ХАЛЫҚАРАЛЫҚ УНИВЕРСИТЕТІ / МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ
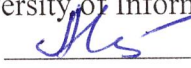## INTERNATIONAL UNIVERSITY

AGREED
Chairman of the Educational and Methodological Council JSC «International University of Information Technologies»
_____A.K. Mustafina
_____2023

APROVE
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

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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 UNESCO	United Nations Educational, Scientific and Cultural Organization/ 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	EuropeanAssociationforQualityAssuranceinHigherEducation/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	

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.

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.

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.

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.

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.

PC1. The ability to apply diagnostic and testing tools for equipment, dismantle damaged hardware devices, troubleshoot technological processes and technical systems.

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.

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.

PC4. The ability to fix and analyze failures in the operation of server and network equipment, eliminate network vulnerabilities, and administer servers.

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.

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.

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.

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.

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.

11	Learning outcomes of the educational program:
	LO1. Demonstrate the ability to use basic mathematical tools.
	LO2. Demonstrate programming skills using Structured Query Language for database design and security.
	LO3. Be proficient in general network utilities for checking network operations and analyzing data

traffic.
LO4. Analyze systems for potential vulnerabilities.
LO5. Understand the principles of construction, types and functions of operating systems.
LO6. Implement mechanisms to protect applications and scripts from modifications using programming and design methods.
LO7. Perform encryption, decryption and cryptanalysis operations.
LO8. Apply technology to protect against network attacks.
LO9. Manage anti-malware and anti-spam technologies on computer systems.
LO10. Respond to information security breaches.
LO11. On one's own diversify and critically analyze modern sources, draw conclusions, argue them and make decisions based on information.
LO12. Be able to use the hardware components of computer systems and networks.
LO13. Own the mathematical apparatus for engineering calculations in the field of design and modeling of software and AO.

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: - Amanzholova S.T. associonated 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

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13
PC 1						V							V
PC 2						V		V		V			
PC 3	V		V	V								V	V
PC 4		V	V		V						V		
PC 5			V	V							V		

	1	2	3	4	5	6	7	8	9	10	11	12	13
PC 6		V				V				V			
PC 7	V							V		V		V	V
PC 8	V			V	V	V					V		V
PC 9								V	V	V	V		

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

No.	Name of the discipline	Brief description of the discipline (30-50 words)	Number of credits	Formed competencies (codes)	Prerequisites	Post-requisitions
		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	5	OK1	No	Philosophy

		developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural and ideological ties between East and West, South and North, between Europe and Asia, between the largest state formations of the Eurasian continent. At various stages of history, states with an original cultural history arose and developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural and ideological ties between East and West, South and North, between Europe and Asia, between the largest state formations of the Eurasian continent. At various stages of history, states with an original cultural history arose and developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan.				
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 Communica tion Technologie s	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	Fundame ntals of computer networks, Fundame ntals 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	Culturolo gy
7	Sociology	The course "Sociology" is 2 credits. It involves lectures, practical work, independent work of the student. During the course, various phenomena of social life are studied. At the same time, the study is carried out from various paradigms of social knowledge, using theories and scientific methods. Students who successfully complete the course will be able to: 1. Use qualitative and quantitative research methods that will be useful in the scientific and professional field. 2. Distinguish between scientific and non-scientific knowledge. 3. Understand and analyze social phenomena and problems from different points of view. 4. Ability to work in a team.	2	OK1	No	Psycholo gy
8	Psychology	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 .	2	OK1	Sociolog y	Research methodol ogy
9	Culturology	Knowledge in the field of cultural studies can serve as a basis for studying the entire complex of social and human sciences. At the same time, the discipline of cultural studies can serve as an addition to general courses in history and philosophy. The course material can serve as a methodological guide for a number of special disciplines: for example, ethics, cultural history, art styles, national management schools, negotiation strategy and tactics, cultural management. Teaching methods and technologies used in the process of program implementation: role-playing games and educational discussions of	2	OK1	Sociolog y	Research methodol ogy

		various formats; case study (analysis of specific situations); project method.				
10	Physical Culture	The course is devoted to the formation of personal physical culture and the ability to use various means of physical culture for the preservation and promotion of health.	8	OK1	No	
	Cycle of general education disciplines **University Component/Elective Component**					
11	Economics and organization production	New trends in economics and organization of production are discussed with examples from real life and practice. The structure of the national economy, the enterprise and the organization of its production are considered.	5	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 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		OK 3	ICT	Diploma design

		cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.	6			
		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 main means of research in analytic geometry are the method of coordinates and the methods of elementary algebra.	4	OK5	No	Mathematical analysis
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	The course is aimed at studying the sections of discrete mathematics, as well as the theory of	6	OK5	Mathematical analysis	Information theory

	of information security	probability and mathematical statistics required to study the processes of information security					
21	Object Oriented Programming (Java)	A course to learn how to write applications using Java technologies	6	PC2	Algorithmization and programming	Web technologies
22	Fundamentals of computer networks	The course is aimed at studying the principles of network technologies, gaining access to local and remote network resources.	6	PC4	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	Linux operating system basics	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	Basics of routing and switching 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	Theory of electrical circuits	The study of physical laws and processes occurring in electric circuits of direct, harmonic and non-harmonic current, methods for analyzing transient and steady processes occurring in linear circuits with lumped parameters; modes of operation of quadripoles and filters, physical processes occurring in electrical circuits with distributed parameters and in non-linear DC circuits.	4	PC1	Physics	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 practical aspects of noise-resistant coding, data transmission systems, modulation and signal demodulation.	4	PC6	Mathematical foundations of information security	Cryptographic methods of information protection
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	Educational practice	The course is designed to study the basics of information security	2	PC1, PC2		
		Cycle of major disciplines **University Component/Elective Component**				
35	Internship	Study of information security technologies	4	PC8	2 course: Technologies for protecting computer information 3 course: Industrial practice 2 courses	Diploma design
36	Basics of routing and switching and wireless networks	Basic technologies, methods and principles of information security	4	PC8	Legal basis for information security	Introduction to Information Security Incident Investigation
37	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
38	Introduction to Information Security 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
39	Corporate cybersecurity	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
40	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	4	PC4, PC5	Linux operating system basics	Corporate cybersecurity

41	Cryptographic methods of information protection	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	4	PC8	Technologies for protecting computer information	Corporate cybersecurity
42	Securing 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
43	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.	5	PC9	Corporate cybersecurity	Practical Pentesting
44	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
45	Internship	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
46	Undergraduate practice	Collecting material for writing a graduation project	5	PC6,PC7,PC8,PC9	Disciplines 3 and 4 courses	Diploma design
47	Internet entrepreneurship	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). Understand all cycles of business processes: from taxation to work with international funds. Apply TRIZ tools (theory of inventive problem solving).	5	OK2, OK3,		Diploma design

		Create your own business projects.				
48	Python for Data Analysis	The course shows how to use your programming skills to build predictive models, visualize data, and work with neural networks. The course is focused on practice and will allow you to immediately start working with data and building models.		PC2	Python programming language	Diploma design
49	UX/UI development	The course introduces students to the concept of designing systems that can interact effectively with people. Students will learn design principles and human behavior, as well as empirical research methods used to solve real-world problems in interface design.		OK3, OK4	Python programming language	Diploma design
50	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
51	IoT technology	The course is dedicated to the study of circuits and microcontroller programs using Arduino and various components, programs using Python for Raspberry Pi to provide the functionality of the Internet of things, systems for the Internet of things.		PC1	Theory of electrical circuits	IoT Security
52	Data Analysis	This discipline studies the basic principles, features, technologies, methods, models, platforms and tools for data analysis, methods for discovering new knowledge in data warehouses, the basic concepts of data mining. The practical part provides for the implementation of the tasks of analyzing, visualizing and interpreting data in various subject areas using statistical data analysis programs and Data Mining methods, analytical platforms and tools. The main sections of the course: Data analysis technologies. Methods of data analysis. regression, time series forecasting, clustering, associations, sequences. Business intelligence technologies: OLAP technologies, DM technologies, data visualization systems and solutions, report generators. Techniques for discovering new knowledge in data warehouses. Basic concepts of data mining. Business Intelligence Platforms. Analytical platform SAS, MS Power BI. Power Query Editor. ETL process. Relational data model. Filtering data with MS Power BI. Working with Data Analysis Expressions (DAX). DAX functions. Practice	5	PC7	Python for data analysis	Introduction to cloud technology

		creating interactive UI/UX elements. Data visualization in Power BI. Review of PowerBI.com, Mobile App.				
53	Machine learning	The purpose of this course is to study the basics of the theory of machine learning, including discriminant, cluster and regression analysis, mastering the skills of practical solving problems of data mining.		PC2	Python programming language	Diploma design
54	Front End Development	In this course, students will study in detail the process of creating the client side of the site, namely the layout of the site template and the development of the user interface. Relevant languages and frameworks are studied.		PC2	Python programming language	Diploma design
55	Mobile technology security	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	4	PC2	Python programming language	Diploma design
56	Introduction to cloud technology	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
57	IoT Security	The course examines the means and methods for protecting devices, software and data in IoT systems.	6			
58	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

59	Databases Oracle NoSQL	The discipline is designed to quickly and efficiently develop database-oriented web applications using Oracle Application Express. To that end, the course covers components such as reports, forms, elements, dynamic actions, calendars, charts, plugins, and other common components needed in an application.	5	PC3	Organization of database management systems	Full stack development
60	Machine learning 2	The purpose of this course is to study the basics of the theory of machine learning, including discriminant, cluster and regression analysis, mastering the skills of practical solving problems of data mining.		PC2	Machine learning 1	Diploma design
61	Full Stack development	Full Stack development is the development of databases, servers, systems engineering and customer interaction. Depending on the project, clients may need a mobile stack, a web stack, or a custom application stack. The course covers the technologies needed to complete a "full stack" project.		PC2	Development of corporate applications on the Django framework	Diploma design
62	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 protect programs from modification and unauthorized copying, as well as create more optimized applications.	5	PC8, PC9	Corporate cybersecurity	Diploma design
63	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
64	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	4	PC8, PC9	Digital forensics	Diploma design

		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.				
65	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
66	Biometric Access Control Systems	The course studies the theoretical foundations for the development and operation of biometric access protection tools, modern tasks, scientific terminology, methods and tools for choosing and substantiating technical solutions when building systems for protecting informatization objects, studying the main provisions of the theory of BSPD and methods for their use in the tasks of identification, authentication, control and access control based on the biometric characteristics of users and their application.		PC1, PC5	IoT Security	Diploma design

4.4. List of modules and learning outcomes

Name of the educational program: Computer security

Qualification: Bachelor of Information Security

Module code / Module name	Learning Outcomes	Criteria for evaluating learning outcomes	Disciplines forming the module Code / Name
		GENERAL EDUCATIONAL MODULES	
Humanitarian module	LO11	$O = (F / P) * 100\%$, 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.	History of Kazakhstan
			Philosophy
			Political science
			Sociology
			Psychology
			Culturology
Language module	LO 1	$O = (F / P) * 100\%$, 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.	Foreign language
			Kazakh (Russian) language
			Office work in Kazakh
			Professionally oriented foreign language
ICT module	LO3, 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.	Information and Communication Technologies

BASIC MODULES

Module	LO	Formula	Subjects
Natural science module	LO 1	O \u003d (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	LO 2	O \u003d (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	LO12	O \u003d (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
			Fundamentals of computer networks

Module	LO	Formula	Subject
Computer Network Fundamentals Module	LO 3	O \u003d (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 Switching, Routing, and Wireless Networking
OS security module	LO 5	. O \u003d (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	LO 11	O \u003d (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.	Research Methodology
			Project Management in Information Security (cw)
			Economics and organization of production
Modeling and design module	LO 11,	O \u003d (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	LO 3, LO 4, LO 7	O \u003d (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	LO 6, LO 8	O \u003d (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	LO 9, LO 10	O \u003d (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
		Practical Pentesting
		Reverse engineering
		Digital forensics
		Introduction to Intelligent Cybersecurity
Final assessment module	LO 1 – LO 12	Writing and defense of the graduation project

5. Curriculum of the educational program

General modules

№ Module code	Component	Discipline code	Name of the discipline	Academic credits	Academic period of study	Exams	Differentiated offset	Course work/project	Total	Lectures	Laboratory	Practical	Studio classes	Practice	SROP	SRO	1 course (1)	1 course (2)	2 course (3)
																	15	**15**	**15**
1	OOD / OK	LAN6001A	Foreign language	5	1	1			5/150			45			15	90	5.0		
2	OOD / OK	LAN6001KR	Kazakh (Russian) language	5	1	1			5/150			45			15	90	5.0		
3	OOD / OK	HK6002	History of Kazakhstan	5	1	1			5/150	15		30			15	90	5.0		
4	OOD / OK	PhC6005	Physical Culture	4	2	2			4/120			45			15	60		4.0	
5	OOD / OK	SPS6005	Psychology	2	2	2			2/60	15		15			15	15		2.0	
6	OOD / OK	LAN6002A	Foreign language	5	2	2			5/150			45			15	90	5.0		
7	OOD / OK	LAN6002KR	Kazakh (Russian) language	5	2	2			5/150			45			15	90	5.0		
8	OOD / OK	ICT6001	Information and Communication Technologies	5	2	2			5/120	15	30.0				15	60	5.0		
9	OOD / OK	SPS6004	Culturology	2	2	2			2/60	15		15			15	15		2.0	
10	OOD / OK	PhC6006	Physical Culture	4	3	3			4/120			45			15	60			4.0

Weeks in academic period: 1 course — 15, 15; 2 course — 15, 15; 3 course — 15, 15; 4 course — 15, 15.

Specialty/educational program modules

Additional modules outside the qualification

Optional modules

#	Module	Comp.	Code	Course	Cr	Sem	Sem	Load (cr/h)	L	L₂	P	Lab	h	SRO(P)	Σ	Kr	1	2	3	4	5	8
eleven	OOD	OK	SPS6003	Political science	2	3	3	2/60	15		15		15	15					2.0			
12	OOD	OK	SPS 6002	Sociology	2	3	3	2/60	15		15		15	15					2.0			
13	OOD	OK	SPS6001	Philosophy	5	5	5	5/150	15		30		15	90							5.0	
14	OOD	HF	ECO6004	Economics and organization of production				5/150	15		30		15	90								
15	OOD	HF	MGT6706	Startups and Entrepreneurship	5	8	8	5/150	15		30		15	90								5.0
16	OOD	HF	JUR 6470	Fundamentals of law and anti-corruption culture	5	8	8	5/150	15		30		15	90								
17	OOD	HF	JUR 6507	Fundamentals of ecology and life safety	5			5/150	15		30		15	90								
18	DB	VC	MAT6002	Mathematical analysis	6	1	1	6/180	30		30		15	105	6.0		6.0					
19	DB	VC	SFT6201	Algorithmization and programming	6	1	1	6/150	15	30.0	15		15	75	6.0		6.0					
20	DB	VC	SEC6217	Legal basis for information security	4	1	1	4/120	15		30		15	60	4.0		4.0					
21	DB	VC	MAT6001	Algebra and geometry	4	2	2	4/120	15		30		15	60	4.0			4.0				
22	DB	VC	PP6205	Educational practice	2	2		2/60				60		0	0	2.0		2.0				
23	DB	VC	PHY6001	Physics	4	3	3	4/90	15	30.0			60	-15	4.0				4.0			
24	DB	VC	MAT6018	Mathematical foundations of information security	6	3	3	6/180	30		30		15	105	6.0				6.0			
25	DB	VC	SFT6207	Object Oriented Programming (Java)	6	3	3	6/150	15	30.0	15		15	75	6.0				6.0			
26	DB	VC	NET6201	Fundamentals of computer networks	6	3	3	6/150	15	30.0	15		15	75	6.0				6.0			
27	DB	VC	LAN6007K	Office work in the state language	2	4	4	2/60	15		15		15	15		2.0					2.0		
28	DB	VC	LAN6004PA	Professionally oriented foreign language	2	4	4	2/60	15		15		15	15		2.0					2.0		
29	DB	VC	SFT6208	Web technologies	4	4		4/105	15	15.0	15		15	45	4.0						4.0	
thirty	DB	VC	EGR6201	Linux operating system basics	4	4	4	4/105	15	15.0	15		15	45	4.0						4.0	
31	DB	VC	NET6202	Fundamentals of Switching, Routing, and Wireless Networking	6	4	4	6/150	15	30.0	15		15	75	6.0						6.0	
32	DB	VC	EEC6001	Theory of electrical circuits	4	4	4	4/90	15	30.0			15	30	4.0						4.0	
33	DB	VC	EGR6202	Information theory	4	5	5	4/90	15	30.0	15		15	30		4.0						4.0	
34	DB	VC	HRD6201	Organization and architecture of computing systems	4	5	5	4/105	15	15.0	15		15	45	4.0							4.0

№	Cyc	Comp	Code	Discipline	Cr	Sem	Sem	Cr/Hrs	L	P	Lab	SIW	IWS	Total	IV	V	VI	VII	VIII
35	DB	VC	SFT6211	Organization of database management systems	4	5	5	4/105	15	15.0	15		15	45		4.0			
36	DB	VC	SEC6204	Project Management in Information Security	4	6	6	4/90	15	30.0			15	30			4.0		
37	DB	VC	RM6202	Research Methodology	2	8	8	2/60	15		15	15	15	15					2.0
38	PD	VC	PP6202	Internship	4	4		4/120				120	15	0	4.0				
39	PD	VC	SEC6201	Technologies for protecting computer information	4	4	4	4/105	15	15.0	15		15	45	4.0				
40	PD	VC	SFT6210	Python programming language	4	5	5	4/105	15	15.0	15		15	45		4.0			
41	PD	VC	SEC6221	Introduction to Information Security Incident Investigation	5	5	5	5/120	15	30.0			15	60		5.0			
42	PD	VC	SEC6212	Corporate cybersecurity	4	6	6	4/105	15	15.0	15		15	45			4.0		
43	PD	VC	PP6203	Internship	4	6		4/120				120		0			4.0		
44	PD	VC	SEC6202	Operating system security	4	6	6	4/90	15	30.0			15	30			4.0		
45	PD	VC	SEC6206	Cryptographic methods of information protection	4	6	6	4/105	15	15.0	15		15	45			4.0		
46	PD	VC	SEC6211	Securing database management systems	5	7	7	5/135	15	15.0	15		15	75				5.0	
47	PD	VC	SEC6213	Digital forensics	5	7	7	5/135	15	15.0	15		15	75				5.0	
48	PD	VC	SEC6208	Practical Pentesting	6	7	7	6/150	15	30.0			15	75				6.0	
49	PD	VC	PP6204	Undergraduate practice	5	8		5/150				150		0					5.0
50	PD	HF	EPP4106	Internet entrepreneurship	5	5		5/120	15	30.0			15	60		5.0			
51	PD	HF	SFT6503	Data Analysis (Python)	5	5	5	5/120	15	30.0			15	60		5.0			
52	PD	HF	SFT6309	UX/UI development	5	5		5/120	15	30.0			15	60		5.0			
53	PD	HF	SEC6233	Introduction to Intelligent Cybersecurity	4	6	6	4/105	15	15.0	15		15	45			4.0		
54	PD	HF	HRD6202	IoT technology	4	6		4/105	15	15.0	15		15	45			4.0		
55	PD	HF	SFT6185	Data Analytics	5	6	6	5/120	15	30.0			15	60			5.0		
56	PD	HF	SFT6508	Machine learning	5	6	6	5/120	15	30.0			15	60			5.0		
57	PD	HF	SFT6311	Front End Development	5	6		5/120	15	30.0			15	60			5.0		
58	PD	HF	SEC6205	Mobile technology security	4	7	7	4/105	15	15.0	15		15	45				4.0	
59	PD	HF	SEC6234	Introduction to cloud technology	4	7	7	4/105	15	15.0	15		15	45				4.0	
60	PD	HF	SEC6215	Internet of things security	6	7	7	6/150	30	30.0	15		30	60				6.0	
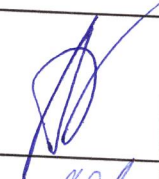
No	Cyc	Comp	Code	Discipline							Hours							
61	PD	HF	SFT6206	Development of corporate applications on the Django framework					6/150	15	30.0	15			30		60	5.0
62	PD	HF	BDO 4310	Oracle NoSQL databases					5/120	15	30.0	15			15		60	
63	PD	HF	SFT6540	Machine learning 2	5	7	7		5/120	15	30.0	15			15		60	5.0
64	PD	HF	SFT6314	Full stack development	5	7	7		5/120	15	30.0	15			15		60	
65	PD	HF	SEC6236	Protection of applications and scripts from modifications	5	8	8		5/135	15	15.0	15			15		75	5.0
66	PD	HF	NET6207	DevNet	5	8	8		5/135	15	15.0	15			15		75	
67	PD	HF	SEC6222	Reverse engineering	4	8	8		4/90	15	30.0				15		30	
68	PD	HF	SEC6237	Information Security Center Analytics	4	8	8		4/90	15	30.0				15		30	4.0
69	PD	HF	SEC6235	Biometric Access Control Systems	4	8	8		4/90	15	30.0				15		30	

Average weekly load in hours

No	Section	Cr	a	b			h1	h2	h3	h4			c1	c2	c3	s1	s2	s3	s4	s5	s6	s7	s8
1	**General education disciplines (OOD)**	**56**	**14**	**0**	**0**	**0**	**1650**	**120**	**30**	**420**	**0**	**0**	**210**	**30**	**870**	**15**	**23**	**8**	**0**	**5**	**0**	**0**	**5**
	Required Component(OOD/OK)	51	13	0	0	0	1500	105	30	390	0	0	195	30	780	15	23	8	0	5	0	0	0
	University component (OOD / VK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Optional component(OOD/KV)	5	1	0	0	0	150	15	0	30	0	0	15	0	90	0	0	0	0	5	0	0	5
2	**Basic disciplines (DB)**	**84**	**18**	**0**	**0**	**0**	**2160**	**315**	**300**	**285**	**0**	**60**	**330**	**16**	**930**	**6**	**22**	**22**	**12**	**4**	**2**		
	Required Component(DB/OK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	University component (DB/VC)	84	18	0	0	0	2160	315	300	285	0	60	330	16	930	6	22	22	12	4	2		
	Optional Component(OD/KV)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
3	**Major disciplines (PD)**	**92**	**17**	**0**	**0**	**0**	**1995**	**255**	**375**	**165**	**0**	**390**	**270**	**0**	**930**	**0**	**8**	**14**	**25**	**31**	**14**		
	Mandatory component (PD/OK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	University component (PD / VC)	54	9	0	0	0	1050	135	180	105	0	390	135	0	495	0	8	9	16	16	5		
	Selectable component (PD/CV)	38	8	0	0	0	945	120	195	60	0	0	135	0	435	0	0	5	9	15	9		
4	**Disciplines for the formation of professional competencies (BDFPK)**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**		
	Required Component(BDFPK/OK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	University component (BDFPK / VK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

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Optional Component(BDFPK/CV)	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 formation of leadership qualities (BDLR)**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Required Component(BDLR/OK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
University component (BDLR / VK)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Optional Component(BDLR/CV)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Curriculum	232	0	0	0	0	5805	69/0	705	870	0	0	0	450	810	273	31	0	29	31	21

		Amount of credits	Semester			Number of hours	Number of weeks
6	**Additional types of training**	8	30	31	29	240.0	
7	**Final assessment module (MIA)**						
	Total with account. IGA	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		
2	Sagymbekova Azhar Oryngalievna Master of Engineering Senior Lecturer	05/21/2023		
3	Makilenov Shakirt Nurlybekovich Master of Engineering Senior Lecturer	05/21/2023		