switching, Routing, and Wireless Networking</p>
<b>OS security module</b>				
		LO 1	<p><math>O \setminus u003d (F / P) * 100\%</math>, where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	<p>Linux operating system basics Organization and architecture of computing systems Cloud computing Operating system security</p>
<b>Module of scientific activity and project management</b>				
				<p>Interdisciplinary software development project Advanced Software Development Economics and organization of production</p>

Information security technology module	LO 6	<p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	O \u003d (F / P) * 100%,	Technologies for protecting computer information
			Legal basis for information security	
			Blockchain technology	
			Corporate cybersecurity	
<b>PROFESSIONAL MODULES</b>				
Data and application protection module	LO 9	<p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills proposed for assimilation</p>	O \u003d (F / P) * 100%,	Introduction to Information Security Incident Investigation
Security threat research module	LO 10, LO 11	<p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills proposed for assimilation</p>	O \u003d (F / P) * 100%,	Applied AI Biometric access control systems Information Security Center Analytics Reverse engineering Writing and defense of the graduation project
Final assessment module	LO 1 - LO 11			







2 1		<u>D</u> <u>B</u>	<u>V</u> <u>C</u>	<u>SFT6207</u>	<u>Object Oriented Programming (Java)</u>	5	3	3		<u>5/1</u> <u>35</u>	<u>1</u> <u>5</u>	<u>15</u> <u>.0</u>	<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>75</u>				<u>5.</u> <u>0</u>					
2 2		<u>D</u> <u>B</u>	<u>V</u> <u>C</u>	<u>EGR6201</u>	<u>Linux operating system basics</u>	4	3	3		<u>4/1</u> <u>05</u>	<u>1</u> <u>5</u>	<u>15</u> <u>.0</u>	<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>45</u>					<u>4.</u> <u>0</u>					
2 3		<u>D</u> <u>B</u>	<u>V</u> <u>C</u>	<u>NET6201</u>	<u>Fundamentals of computer networks</u>	6	3	3		<u>6/1</u> <u>50</u>	<u>1</u> <u>5</u>	<u>30</u> <u>.0</u>	<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>75</u>					<u>6.</u> <u>0</u>					
2 4		<u>D</u> <u>B</u>	<u>V</u> <u>C</u>	<u>LAN6004</u> <u>PA</u>	<u>Professionally oriented foreign language</u>	2	4	4		<u>2/6</u> <u>0</u>	<u>1</u> <u>5</u>		<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>15</u>					<u>2.</u> <u>0</u>					
2 5		<u>D</u> <u>B</u>	<u>V</u> <u>C</u>	<u>LAN6006</u> <u>KR</u>	<u>Professional (Russian) language</u>	2	4	4		<u>2/6</u> <u>0</u>	<u>1</u> <u>5</u>		<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>15</u>					<u>2.</u> <u>0</u>					
2 6		<u>D</u> <u>B</u>	<u>V</u> <u>C</u>	<u>NET6202</u>	<u>Fundamentals of Switching, Routing, and Wireless Networking</u>	6	4	4		<u>6/1</u> <u>50</u>	<u>1</u> <u>5</u>	<u>30</u> <u>.0</u>	<u>1</u> <u>5</u>	<u>1</u> <u>5</u>	<u>75</u>					<u>6.</u> <u>0</u>					



27		<u>D</u>	<u>V</u>	<u>EEC6001</u>	Theory of electrical circuits	4	4	4		<u>4/9</u>	<u>15</u>	<u>30</u>				<u>40</u>		
28		<u>D</u>	<u>V</u>	<u>SFT6208</u>	Web technologies	4	4	4		<u>4/105</u>	<u>15</u>	<u>45</u>				<u>40</u>		
29		<u>D</u>	<u>V</u>	<u>EGR6202</u>	Information theory	4	5	5		<u>4/9</u>	<u>30</u>	<u>30</u>				<u>40</u>		
30		<u>D</u>	<u>V</u>	<u>HRD6201</u>	Organization and architecture of computing systems	6	5	5		<u>6/150</u>	<u>30</u>	<u>75</u>				<u>60</u>		
31		<u>D</u>	<u>V</u>	<u>SFT6211</u>	Organization of database management systems	4	5	5		<u>4/105</u>	<u>15</u>	<u>45</u>				<u>40</u>		
32		<u>D</u>	<u>V</u>	<u>SEC6223 (HOF)</u>	Foreign language I (German, part 1)	5	6	6		<u>5/135</u>	<u>15</u>	<u>75</u>				<u>50</u>		
33		<u>D</u>	<u>V</u>	<u>SEC6225 (HOF)</u>	Cloud computing	5	6	6		<u>5/135</u>	<u>15</u>	<u>75</u>				<u>50</u>		
34		<u>D</u>	<u>V</u>	<u>SFT6209 (HOF)</u>	Advanced Software	5	7	7		<u>5/135</u>	<u>15</u>	<u>75</u>				<u>50</u>		



4 1	PD	V C	SEC6221	Introduction to Cybersecurity Incident Investigation	4	5	5	4/9 0	1 5	30 0	1 5	1 5	4. 0					
4 2	PD	V C	SEC6202	Operating system security	4	5	5	4/9 0	1 5	30 0	1 5	1 5	4. 0					
4 3	PD	V C	SFT6210	Python programming language	4	5	5	4/1 05	1 5	15 0	1 5	1 5	4. 0					
4 4	PD	V C	PP6209(HOF)	Intermediate software development project	5	6	6	5/0	0	0	0	0	5. 0					
4 5	PD	V C	SEC6224(HOF)	data science	5	6	6	5/1 35	1 5	15 0	1 5	1 5	5. 0					
4 6	PD	V C	SEC6229(HOF)	Applied AI	5	7	7	5/1 35	1 5	15 0	1 5	1 5	5. 0					
4 7	PD	V C	PP6204	Undergraduate practice	5	8	8	5/1 50	1 5 0	0	0	0						5. 0
4 8	PD	V C	SEC6238	Blockchain	4	8	8	4/9 0	1 5	30 0	1 5	1 5						4. 0

<u>4</u> <u>9</u>	<u>PD</u>	<u>H</u> <u>F</u>	<u>SEC6227</u> ( <u>HOF</u> )	<u>5</u> <u>6</u> <u>6</u>	<u>5</u> <u>1</u> <u>6</u>	<u>5</u> <u>1</u> <u>35</u>	<u>1</u> <u>15</u> <u>5</u> <u>.0</u>	<u>1</u> <u>1</u> <u>5</u>	<u>1</u> <u>1</u> <u>5</u>	<u>75</u>	<u>1</u> <u>5</u>	<u>5.</u> <u>0</u>								
<u>5</u> <u>0</u>	<u>PD</u>	<u>H</u> <u>F</u>	<u>SEC6231</u> ( <u>HOF</u> )	<u>5</u> <u>7</u> <u>7</u>	<u>5</u> <u>1</u> <u>5</u>	<u>5</u> <u>1</u> <u>35</u>	<u>1</u> <u>15</u> <u>5</u> <u>.0</u>	<u>1</u> <u>1</u> <u>5</u>	<u>1</u> <u>1</u> <u>5</u>	<u>75</u>	<u>1</u> <u>5</u>	<u>5.</u> <u>0</u>								
<u>5</u> <u>1</u>	<u>PD</u>	<u>H</u> <u>F</u>	<u>SEC6232</u> ( <u>HOF</u> )	<u>5</u> <u>7</u> <u>7</u>	<u>5</u> <u>1</u> <u>5</u>	<u>5</u> <u>1</u> <u>35</u>	<u>1</u> <u>15</u> <u>5</u> <u>.0</u>	<u>1</u> <u>1</u> <u>5</u>	<u>1</u> <u>1</u> <u>5</u>	<u>75</u>	<u>1</u> <u>5</u>	<u>5.</u> <u>0</u>								
<u>5</u> <u>2</u>	<u>PD</u>	<u>H</u> <u>F</u>	<u>SEC6222</u>	<u>4</u> <u>8</u> <u>8</u>	<u>4</u> <u>1</u> <u>9</u>	<u>4</u> <u>9</u> <u>0</u>	<u>30</u> <u>30</u> <u>.0</u>	<u>1</u> <u>1</u> <u>5</u>	<u>1</u> <u>1</u> <u>5</u>	<u>30</u>	<u>1</u> <u>5</u>	<u>4.</u> <u>0</u>								
<u>5</u> <u>3</u>	<u>PD</u>	<u>H</u> <u>F</u>	<u>SEC6235</u>	<u>4</u> <u>8</u> <u>8</u>	<u>4</u> <u>9</u> <u>0</u>	<u>4</u> <u>9</u> <u>0</u>	<u>30</u> <u>30</u> <u>.0</u>	<u>1</u> <u>1</u> <u>5</u>	<u>1</u> <u>1</u> <u>5</u>	<u>30</u>	<u>1</u> <u>5</u>									
<u>5</u> <u>4</u>	<u>PD</u>	<u>H</u> <u>F</u>	<u>SEC6237</u>	<u>5</u> <u>1</u> <u>3</u>	<u>5</u> <u>1</u> <u>0</u>	<u>4</u> <u>9</u> <u>0</u>	<u>30</u> <u>30</u> <u>.0</u>	<u>1</u> <u>1</u> <u>5</u>	<u>1</u> <u>1</u> <u>5</u>	<u>30</u>	<u>1</u> <u>5</u>									
				<b>Average weekly load in hours</b>										<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>1</u>	<b>General education disciplines (OOD)</b>			<u>5</u> <u>1</u>	<u>1</u> <u>3</u>	<u>0</u> <u>0</u>	<u>15</u> <u>00</u>	<u>1</u> <u>0</u> <u>5</u>	<u>3</u> <u>9</u> <u>0</u>	<u>0</u> <u>0</u>	<u>1</u> <u>9</u> <u>5</u>	<u>78</u> <u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>	<u>3</u>	<u>8</u>	<u>0</u>	<u>5</u>	<u>0</u>
<b>Required Component (OOD/OK)</b>				<u>5</u> <u>1</u>	<u>1</u> <u>3</u>	<u>0</u> <u>0</u>	<u>15</u> <u>00</u>	<u>1</u> <u>0</u> <u>5</u>	<u>3</u> <u>9</u> <u>0</u>	<u>0</u> <u>0</u>	<u>1</u> <u>9</u> <u>5</u>	<u>78</u> <u>0</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>8</u>	<u>0</u>	<u>5</u>	<u>0</u>





## 6. Additional educational programs (Minor)

The name of the additional educational program (Minor) indicating the list of disciplines that form the Minor	Total amount of credits/number of credits by discipline	Semesters of study	Documents on the results of the development of additional educational programs (Minor)
Data protection	15	5,6,7	Certificate
IoT security technologies	15	5,6,7	Certificate
Operating system security management	15	5,6,7	Certificate
System Administrator	15	5,6,7	Certificate
Robotics	15	5,6,7	Certificate
web programmer	15	5,6,7	Certificate
Modeling and visualization	15	5,6,7	Certificate
BI analytics tools	15	5,6,7	Certificate
Machine learning specialist	15	5,6,7	Certificate
Big data processing and analysis	15	5,6,7	Certificate
Digital Marketing & E-commerce	15	5,6,7	Certificate
Business & Entrepreneurship	15	5,6,7	Certificate
economics	15	5,6,7	Certificate
Management & Leadership	15	5,6,7	Certificate
financial engineering	15	5,6,7	Certificate
Accounting by ACCA	15	5,6,7	Certificate
financial analytics	15	5,6,7	Certificate
Network technologies of telecommunications	15	5,6,7	Certificate
Mobile telecommunication technologies	15	5,6,7	Certificate

## 7. Approval sheet with developers

Name of the educational program: 6B06304 "Computer Security" (Computer Security)

No. p / p	Position, scientific or academic degree and Surname I.O. educational program developer	date	painting	Note
1	Amanzholova Saule Toksanovna PhD Associate Professor	05/21/2023		
2	Sagymbekova Azhar Oryngaliyevna Master of Engineering Senior Lecturer	05/21/2023		
3	Makilenov Shakirt Nurlybekovich Master of Engineering Senior Lecturer	05/21/2023		