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
6B06303 «Network 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

Table of contents

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 "Network 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.

The educational program ensures the application of the principles of student–centered learning, an individual approach to the student, contributes to the formation of general cultural, basic and professional competencies in the direction of "B058 - Information security".

On the basis of this educational program, educational organizations can develop work curricula and work study programs (syllabuses) using appropriate methodological recommendations for the development of working educational and methodological documentation.

2. Purpose and objectives of the educational program

The purpose of the EP is providing practice–oriented training of highly qualified specialists in the field of information security audit of enterprises with general cultural and professional competencies in the field of information security, as well as to create conditions for continuous professional self-improvement, development of socio-personal competencies of specialists, expansion of social mobility and competitiveness in the labor market.

Tasks of the EP:

1. Ensuring the protection of information and informatization objects using standards and protocols of network interaction.

2. Monitoring, analyzing and comparing the effectiveness of software and hardware information security tools in operating systems and networks.

3. Carrying out the correct operation of the system administration and hardware and software protection.

4. Continuous monitoring and control of information security.

5. Development, design and maintenance of the organization's network security tools

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:

		assessment of the risks associated with business losses due to unavailability, loss or compromise of a particular resource
		
		Objects of professional activity of graduates of the EP:
		   – Channels for committing cybercrimes
		   – Modern IT
		   – Business processes
		   – Blockchain networks
		The subject of professional activity:
		Enterprises in various industries, both government and business
		Types of professional activity of an EP graduate:
		   – Cyber Investigator
		   – Blockchain technologist
		The functions of the professional activity of a graduate of the EP:
		   – Countering cybercrime
		   – 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		

the anti-corruption culture

LO2. Demonstrate the ability to write and communicate orally in the state language and the language of interethnic communication, use foreign sources of information, possess communication skills, master office management techniques in the state language, have public speaking skills, argumentation, discussion and polemics in a professional foreign language

LO3. Be able to use a variety of mathematical and natural science physics methods to solve specific engineering problems. Possess mathematical apparatus for the design of hardware components and electrical networks and digital circuit design

LO4. Demonstrate an understanding of history and philosophy as a methodology of human activity, readiness for self-knowledge, be able to apply methods of psychology, cultural studies and find organizational and managerial solutions in non-standard conditions and with the help of political science and sociology, systematize knowledge about world and Kazakh legislation in the field of information security

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

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 features of the architecture of computing systems and network security. Apply security and automation methods for corporate networks and principles of network interconnection

LO9. Use DevNet tools related to network programming and scripting for network applications. Own a network security tool for various corporate WLAN technologies. Maintain the security level of the network infrastructure

LO10. Apply the principles of organization, management and protection of databases. Apply data protection skills using intelligent cybersecurity techniques

LO11. Apply existing intrusion prevention and detection systems and be able to manage and monitor network infrastructure vulnerabilities. Apply the methods and techniques of analytics of the information security management center

LO12. Apply digital forensics methods of network infrastructure and have practical pentesting skills. Apply reverse engineering techniques to investigate malicious code. Demonstrate knowledge in modern information recovery technologies when detecting network infrastructure vulnerabilities

LO13. Use cloud and blockchain technologies to create secure applications

LO14. 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 6B06303 «Network security»

		During the study of this course, students will acquire knowledge, skills and abilities in all major periods and subperiods of the history of Kazakhstan. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above-mentioned 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	4	OK1	none	Cultural studies-Psychology

		collect, store, process and distribute information				
6	Physical Culture	The course is devoted to the formation of physical culture of the individual and the ability to use a variety of means of physical culture for the preservation and promotion of health	8	OK1	none	
7	Cultural studies-Psychology	As a result of studying the course 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	4	OK1	none	Research metodology

		forms of ownership and processes used in manufacturing and marketing, finance, personnel and management in business operations			
11	Fundamentals of law and anti-corruption culture	The course outlines the legal, economic and social foundations of counteraction corruption, the peculiarities of state 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	EC 3	Legal Basics of Information Security	Diploma project
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	EC 3	Information and Communication Technologies	Diploma project

		The cycle of basic disciplines **The university component**				
14	Mathematical analysis	The purpose of the course is to familiarize students with important branches of calculus and its applications in computer science. During the educational process, students should become familiar with and be able to apply 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	6	PC3 EC5	Algebra and Geometry	Information Theory
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	2	PC4	Algorithmization and Programming	Industrial practice

		theory commonly used in engineering research and scientific applications. Methods and principles of analysis of electrical circuits, including basic concepts such as voltage, current, resistance, impedance, Ohm's and Kirchhoff's law; 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

		including for the **completion of a** thesis project (work)				
		The cycle of basic disciplines **Component of choice**				
33	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	4	PC9	Mathematical foundations of information security	Mobile security technologies
34	Network infrastructure security	The discipline is designed to teach students the basic aspects of protecting computer networks and information resources from cyber threats. During the course, students study methods of protecting networks from external and internal threats, analyze possible vulnerabilities and attack scenarios, and also study modern technologies and methods of information protection. As a result of studying this discipline, students will be able to effectively protect the network infrastructure from cyber attacks, be able to analyze vulnerabilities and take measures to eliminate possible problems		PC8, PC9	Mathematical foundations of information security	Intrusion detection and prevention systems
		The cycle of core disciplines				

		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				
41	Network security	The course is designed to study the basic and auxiliary tools and services to ensure the protection of computer networks from unauthorized access, use, disclosure, violation, modification or destruction. During the course, requirements, rules, protocols, as well as software and hardware solutions are considered to increase the level of fault tolerance and security in the network. The purpose of this course is to provide students with knowledge and skills to ensure network security against various threats, including hacking and malware, misconfiguration and data leakage	4	PC6, PC9	Switching, Routing, and Wireless Essentials	Intrusion detection and prevention systems
42	WLAN Enterprise Technologies	The purpose of the course is to study the technologies of local wireless networks of the IEEE 802.11 standard, approaches to the design of Wi-Fi networks, and the acquisition of skills in working with telecommunications equipment that can be applied at the beginning of work as a network specialist	5	PC5	Switching, Routing, and Wireless Essentials	Network Interconnection

		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 collecting digital evidence, the course provides an overview of utilities, frameworks and tools for forensic analysis				
49	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
50	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	Analytics of Information Security Center	Diploma project
51	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		PC9	Organization of database management systems	Diploma project

		incident management. They also study methods for evaluating the effectiveness of protection systems, as well as creating action plans for vulnerability management. Students study the basic principles of network security, including access control, protection against DDoS attacks, the use of cryptography and others				
56	Network Interconnection	This course includes the study of the basic principles of unified network design, including the choice of topology, the choice of network devices and the configuration of routing protocols. The course teaches you how to ensure the security of a single network, including protection against attacks and malware. As part of the course, students also learn unified network management techniques, including traffic monitoring and analysis, bandwidth management, and route redundancy. They also learn how to solve network setup problems and diagnose and fix failures.	4	PC6, PC9	WLAN Enterprise Technologies	Diploma project
57	Blockchain technology	The course is dedicated to learning the basics of blockchain technologies. The course examines the practice of using blockchain technologies in the bitcoin and Ethereum cryptocurrencies, as well as other		PC9	Cryptographic methods of information security	Diploma project

4.4. List of modules and learning outcomes

Name of the educational program: 6B06303 «Network 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
			Digital circuit design

		Blockchain technology
		Practical pentesting
		Intrusion detection and prevention systems
		Protection of database management systems
		Digital forensics of network infrastructure
The module of Final certification	LO 1 - LO 13	Writing and defending a diploma project

№	Cycle	Comp.	Code	Discipline	Credits	Sem.	ECTS/Hours	Lec	Pr	Lab	SROP	Total	ECTS
16	GER	ES	ECO6004	Economics and Industrial Engineering	6		5/150	15	30	15	30	90	
17	BS	UC	MAT6002	Mathematical analysis	6	1	6/180	30	15	30	30	105	6
18	BS	UC	MAT6001	Algebra and Geometry	4	2	4/120	15	15		30	60	4
19	BS	UC	SFT6201	Algorithmization and Programming	6	2	6/180	15	30	30	15	105	6
20	BS	UC	EP6201	Educational practice	2	2	2/60			60		0	2
21	BS	UC	PHY6001	Physics	4	3	4/120	15	15	30	15	60	4
22	BS	UC	SEC6217	Legal Basics of Information Security	4	3	4/120	15	15		30	60	4
23	BS	UC	MAT6018	Mathematical foundations of information security	6	3	6/180	15	30	30	30	105	6
24	BS	UC	SFT6207	Object-oriented programming (Java)	6	3	6/180	15	30	30	15	105	6
25	BS	UC	NET6201	Computer Networking Basics	6	3	6/180	15	30	30	15	105	6
26	BS	UC	LAN6004PA	Professionally oriented foreign language	4	4	4/120	15			45	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	4/120	15	15	15	15	60	4
29	BS	UC	NET6202	Switching, Routing, and Wireless Essentials	6	4	6/180	15	30	30	15	105	6
30	BS	UC	EEC6001	Basic Circuit Theory	4	4	4/120	15	30		15	60	4
31	BS	UC	EGR6202	Information Theory	4	5	4/120	15	15	30		60	4
32	BS	UC	SFT6211	Organization of database management systems	4	5	4/120	15	15	15	15	60	4
33	BS	UC	EEC6661	Digital circuit design	4	5	4/120	15	15	15	15	60	4
34	BS	UC	SEC6204	Project Management in Information Security	4	6	4/120	15	15	30		60	4
35	BS	UC	RM6202	Research metodology	3	8	3/90	15	15		15	45	3
36	BS	ES	SEC6233	Introduction to Intelligent Cybersecurity	4	6	4/120	15	15		15	60	4
37	BS	ES	SEC6247	Network infrastructure security	4		4/120	15	15		15	60	4
38	AS	UC	IP6202	Industrial practice	4	4	4/120			120		0	4
39	AS	UC	SEC6201	Computer Information Protection Technologies	4	4	4/120	15	15	15	15	60	4
40	AS	UC	NET6203	Enterprise Networks, Security, and Automation	4	5	4/120	15	15	30		60	4
41	AS	UC	SFT6212	Design Pattern	4	5	4/120	15	15	30		60	4
42	AS	UC	IP6203	Industrial practice	4	6	4/120			120		0	4
43	AS	UC	SEC6202	Security of operating systems	4	6	4/120	15	15	30		60	4
44	AS	UC	SEC6206	Cryptographic methods of information security	5	6	5/150	15	15	15	15	90	5
45	AS	UC	SEC6209	Network Security	4	6	4/120	15	15	15	15	60	4

Core subjects(BDPD/CS)	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
Electives(BDPD/ES)	0	0	0	0	0	0	0	0	0	0	0	30	30	0
Total on curriculum	232	6510	630	720	870	450	705	3585	25	35	30	30	30	30

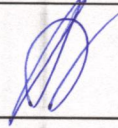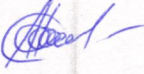|	Number of credits	Academic period	Number of hours	Number of weeks
Additional courses	8		240	
6 Module of final certification (MoFC)				
7 **Total including FCS**	240		7200	

7. List of approvals with developers

Name of the educational program:
6B06303 «Network 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			