AGREED
Chairman of the Educational and Methodological Council of JSC «International University of Information Technologies»
_____ A.K. Mustafina
«19» 03 2024

APPROVE
Chairman of the Board – Rector of JSC «International University of Information Technologies»
_____ A.K. Khikmetov
«__» _____ 2024

EDUCATIONAL PROGRAM
6B06301 «Computer security»

Education Area Code and Classification: 6B06 – Information and Communication Technologies
Code and classification: 6B063 – Information security
Group of educational programs: B058 — Information security
Level according to the International Standard Classification of Education (ISCE): 6
Level according to National Qualifications Framework (NQF): 6
Level according to Industry Qualifications Framework (IQ): 6
Duration of study: 4 years
Credits: 240

AGREED
Director of the Chairman of the ALE «Kazakhstan Information Security Association»
_____ V.V. Pokusov
_____ 2024

AGREED
General director of the «National Innovation Center»
_____
«__» _____ 2024

Almaty, 2024

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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, highly motivated 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 assumes a shift in emphasis in the educational process from teaching (as the main role of the teaching staff in the "translation" of knowledge) to teaching (as an active educational activity of the student).

The educational program "Computer Security" is to provide practice-oriented training for graduates in the field of creation, use and protection of information technologies designed to work in various industries and in business. This educational program is based on the recommendations of the Professional Standards of the Republic of Kazakhstan "Information Infrastructure and IT Security Professionals" (Appendix No. 11k to the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022), follows new trends from the Atlas of New Professions, Regional standards, National Qualifications Framework and The industry qualifications framework according to level 6.

A computer security specialist is an employee engaged in ensuring computer security at an 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 occurring during information protection.

The educational program "Computer Security" was developed on the basis of an analysis of the 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 OP "Computer Security" meets the needs of stakeholders (students, employers, the state) and external qualification requirements.

2. Purpose and objectives of the educational program

The purpose of the EP is providing practice–oriented training for graduates in the field of creation, use and protection of information technologies designed to work in various industries and businesses.

Tasks of the EP:

1. To prepare graduates for professional activity in the field of protection of 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 (dedication, organization, hard work, sociability, ability to work in a team, responsibility for the final 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, including in ACM format), complex (test/written/oral + others).

In accordance with table 1, the following ratio of exam forms is recommended:

		– Channels for committing cybercrimes – Modern IT **The subject of professional activity:** Enterprises in various industries, both government and business **Types of professional activity of an EP graduate:** – Blockchain technologist – Cyber Investigator – Cyberprotector **The functions of the professional activity of a graduate of the EP:** – Countering cybercrime in a personalized form to individual users – Ensuring the client's security in all types and forms of interactions in the digital world (PCs, networks, neural networks, etc.), including privacy requests – Identification of cyber-attacks, tracking and searching for their sources, initiators and perpetrators – Organization of constant monitoring of networks and computer systems for external interference – Development and implementation of blockchain networks – Building architectures and organizing the interaction of multiple blocks – Improvement and expansion of PAC in blockchain networks
8	QMSE level	6th level
9	NFQ level	6th level
10	IQF level	6th level
11	List of competencies of the educational program: EC1. The ability to understand the driving forces and patterns of the historical process, the place of man in the historical process and the ability to understand philosophy as a methodology of human activity, readiness for self-knowledge, self-activity, the development of cultural wealth as a factor in the harmonization of personal and interpersonal relations EC2. The ability to form and develop skills and competencies in the field of organization, planning and management of production, the ability to apply the knowledge gained to understand the environmental reality, the ability to generalize, analyze, predict when setting goals in the professional field and choose ways to achieve them using scientific research methodology EC3. 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 EC4. The ability to write and communicate orally in the state language and the language of interethnic communication, the ability to use foreign sources of information, possess communication skills, public speaking, argumentation, discussion and polemics in a foreign language	

	LO5. Be able to use the principles of construction, types and functions of operating systems and apply existing methods of protection and security of operating systems. Be able to analyze operating systems and various applications for potential vulnerabilities and threats. Be able to implement various mechanisms to protect applications and scripts from modifications using programming and design methods LO6. Apply information security technologies, including various encryption, decryption and cryptanalysis operations, which are based on mathematical research and information theory in the field of information security, as well as apply existing legislation in the field of information security LO7. Be able to program various applications using algorithmization methods, object-oriented programming, web technologies, is able to optimize program code using specialized corporate applications on the Django framework, develop, maintain and test secure applications and programs including mobile technologies and their security LO8. Be able to set up computer networks, knows the routing and switching features of wired and wireless computer networks. Know the architecture features of computing systems and networks. Use DevNet tools related to network programming and scripting for network applications LO9. Apply the principles of organization, management and protection of databases. Apply data protection skills in corporate infrastructure and corporate cybersecurity. Be able to use methods for managing identification and access to applications LO10. Apply digital forensics techniques and have practical pentesting skills. Apply reverse engineering techniques to investigate malicious code. Demonstrate knowledge in modern information recovery technologies in case of failures and attacks LO11. Use cloud technology and intelligent cybersecurity techniques with machine learning. Use blockchain technologies to create secure applications. Also apply methods of countering cyber intelligence and is able to minimize the cyber risks of various applications LO12. Be able to apply the acquired knowledge according to the selected additional educational program	
13	The form of education	Full-time
14	The language of education	English
15	Credits	240
16	Academic degree awarded	Bachelor's degree in Information and communication technologies in the educational program 6B06301 «Computer security»
17	Professional standard for the educational program	1. Specialists-professionals in the security of information infrastructure and from 2. Ensuring the security of the information infrastructure and FROM 3. Information security
18	Developer(s) and authors:	JSC International University of Information Technologies, Department of Cybersecurity: – Amanzholova S.T., associate professor, c.t.s. – Sagymbekova A.O., senior lecturer – Makilenov Sh.N., senior lecturer – Askarbekova N.Y., senior lecturer

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

		periods of history and transfer the rich historical and cultural heritage through the centuries to the current generation				
2	Foreign language	The course includes an intensive English language learning program focused on grammar and speaking skills. The course includes topics reflecting the latest developments in the field of information technology, and the terminology dictionary makes them directly relevant to the needs of students	10	OK4	none	Professionally oriented foreign language
3	Kazakh (Russian) language	The course occupies a special place in the Bachelor's degree program with engineering education. For students of a technical university, learning professional Kazakh/Russian languages is not only the improvement of skills and abilities acquired at school, but also a means of mastering a future specialty	10	EC4	none	Diploma project
4	Sociology-Political science	The course "Sociology" examines various phenomena of social life. At the same time, the research is carried out from various paradigms of public knowledge, using theories and scientific methods. Students who have successfully completed the course will be able to: 1. Use qualitative and quantitative research methods that will be useful in the scientific and professional field.	4	OK1	none	Cultural studies-Psychology

		in the field of cultural studies, students will acquire the basics for studying the entire complex of social sciences and humanities, and master intercultural communications. 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 schools of management, negotiation strategy and tactics, cultural management. Teaching methods and technologies used in the implementation of the program: role-playing games and educational discussions of various formats; case study (analysis of specific situations); project method. The Psychology course presents psychology issues in a broad educational and social context. The knowledge, skills and abilities acquired and formed as a result of mastering the course content give students the opportunity to apply them in practice in various spheres of life: personal, family, professional, business, social, in working with people from different social groups and age categories				

		policy are revealed, international experience in combating corruption is presented the fight against corruption, the peculiarities of conflict-of-interest regulation are determined, professional ethics, methods of detecting corruption violations. As a result of successful completion of the course, students will have the following competencies: 1. Understand the measures of legal responsibility for participation in corruption violations. 2. Identify conflicts of interest in the activities of organizations leading to corruption. 3. To analyze the work of organizations using various research methods				
12	Fundamentals safety of life activity and ecology	Studies the ways of safe human interaction with the environment (industrial, household, urban, natural), the sustainable functioning of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of consequences of natural and man-made emergencies and the use of modern means of destruction. The course also reveals the role of ecology in solving modern economic, social and political		EC 3	Information and Communication Technologies	Diploma project

		mathematical methods and tools to solve various applied problems. Moreover, they study fundamental methods of studying infinitesimal variables using analysis, which is based on the theory of differential and integral calculations				
15	Algebra and Geometry	The successful application of algebra and geometry to solve specific problems is primarily due to the rapid growth of computing 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. Analytical 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 analytical geometry are the coordinate method and the methods of elementary algebra.	4	PC3 EC5	none	Mathematical analysis
16	Educational practice	The course is designed to study the basics of information security	2	PC4	Algorithmization and Programming	Industrial practice
17	Algorithmization and Programming	An introductory programming course that studies linear, conditional, repetitive structures of algorithms; one-dimensional and two-dimensional arrays and strings in the C++ programming language. Programming using	6	PC2	Information and Communication Technologies	Object-oriented programming (Java)

		basic methods of analysis of electrical circuits, resistive circuits, 1st and 2nd order circuits; circuits with DC and AC sources				
24	Basics of the Linux operating system	The course provides students with basic Linux knowledge and basic Linux command line skills	4	PC4	Information and Communication Technologies	Security of operating systems
25	Professionally oriented foreign language	It includes a grammar course, lexical material of a professional nature and texts of a professional orientation	4	EC4	Foreign language	Diploma project
26	Switching, Routing, and Wireless Essentials	Teach students how to configure routers and switches for advanced functionality, configure aggregation, redundancy and routing protocols, troubleshoot device problems and fine-tune routing protocols	6	PC5	Computer Networking Basics	Security of operating systems
27	Web technologies	This course teaches the basics of website development using HTML, Cascading Style Sheets (CSS), JavaScript and jQuery. Teaches you how to use the PHP programming language, master the basics of the MySQL database and develop secure server-side client web applications	4	PC7	Object-oriented programming (Java)	Design Pattern
28	Information Theory	The course aims to study noise-tolerant codes, taking into account the information redundancy limit. Evaluate sampling and quantization errors	4	PC3, PC5	Algebra and Geometry	Basic Circuit Theory
29	Organization and architecture of computing systems	The course presents the basic principles of hardware concepts of computer hardware elements and methods for	4	PC5	Basics of the Linux operating system	Security of operating systems

		which can be useful in case of loss, damage or destruction. During the course, students learn how to use special tools for information recovery, including data recovery programs and utilities for detecting and correcting errors in storage systems				
34	Introduction to Intelligent Cybersecurity	The course contains lecture and laboratory material on knowledge management for cybersecurity purposes and on the use of software agents and other tools and systems for deep modeling of the environment and the agent itself, followed by machine learning, in particular deep learning and reinforcement learning and practical application of predicate and non-classical logic to build reasoning machines		PC9	Corporate Cyber Security	Mobile security technologies
The cycle of core disciplines The university component/Component of choice						
35	Industrial practice	The course is dedicated to the study of information security technologies	8	EC2	Educational practice	Pre-graduate practice
36	Computer information protection technologies	Basic methods and principles of information protection	4	PC8	Computer Networking Basics, Basics of the Linux operating system	IoT Security
37	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 bringing to justice, analyzing incidents and taking measures to prevent similar	4	PC9	Computer Information Protection Technologies	Corporate Cyber Security

		cryptography, and cryptanalysis. mathematical foundations of algorithms for asymmetric and symmetric cryptosystems, electronic digital signature. Be able to apply cryptography in the development of information security systems in practice				
42	Practical pentesting	The course is designed to study pentesting techniques and pentesting tools. Conducting attacks on the basis of various protocols, operating systems	6	PC9	Computer Information Protection Technologies	Diploma project
43	Protection of database management systems	The course provides an overview of various concepts and methods for ensuring the security of a database management system. The topics cover advanced SQL, transaction management language, data management language, functions and triggers, database management and monitoring, database backup and recovery, SQL injection, etc. During the course, students will solve various tasks using PostgreSQL DBMS	5	PC9	Organization of database management systems	Diploma project
44	Digital Forensics	This course teaches you how to apply special techniques, methods and tools of digital forensics. The course is designed to study the methods of disclosure and investigation of computer crimes, the rules for collecting, securing and presenting evidence on them. The course examines popular tools for conducting forensic analysis and	4	PC9	Corporate Cyber Security	Practical pentesting

		and attribute management				
50	Minor 3	An additional educational program (Minor) is a set of disciplines and (or) modules and other types of educational work determined by the student for study in order to form additional competencies	5	PC2, PC9	Computer Information Protection Technologies	Research metodology
51	Introduction to Cloud	The course is aimed at studying the technology of creating a cloud service, working with existing cloud services, and using cloud computing technology to solve cybersecurity problems	4	PC6	Security of operating systems	Diploma project
52	Mobile security technologies	The discipline provides knowledge on the use of tools for programming and designing mobile applications, on the development of user interfaces for mobile applications, on the use of software functions that support telephony, sending/receiving SMS, connection management via Wi-Fi, Bluetooth, programming background services, notification and alarm mechanisms, application interaction with geolocation and mapping services		PC2	Design Pattern	Diploma project
53	DevNet	The course is aimed at understanding the meaning, configuration and use of software concepts, as well as tools related to network programming (scripting in Python, Git, JSON, Postman, API). Description of the proprietary software-defined Network (SDN)	5	PC7, PC9	Computer Networking Basics	Diploma project

		cyber threats, including access control mechanisms, firewalls, attack detection and prevention systems, antivirus programs and others. The course includes the study of the concept of cyber risks and their management methods, students analyze cyber risks, use tools to assess them and create risk management plans				
56	Blockchain technology	The course is dedicated to learning the basics of blockchain technologies. The course examines the practice of using blockchain technologies in cryptocurrencies bitcoin and Ethereum, 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	Cryptographic methods of information security	Diploma project
57	Reverse Engineering	Reverse engineering of code is the process of analyzing the machine code of a program, which aims to understand the principle of operation, restore the algorithm, discover undocumented features of the program, 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 assembly code. In dynamic analysis, the		PC8, PC9	Digital Forensics	Diploma project

4.4. List of modules and learning outcomes

Name of the educational program: 6B06301 «Computer Security»
Qualification: Bachelor of Information Security

Module Code / Module Name	Learning outcomes	Criteria for evaluating learning outcomes	Disciplines forming the module Code / Name
GENERAL EDUCATION MODULES			
Humanitarian module	LO 1, LO 4	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	History of Kazakhstan Philosophy Sociology-Political science Cultural studies-Psychology
Language module	LO 2	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	Foreign language Kazakh (Russian) language Professionally oriented foreign language
The ICT module	LO 5	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	Information and Communication Technologies
BASIC MODULES			
Natural Science module	LO 3	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	Algebra and Geometry Mathematical analysis Physics Information Theory Mathematical foundations of information security
Programming Languages Module	LO 7	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	Algorithmization and Programming Object-oriented programming (Java) Design Pattern Web technologies Organization of database management systems Development of corporate applications on the Django framework
Hardware Module	LO 10, LO 11	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills;	Basic Circuit Theory

PROFESSIONAL MODULES			
Data and Application Protection module	LO 6, LO 9, LO 12	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	Mobile security technologies
			Corporate Cyber Security
			Protection of applications and scripts from modifications
Security Threat Research Module	LO 9, LO 10	S = (A/F) * 100% , where S is the assessment of academic performance (learning, productivity); A is the actual amount of acquired knowledge, skills; F is the full amount of knowledge, skills proposed for assimilation	Introduction to Cybersecurity Incident Investigation
			Reverse engineering
			Digital Forensics
			Cyber risk and cyber intelligence
The module of Final certification	LO 1 - LO 13		Writing and defending a diploma project

16	GER	ES	ECO6004	Economics and Industrial Engineering				5/150	15		30		15	90									
17	BS	UC	MAT6002	Mathematical analysis	6	1	1	6/180	30		30		15	105	6								
18	BS	UC	MAT6001	Algebra and Geometry	4	2	2	4/120	15		30		15	60		4							
19	BS	UC	SFT6201	Algorithmization and Programming	6	2	2	6/180	15	30	15		15	105		6							
20	BS	UC	EP6201	Educational practice	2	2		2/60				60	0	0		2							
21	BS	UC	PHY6001	Physics	4	3	3	4/120	15	30			15	60			4						
22	BS	UC	SEC6217	Legal Basics of Information Security	4	3	3	4/120	15		30		15	60			4						
23	BS	UC	MAT6018	Mathematical foundations of information security	6	3	3	6/180	30		30		15	105			6						
24	BS	UC	SFT6207	Object-oriented programming (Java)	6	3	3	6/180	15	30	15		15	105			6						
25	BS	UC	NET6201	Computer Networking Basics	6	3	3	6/180	15	30	15		15	105			6						
26	BS	UC	LAN6004PA	Professionally oriented foreign language	4	4	4	4/120			45		15	60				4					
27	BS	UC	SFT6208	Web technologies	4	4		4/120	15	15	15		15	60				4					
28	BS	UC	EGR6201	Basics of the Linux operating system	4	4	4	4/120	15	15	15		15	60				4					
29	BS	UC	NET6202	Switching, Routing, and Wireless Essentials	6	4	4	6/180	15	30	15		15	105				6					
30	BS	UC	EEC6001	Basic Circuit Theory	4	4	4	4/120	15	30			15	60				4					
31	BS	UC	EGR6202	Information Theory	4	5	5	4/120	15	30			15	60					4				
32	BS	UC	HRD6201	Organization and architecture of computing systems	4	5	5	4/120	15	15	15		15	60					4				
33	BS	UC	SFT6211	Organization of database management systems	4	5	5	4/120	15	15	15		15	60					4				
34	BS	UC	SEC6204	Project Management in Information Security	4	6	6	4/120	15	30			15	60						4			
35	BS	UC	RM6202	Research metodology	3	8	8	3/90	15		15		15	45									3
36	BS	ES	SEC6233	Introduction to Intelligent Cybersecurity	4	6	6	4/120	15	15	15		15	60						4			
37	BS	ES	SEC6243	Information recovery technologies				4/120	15	15	15		15	60									
38	AS	UC	IP6202	Industrial practice	4	4		4/120				120	0	0				4					
39	AS	UC	SEC6201	Computer Information Protection Technologies	4	4	4	4/120	15	15	15		15	60				4					
40	AS	UC	SEC6221	Introduction to Cybersecurity Incident Investigation	4	5	5	4/120	15	30			15	60					4				
41	AS	UC	SFT6212	Design Pattern	4	5	5	4/120	15	30			15	60					4				
42	AS	UC	IP6203	Industrial practice	4	6		4/120				120	0	0						4			
43	AS	UC	SEC6202	Security of operating systems	4	6	6	4/120	15	30			15	60						4			

	Core subjects(BDPD/CS)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component(BDPD/UC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Electives(BDPD/ES)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total on curriculum		**232**				**6510**	**630**	**720**	**870**	**450**	**720**	**3585**	**25**	**35**	**30**	**30**	**30**	**30**	**30**	
6	**Additional courses**								**Number of credits**		**Academic period**			**Number of hours**			**Number of weeks**			
7	**Module of final certification (MoFC)**								**8**					**240**						
Total including FCS									**240**					**7200**						

7. List of approvals with developers

Name of the educational program:
6B06301 «Computer security»

No.	Position, academic degree and surname, first name, patronymic of the developer of the educational program	Date	Signature	Note
1	Amanzholova Saule Toksanovna Candidate of Technical Sciences Associate Professor			
2	Sagymbekova Azhar Oryngalievna Master of Technical Sciences Senior Lecturer			
3	Makilenov Shakirt Nurlybekuly Master of Technical Sciences Senior Lecturer			
4	Askarbekova Nesibeli Yerkinkyzy Master of Technical Sciences Senior Lecturer			