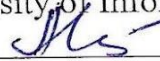


AGREED

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


A.K. Mustafina
2023

APPROVE

Rector
JSC «International
University of Information Technologies»



A. Khikmetov
2023

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 (ISCED):6
Level according to National Qualifications Framework (NQF):6
Level according to Industry Qualifications Framework (EQF): 6
Duration of study: 4 years
Credits: 240

AGREED

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


V.V. Pokusov
2023

AGREED

Director of the National Innovation Center


2023

Almaty, 2023

Table of contents

List of abbreviations and designations3

1. Description of the educational program4
2. Purpose and objectives of the educational program4
3. Requirements for evaluating the learning outcomes of an educational program4
4. Passport of the educational program5
 - 4.1 General5
 - 4.2 Matrix for correlating the learning outcomes of the educational program with the competencies being formed7
 - 4.3. Information about disciplines8
 - 4.4. List of modules and learning outcomes15
5. Curriculum of the educational program18
6. Additional educational programs (Minor)25
7. List of approvals with developers26

List of abbreviations and symbols

HE	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
PE	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, 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 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 "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. 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" (**Appendix 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 12/05/2022**), 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.

A computer security specialist is an employee involved in ensuring computer security in 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 arising in the process of information protection.

The educational program "Computer Security" was developed on the basis of 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 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), 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	6B06301 "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	List of competencies of the educational program: OK1. The ability to understand the driving forces and patterns of the historical process, the place of man in the historical process, understanding 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 relationships, to find organizational and managerial	

	<p>solutions in non-standard conditions and in conditions 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>OK2. The ability to form and develop skills and competencies in the field of organization, planning and production management, apply the acquired knowledge to comprehend the environmental reality, generalize, analyze, predict when setting goals in the professional field and choose ways to achieve them using scientific research methodology.</p> <p>OK 3. 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>OK4. 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>OK5. 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 in the course of professional activity, and the ability to involve the appropriate mathematical apparatus to solve it.</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 test 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.</p>
11	<p>Learning outcomes of the educational program:</p> <p>LO1. Applies the principles of organization, management and protection of databases. Applies data protection skills in corporate infrastructure and corporate cybersecurity. Knows how to use identity and application access management techniques.</p> <p>LO2. Able to use a variety of mathematical and natural science methods of physics to solve specific</p>

	<p>engineering problems. Owns a mathematical apparatus for the design of hardware components and electrical networks.</p> <p>LO3. Able to apply digital forensics methods and has practical pentesting skills. Applies reverse engineering techniques to investigate malicious code. Demonstrates knowledge of modern information recovery technologies in the event of failures and attacks.</p> <p>LO4. Knows how to use the principles of construction, types and functions of operating systems and applies the available methods of protection and security of operating systems. Able to analyze operating systems and various applications for potential vulnerabilities and threats. It can implement various mechanisms for protecting applications and scripts from modifications using programming and design methods.</p> <p>LO5. Demonstrate 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>LO6. Demonstrates the ability for written and oral communication in the state language and the language of interethnic communication, use foreign sources of information, possesses communication skills, owns the technique of office work in the state language, has the skills of public speaking, argumentation, discussion and polemics in a professional foreign language.</p> <p>LO7. Applies 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.</p> <p>LO8. Knows how to set up computer networks, knows the features of routing and switching wired and wireless computer networks. Knows the features of the architecture of computer systems and networks. Uses DevNet tools related to network programming and scripting for network applications.</p> <p>LO9. Knows how to program various applications using algorithmization methods, object-oriented programming, web technologies, knows how 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. Knows the organization of blockchain technologies and is able to develop smart contracts.</p> <p>LO10. Demonstrates an understanding of history and philosophy as a methodology of human activity, readiness for self-knowledge, is able to apply the 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 Kazakhstani legislation in the field of information security.</p> <p>LO11. Uses methods of cloud technologies and intelligent cybersecurity with machine learning. It also uses methods to counter cyber intelligence and is able to minimize the cyber risks of various applications.</p> <p>LO12. To be able to apply the acquired knowledge in the chosen additional educational program.</p>	
12	Form of study	full-time
13	Languages of instruction	English
14	Volume of loans	240
15	Awarded Academic Degree	Bachelor in Information Security Educational Program "6B06301-Computer Security"
16	Developer(s) and authors:	JSC "International University of Information Technologies", department Cyber security:

		<ul style="list-style-type: none"> - Amanzholova S.T. associated professor, Ph.D. - Sagymbekova A.O. senior lecturer - Makilenov Sh.N. senior lecturer
--	--	---

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

List of competencies of the educational program	LO1	LO2	LO3	LO4	LO5	LO6	LO7
Humanitarian module				✓			
Language module				✓			
ICT module			✓				
Natural science module	✓						
Programming languages module					✓		
Hardware module		✓					
Computer Network Fundamentals Module					✓		
OS security module						✓	
Module of scientific activity and project management							✓
Modeling and design module		✓					
Information security technology module						✓	
Data and application protection module						✓	
Security threat research module							✓
Final assessment module	✓	✓	✓	✓	✓	✓	✓

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	Post-requisites
Cycle of general education disciplines Required component						
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 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	5	OK1	No	Philosophy

		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.				
2	Philosophy	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.	5	OK1	History of Kazakhstan	Research methodology
3	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	OK4	No	Professional foreign language
4	Kazakh (Russian) language	The course occupies a special place in the system of training bachelors with an engineering education. For students of 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	OK4	No	Office work in Kazakh
5	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
6	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	OK1	No	Culturology

7	Sociology	<p>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 carried out from various paradigms of social knowledge, using theories and scientific methods. Students who successfully complete the course will be able to:</p> <ol style="list-style-type: none"> 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	OK1	No	Psychology
8	Psychology	<p>This course presents the issues of psychology in a broad educational and social context. The knowledge, abilities and skills acquired and formed as a result of mastering the course content give students the opportunity to apply them in practice in various areas of life: personal, family, professional, business, public, in working with people - representatives of different social groups and age categories .</p>	2	OK1	Sociology	Research methodology
9	Cultural studies	<p>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.</p>	2	OK1	Sociology	Research methodology
10	Physical Culture	<p>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.</p>	8	OK1	No	
<p align="center">Cycle of general education disciplines University Component/Elective Component</p>						
11	Economics and Industrial Engineering	<p>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.</p>	5	OK2	Mathematics I	Diploma design

12	Startups and Entrepreneurship	This course is an introduction to what a business is, how it works and how to manage it. Students will define ownership and processes used in manufacturing and marketing, finance, human resources and management in business operations.		OK 3	ICT	Diploma design
13	Fundamentals of law and anti-corruption culture	The course outlines the legal, economic and social foundations of countering corruption, features of state policy are revealed, international experience in combating with corruption, the specifics of regulation of conflicts of interest, service ethics, methods for detecting corruption violations. As a result of successful completion of the course, students will have the following competencies: 1. Understand the measures of legal liability for participation in corruption violations. 2. Identify conflicts of interest in the activities of organizations that lead to corruption. 3. Analyze the work of organizations using various research methods.		OK 3	Legal basis for information security	Diploma design
14	Fundamentals of safety of life activity and ecology	Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat. The course also reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.		OK 3	ICT	Diploma design
Cycle of basic disciplines Selectable Component						
15	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	4	OK5	No	Mathematical analysis

		main means of research in analytic geometry are the method of coordinates and the methods of elementary algebra.				
16	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	OK5	Algebra and geometry	Information theory
17	Physics	Study the basic laws of classical mechanics, special relativity, electromagnetic phenomena, quantum mechanics, thermodynamics in search of ways to solve physical problems	4	OK5	Mathematical analysis	Theory of electrical circuits
18	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	ICT	Object Oriented Programming (Java)
19	Legal basics 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	OK1	No	Technologies for protecting computer information
20	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	OK5	Mathematical analysis	Information theory
21	Object Oriented Programming (Java)	A course to learn how to write applications using Java technologies	6	PC2	Algorithmization and programming	Web technologies
22	Computer networks basics	The course is aimed at studying the principles of network technologies, gaining access to local and remote network resources.	6	PC4	ICT	Fundamentals of Switching, Routing, and Wireless Networking

23	Professionally oriented foreign language	Includes a grammar course, lexical material of a professional nature and texts of a professional orientation.	2	OK4	Foreign language	Research methodology
24	Business correspondence in the state language	Office work in the state language is a very important subject for students, because. this discipline teaches the preparation, execution of documents in the state language, forms practical skills and abilities to independently compose, translate documents into the Kazakh language.	2	OK4	Kazakh (Russian) language	No
25	Web technologies	This course teaches the basics of web development 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
26	Basics of the Linux operating system	The course provides students with basic knowledge of working with Linux and basic Linux command line skills.	4	PC4, PC5	ICT	Operating system security
27	Switching and routing and wireless networks	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 Investigation
28	Basic circuit theory	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	IoT technologies
29	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	4	PC6	Mathematical foundations of information security	Cryptographic methods of information protection

		practical aspects of noise-resistant coding, data transmission systems, modulation and signal demodulation.				
30	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	
31	Organization of database management systems	The course provides knowledge and skills in database design, from the conceptual stage to physical implementation.	4	PC3	Linux operating system basics	Operating system security
32	Project Management in Information Security	The course teaches to use project management tools at various stages of the project life cycle, to make a qualitative and quantitative assessment of project risks, to determine the effectiveness of the project	4	PC6	Legal basis for information security	Diploma design
33	Research Methodology	The course is devoted to the study of activities aimed at developing students' ability to make independent theoretical and practical judgments and conclusions, the skills of an objective assessment of scientific information, the freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for the implementation of a graduation project (work).	2	OK3	Project Management in Information Security	Diploma design
34	Industrial practice	The course is designed to study the basics of information security	2	PC1, PC2		
35	Information recovery technologies	The course is devoted to developing students' ability to make independent theoretical and practical judgments and conclusions. It fosters skills in the objective assessment of scientific information, promotes freedom in scientific research, and encourages the application of scientific knowledge in educational activities	4	PC2	Information theory	
		Cycle of major disciplines University Component/Elective Component				

35	Industrial practice	Study of information security technologies	4	PC8	2 course: Technologies for protecting computer information 3 course: Industrial practice 2 courses	Diploma design
36	Computer Information Protection Technologies	The course focuses on the study of methods and tools designed to safeguard computer systems and data from unauthorized access, breaches, and other security threats. It aims to develop students' ability to make independent theoretical and practical judgments regarding information security, while also fostering the skills needed for objective assessment of security-related data		LO8, LO9	Information and communication technology	
37	Switching and routing and wireless networks	Basic technologies, methods and principles of information security		PC8	Legal basis for information security	Introduction to Information Security Incident Investigation
38	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
39	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	Corporate cybersecurity
40	Corporate Cyber security	The course is devoted to the study of corporate security issues, host security analysis, monitoring, application of methods for detecting information security violations and responding to them	4	PC7, PC9	Introduction to Information Security Incident Investigation	Digital forensics

41	Security of Operating Systems	The course is devoted to the study of the principles of construction, types and functions of operating systems and their protection system		PC4, PC5	Linux operating system basics	Corporate cybersecurity
42	Cryptographic methods of information security	The course provides knowledge of the principles of cryptology, cryptography, 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		PC8	Technologies for protecting computer information	Corporate cybersecurity
43	Protection of database management systems	The course provides an overview of various concepts and techniques for securing a database management system. Topics cover advanced SQL, transaction management language, data management language, functions and triggers, database management and monitoring, database backup and restore, SQL injection, etc. During the course, students will solve various tasks using PostgreSQL DBMS .	5	PC3	Organization of database management systems	Diploma design
44	Digital forensics	This course teaches to apply special techniques, methods and tools of digital forensics. The course is designed to study methods for detecting and investigating computer crimes, the rules for collecting, securing and presenting evidence on them. The course reviews popular tools for conducting forensic analysis and collecting digital evidence. The course provides an overview of utilities, frameworks and tools for forensic analysis.		PC9	Corporate cybersecurity	Practical Pentesting
45	Practical Pentesting	The course is designed to study the methods of pentesting, pentesting tools. Carrying out attacks on the basis of various protocols, operating systems.	6	PC9	Digital forensics	Diploma design
46	Industrial practice	Application of knowledge in the protection of computer facilities	4	PC6, PC7, PC8, PC9	2 course: Technologies for protecting computer information 3 course: Industrial practice 2 courses	Diploma design
47	Pre-graduate practice	Collecting material for writing a graduation project	5	PC6, PC7, PC8, PC9	Disciplines 3 and 4 courses	Diploma design
48	Industrial practice	Understand the basic concepts of entrepreneurship (what is it: a startup, a business model, a hypothesis, the core of the target audience, the needs and problems of the target audience).		OK2, OK3,		Diploma design

		<p>Understand all cycles of business processes: from taxation to work with international funds.</p> <p>Apply TRIZ tools (theory of inventive problem solving).</p> <p>Create your own business projects.</p>				
49	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 the practical application of predicate and non-classical logics to build reasoning machines.	4	PC9	Corporate cybersecurity	Mobile technology security
50	Mobile security technology	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 provide support for telephony, sending / receiving SMS, managing connections via Wi-Fi, Bluetooth, programming background services, notification mechanisms and signaling, interaction of applications with geolocation and mapping services		PC2	Python programming language	Diploma design
51	Introduction to cloud	The course is aimed at studying the technology of creating a cloud service, working with existing cloud services, using cloud computing technology in solving cybersecurity problems.		PC6	Data Analytics	Diploma design
52	Development of corporate applications on the Django framework	This course provides an opportunity to create business automation systems, Internet projects, services, startups. Creation of large online stores or corporate portals with the introduction of services for interacting with visitors and with elements of business automation.		PC2	Python programming language	Diploma design
53	Protection of applications and scripts from modifications	The course "Protection of applications and scripts from modifications" is intended to study the issues of choosing and using disassembly tools, debugging and protecting applications, internal devices and algorithms of the main disassembly and debugging tools. The course is aimed at developing skills in working with tools and tools for studying and protecting applications from modification. Various approaches to studying and debugging applications, reconstructing algorithms, and practical techniques for working with popular disassembly tools are studied. The knowledge gained in the course of studying this course will allow you to effectively	5	PC8, PC9	Corporate cybersecurity	Diploma design

		protect programs from modification and unauthorized copying, as well as create more optimized applications.				
54	DevNet	The course aims to understand the meaning, configuration and use of software concepts, as well as tools related to network programming (scripting in Python, Git, JSON, Postman, API). Describe your own software-defined networking (SDN) approach, including centralized application policy management.			Digital forensics	Diploma design
55	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	Digital forensics	Diploma design
56	Analytics of Information Security Center	The course is devoted to the study of methods for analyzing a system for potential vulnerabilities and creating recommendations for eliminating vulnerabilities		PC8, PC9	Practical Pentesting	Diploma design
57	Identity and Access management	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.		PC1, PC5	IoT Security	Diploma design
58	Minor 1	Interdisciplinary program that includes courses in mathematical and computer modeling, as well as computer engineering and software development. Students study mathematical modeling methods and their applications in computer systems, alongside the fundamentals of computer system operations and software development	5	PC2	Programming	Diploma design
59	Minor 2	Interdisciplinary program that includes courses in mathematical and computer modeling, as well as computer engineering and software development. Students study mathematical modeling methods and their applications in computer systems, alongside the fundamentals of computer system operations and software development		PC2	Programming	Diploma design

60	Identity and access management	The course focuses on the processes and technologies used to manage digital identities and control user access to systems and resources within an organization. It aims to equip students with the knowledge and skills needed to implement effective IAM strategies, ensuring that the right individuals have the appropriate access to resources while maintaining security and compliance	6	PC7	Data and application protection module	Diploma design
61	Minor 3	Interdisciplinary program that includes courses in mathematical and computer modeling, as well as computer engineering and software development. Students study mathematical modeling methods and their applications in computer systems, alongside the fundamentals of computer system operations and software development	5	PC2	Programming	Diploma design
62	Blockchain technology	The course explores the principles and applications of blockchain, a decentralized and distributed ledger technology that underpins cryptocurrencies and various digital applications. The course aims to provide students with a comprehensive understanding of how blockchain works, its benefits, challenges, and potential use cases across different industries.	4	PC9	Security threat research module	Diploma design
63	Cyber risk and cyber intelligence	The course focuses on understanding the threats and vulnerabilities in the digital landscape and the strategies for mitigating cyber risks through effective intelligence practices. It aims to equip students with the knowledge and skills necessary to assess cyber risks and implement measures to protect organizations from cyber threats.		OK5	Information theory	Diploma design

4.4. List of modules and learning outcomes

List of modules and learning outcomes

Name of the educational program: _____ Computer security _____

Qualification: _____ Bachelor of Information Security _____

Module code / Module name	Direction Learning Outcomes	Criteria for evaluating learning outcomes	Disciplines forming the module Code / Name
GENERAL EDUCATIONAL MODULES			
Humanitarian module	LO4	$O = (F / P) * 100\%$ <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>	History of Kazakhstan
			Philosophy
			Political science
			Sociology
			Psychology
			Culturology
Language module	LO4	$O = (F / P) * 100\%$ <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>	Foreign language
			Kazakh (Russian) language
			Office work in Kazakh
			Professionally oriented foreign language

ICT module	LO3	$O = (F / P) * 100\%$, 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
BASIC MODULES			
Natural science module	LO1	$O = (F / P) * 100\%$, 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
Programming languages module	LO5	$O = (F / P) * 100\%$, 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.	Algorithmization and programming
			Object Oriented Programming (Java)
			Development of corporate applications on the Django framework

			Web technologies
			Organization of database management systems (cw)
			Python programming language
Hardware module	LO2	$O = (F / P) * 100\%$, 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.	
			Theory of electrical circuits
Computer Network Fundamentals Module	LO5	$O = (F / P) * 100\%$, 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.	Fundamentals of computer networks
			Fundamentals of Switching, Routing, and Wireless Networking
OS security module	LO6	$O = (F / P) * 100\%$, 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.	Linux operating system basics
			Operating system security
Module of scientific activity and project management	LO7	$O = (F / P) * 100\%$,	Research Methodology
			Project Management in Information Security (cw)

		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.	Economics and organization of production
Modeling and design module	LO2	O = (F / P) * 100%, 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.	
			Organization and architecture of computing systems
Information security technology module	LO6	O = (F / P) * 100%, 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.	Technologies for protecting computer information
			Cryptographic methods of information protection
PROFESSIONAL MODULES			
Data and application protection module	LO6	O = (F / P) * 100%, 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	Protection of applications and scripts from modifications
			Database management systems protection (cw)
			Corporate cybersecurity
			Mobile technology security
			DevNet

Security threat research module	LO7	$O = (F / P) * 100\%,$ <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>	Practical Pentesting
			Reverse engineering
			Digital forensics
			Introduction to Intelligent Cybersecurity
Final assessment module	LO 1 – LO 17		Writing and defense of the graduation project

5. Curriculum of the educational program

Module code	Module name	Discipline cycle	Discipline component	Code of subject	Subject name	Academic credits	Academic study period	Control in the academic period			Number of hours								Distribution of credits per academic period								
											Total	Classroom work					Independence of students		1 course		2 course		3 course		4 course		
								Lectures	Laboratory trainings	Practice		Studio	Practice	Independence of work of	Independence of work of	1	2	3	4	5	6	7	8				
																Number of weeks in the academic period											
																15	15	15	15	15	15	15	15				
General modules																											
Modules of specialty/education programm																											
Additional modules beyond qualification																											
Modules of choice																											
1		GE R	C S	LAN6001 A	Foreign language	5	1	1			5/150			45			15	90	5.0								
2		GE R	C S	LAN6001 KR	Kazakh (Russian) language	5	1	1			5/150			45			15	90	5.0								
3		GE R	C S	HK 6002	History of Kazakhstan	5	1	1			5/150	15		30			15	90	5.0								
4		GE R	C S	SPS6005	Psychology	2	2	2			2/60	15		15			15	15		2.0							
5		GE R	C S	LAN6002A	Foreign language	5	2	2			5/150			45			15	90		5.0							
6		GE R	C S	LAN6002KR	Kazakh (Russian) language	5	2	2			5/150			45			15	90		5.0							
7		GE R	C S	ICT6001	Information and Communication Technologies	5	2	2			5/150	15	30.0				15	90		5.0							
8		GE R	C S	SPS6004	Cultural studies	2	2	2			2/60	15		15			15	15		2.0							
9		GE R	C S	PhC6005	Physical Culture	4	2	2			4/120			45			15	60		4.0							

10		GE R	C S	SPS6003	Political science	2	3	3			2/60	15		15			15	15			2.0					
11		GE R	C S	SPS 6002	Sociology	2	3	3			2/60	15		15			15	15			2.0					
12		GE R	C S	PhC6006	Physical Culture	4	3	3			4/120			45			15	60			4.0					
13		GE R	C S	SPS6001	Philosophy	5	5	5			5/150	15		30			15	90					5.0			
14		GE R	E S	ECO6004	Economics and Industrial Engineering	5	8	8			5/150	15		30			15	90								5.0
15		GE R	E S	MGT6706	Startups and entrepreneurship						5/150	15		30			15	90								
16		GE R	E S	JUR 6470	Fundamentals of law and anti-corruption culture						5/150	15		30			15	90								
17		GE R	E S	JUR 6507	Fundamentals safety of life activity and ecology						5/150	15		30			15	90								
18		BS	U C	MAT6002	Mathematical analysis	6	1	1			6/180	30		30			15	105	6.0							
19		BS	U C	SEC6217	Legal Basics of Information Security	4	1	1			4/120	15		30			15	60	4.0							
20		BS	U C	MAT6001	Algebra and Geometry	4	2	2			4/120	15		30			15	60		4.0						
21		BS	U C	SFT6201	Algorithmization and Programming	6	2	2			6/180	15	30.0	15			15	105		6.0						
22		BS	U C	PP6205	Educational practice	2	2				2/60					60	0	0		2.0						
23		BS	U C	PHY6001	Physics	4	3	3			4/120	15	30.0				60	15			4.0					
24		BS	U C	MAT6018	Mathematical foundations	6	3	3			6/180	30		30			15	105			6.0					

					of information security																					
25		BS	UC	SFT6207	Object-oriented programming (Java)	6	3	3			6/180	15	30.0	15			15	105			6.0					
26		BS	UC	NET6201	Computer Networking Basics	6	3	3			6/180	15	30.0	15			15	105			6.0					
27		BS	UC	LAN6004 PA	Professionally oriented foreign language	2	4	4			2/60	15		15			15	15				2.0				
28		BS	UC	SFT6208	Web technologies	4	4				4/120	15	15.0	15			15	60				4.0				
29		BS	UC	EGR6201	Basics of the Linux operating system	4	4	4			4/120	15	15.0	15			15	60				4.0				
30		BS	UC	NET6202	Switching, Routing, and Wireless Essentials	6	4	4			6/180	15	30.0	15			15	105				6.0				
31		BS	UC	EEC6001	Basic Circuit Theory	4	4	4			4/120	15	30.0				15	60				4.0				
32		BS	UC	LAN6007 K	Business correspondence in the state language	2	4	4			2/60	15		15			15	15				2.0				
33		BS	UC	EGR6202	Information Theory	4	5	5			4/120	15	30.0				15	60					4.0			
34		BS	UC	HRD6201	Organization and architecture of computing systems	4	5	5			4/120	15	15.0	15			15	60					4.0			
35		BS	UC	SFT6211	Organization of database management systems	4	5	5			4/120	15	15.0	15			15	60					4.0			

36		BS	UC	SEC6204	Project Management in Information Security	4	6	6			4/12 0	15	30. 0				15	60					4. 0		
37		BS	UC	RM6202	Research methodology	2	8	8			2/60	15		15			15	15							2. 0
38		BS	ES	SEC6243	Information recovery technologies	4	6	6			4/12 0	15	15. 0	15			15	60					4. 0		
39		BS	ES	SEC6233	Introduction to Intelligent Cybersecurity						4/12 0	15	15. 0	15			15	60							
40		AS	UC	IP6202	Industrial practice	4	4				4/12 0					12 0	0	0				4. 0			
41		AS	UC	SEC6201	Computer Information Protection Technologies	4	4	4			4/12 0	15	15. 0	15			15	60				4. 0			
42		AS	UC	SFT6210	Python programming language	4	5	5			4/12 0	15	15. 0	15			15	60				4. 0			
43		AS	UC	SEC6221	Introduction to Cybersecurity Incident Investigation	5	5	5			5/15 0	15	30. 0				15	90				5. 0			
44		AS	UC	SEC6202	Security of operating systems	4	6	6			4/12 0	15	30. 0				15	60				4. 0			
45		AS	UC	SEC6206	Cryptographic methods of information security	4	6	6			4/12 0	15	15. 0	15			15	60				4. 0			
46		AS	UC	SEC6212	Corporate Cyber Security	4	6	6			4/12 0	15	15. 0	15			15	60				4. 0			
47		AS	UC	IP6203	Industrial practice	4	6				4/12 0					12 0	0	0				4. 0			
48		AS	UC	SEC6213	Digital Forensics	5	7	7			5/15 0	15	15. 0	15			15	90						5. 0	

4 9		AS	U C	SEC6208	Practical pentesting	6	7	7			6/18 0	15	30. 0	15			15	105							6. 0	
5 0		AS	U C	SEC6211	Protection of database management systems	5	7	7			5/15 0	15	15. 0	15			15	90							5. 0	
5 1		AS	U C	PP6204	Pre-graduate practice	5	8				5/15 0					15 0	0	0							5. 0	
5 2		AS	E S	MIN601	Minor 1	5	5	5			5/15 0	15	30. 0				15	90					5. 0			
5 3		AS	E S	MIN602	Minor 2	5	6	6			5/15 0	15	30. 0				15	90						5. 0		
5 4		AS	E S	SEC6234	Introduction to Cloud	4	7	7			4/12 0	15	15. 0	15			15	60							4. 0	
5 5		AS	E S	SEC6205	Mobile security technologies						4/12 0	15	15. 0	15			15	60								
5 6		AS	E S	SEC6244	Identity and access management	6	7	7			6/18 0	15	30. 0	15			15	105							6. 0	
5 7		AS	E S	SFT6206	Development of corporate applications on the Django framework						6/18 0	15	30. 0	15			15	105								
5 8		AS	E S	MIN603	Minor 3	5	7	7			5/15 0	15	30. 0				15	90							5. 0	
5 9		AS	E S	SEC6236	Protection of applications and scripts from modifications	5	8	8			5/15 0	15	15. 0	15			15	90							5. 0	
6 0		AS	E S	NET6207	DevNet						5/15 0	15	15. 0	15			15	90								
6 1		AS	E S	SEC6238	Blockchain technology	4	8	8			4/12 0	15	30. 0				15	60							4. 0	
6 2		AS	E S	SEC6245	Cyber risk and cyber intelligence						4/12 0	15	30. 0				15	60								

6 3		AS	E S	SEC6222	Reverse Engineering						4/12 0	15	30. 0				15	60								
Weekly average workload at hours																		0	0	0	0	0	0	0	0	0
1	General education subjects(GER)					56		1 4	0	0	168 0	12 0	30	42 0	0	0	210	900	15	23	8	0	5	0	0	5
	Core subjects(GER/CS)					51		1 3	0	0	153 0	10 5	30	39 0	0	0	195	810	15	23	8	0	5	0	0	0
	University component(GER/UC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Electives(GER/ES)					5		1	0	0	150	15	0	30	0	0	15	90	0	0	0	0	0	0	0	5
2	Base requirements(BS)					88		1 9	0	0	258 0	33 0	31 5	30 0	0	60	345	1290	10	12	22	22	12	8	0	2
	Core subjects(BS/CS)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component(BS/UC)					84		1 8	0	0	246 0	31 5	30 0	28 5	0	60	330	1230	10	12	22	22	12	4	0	2
	Electives(BS/ES)					4		1	0	0	120	15	15	15	0	0	15	60	0	0	0	0	0	4	0	0
3	Profession requirements(VRS)					88		1 6	0	0	225 0	24 0	36 0	15 0	0	39 0	240	1260	0	0	0	8	14	21	31	14
	Core subjects(VRS/CS)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component(VRS/UC)					54		9	0	0	123 0	13 5	18 0	10 5	0	39 0	135	675	0	0	0	8	9	16	16	5
	Electives(VRS/ES)					34		7	0	0	102 0	10 5	18 0	45	0	0	105	585	0	0	0	0	5	5	15	9
4	Disciplines for the formation of professional competencies(BDFPC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Core subjects(BDFPC/CS)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component(BDFPC/UC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Electives(BDFPC/ES)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Disciplines of personal development and the formation of leadership qualities(BDPD)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Core subjects(BDPD/CS)					0		0	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	0	0
	Electives(BDPD/ES)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total on curriculum						23 2			0	0	651 0	69 0	70 5	87 0	0	45 0	795	3450	25	35	30	30	31	29	31	21
6	Additional courses														Number of credits		Academic period		Number of hours		Number of weeks					

7	Module of final certification (MoFC)	8		240.0	
	Total including FC	240		7200.0	

6. Additional educational programs (Minor)

The name of the additional educational program (Minor) indicating the list of disciplines that form the Minor	Total number 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:6B06301"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		