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
6B06302 «Hardware 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
air defense	Postgraduate education
PC	Professional competence
PM	Professional module
WG	Working group
RK	The Republic of Kazakhstan
RO	Learning Outcome
CM	Special module
QMS	Quality Management System
SAM	Socio-economic module
TVE	Technical and Vocational Education
TVET	Technical and vocational education and post-secondary education
UNESCO	United Nations Educational, Scientific and Cultural Organization/
UNESCO	specialized agency of the United Nations Educational, Scientific and Cultural Affairs.
Cedefop	European Center for the Development of Vocational Training
DACUM	from English. Developing Curriculum
ECVET	European Credit System for vocational education and training
EQAVET	European Quality Assurance in Vocational Education and Training
ENQA	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

At the present stage of development of our state, the issue of ensuring public procurement for the country's defense and security with domestic hardware and software has become acute, which is reflected in the Action Plan for the implementation of the Cybersecurity Concept ("Cyber Shield of Kazakhstan") until 2022, approved by the Decree of the Government of the Republic of Kazakhstan. From the state need, there is an urgent need to train specialists who are able not only to issue a qualified opinion on the results of instrumental checks of IT and telecom equipment on the possibility of its use at critical informatization objects, but also in the future to participate in research and development on the development of their own hardware. This educational program is based on**recommendationsProfessional 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 dated 12/05/2022), follows new trends from the Atlas of Emerging Jobs, RegionalWithstandards, national frameworkAndqualificationsAndSectoral qualifications framework according to level 6.**

The educational program "Information Security Hardware" is designed to provide practice-oriented training of graduates in the field of protecting critical information circulating in information systems from unauthorized access, including using methods and means of cryptographic information protection designed to work in various industries and in business.

Specialist in the field of information security hardware - an employee involved in the development, implementation and maintenance of the technical section of the information security system at the enterprise. The main activity of a specialist in the field of information security hardware is related to secure computing systems and technical means for processing, storing and transmitting information; information security services; mathematical models of processes arising in the process of information protection.

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

2. Purpose and objectives of the educational program

The purpose of the EP is to train highly qualified personnel for innovative and high-tech industries in the field of information security, who have theoretical and practical knowledge, skills and abilities necessary for their implementation in professional activities, meeting the needs of the domestic and world markets for intellectual labor, ready to make a qualitative breakthrough in information security .

Tasks of the OP:

1. To provide practice-oriented training of graduates in the field of creating, implementing and maintaining the technical section of an information security system designed to work in various industries and businesses.
2. Pprepare graduates for professional activities in the field of information security using technical means;
3. ABOUTto provide market demand by specialists in information security hardware;
4. WITHcreate conditions for continuous professional self-improvement, development of social and personal qualities of graduates (purposefulness, organization, diligence, sociability, ability to work in a team, responsibility for the final result of their professional activity, civic responsibility, tolerance), social mobility and competitiveness in the labor market.

3. Requirements for the results of mastering the educational program

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

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	6B06302 "Hardware security" (Information security hardware)
5	Brief description of the educational program	The educational program "Hardware Security" includes work with the analysis of threats to information security, for open and closed systems using third-party and developed software 1) Information Security Threat Modeling 2) Special survey of protected objects to identify channels of information leakage and unauthorized access. 3) Implementation of the technical section of the information security system in the organization 4) Maintenance of the technical section of the information security system during its operation

		5) Carrying out special inspections and evaluations security objects of protection Application of the main provisions of regulatory legal acts in the field of information security
6	Purpose of the OP	Training of highly qualified personnel for innovative and knowledge-intensive industries in the field of information security, possessing theoretical and practical knowledge, skills and abilities necessary for their implementation in professional activities, meeting the needs of the domestic and world intellectual labor markets, ready to make a qualitative breakthrough in information security.
7	ISCED level	6th level
8	NQF level	6th level
9	ORC level	6level
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 and the ability to understand philosophy as a methodology of human activity, readiness for self-knowledge, self-activity, the development of cultural wealth as a factor in the harmonization of personal and interpersonal relationships . OK2. The ability to form and develop skills and competencies in the field of organization, planning and management of production, the ability to apply the acquired knowledge to comprehend the environmental reality, the ability to generalize, analyze, predict when setting goals in the professional field and choose ways to achieve them using scientific research methodology 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.Ability for written and oral communication in the state language and the language of international communication, the ability 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 find organizational and managerial solutions in non-standard conditions and in the conditions of different opinions and the willingness to bear responsibility for them, the ability to systematize knowledge about the world and Kazakhstan legislation in the field of information security PC2. The ability to use programming languages and tools for developing secure software, the ability to find coding errors in the information and computing system being	

	developed, the ability to create, test, debug and execute programs in different programming languages PC3. The ability to apply the theory and methods of mathematics to build qualitative and quantitative models of objects and processes in the natural sciences, the ability to select and apply appropriate equipment, tools and research methods to solve problems in the chosen subject area, the ability to configure and adjust software and hardware systems, the ability to match hardware and software as part of information and automated systems PC4. The ability to apply the theory and principles of design, organization and administration of operating systems, the ability to install, debug software and configure hardware for putting information systems into operation, the ability to maintain the operability of information systems and technologies in the specified functional characteristics and compliance with quality criteria PC5. The ability to design distributed information systems, their components and protocols for their interaction, the ability to administer local and remote network resources, the ability to use methods and tools for troubleshooting in networks PC6. The ability to apply equipment diagnostics and testing tools, the ability to take into account modern trends in the development of electronics, measuring and computer technology, information technology in their professional activities, the ability to calculate and design electronic devices, circuits and devices for various functional purposes in accordance with the terms of reference using automation tools design PC7. The ability to develop user interfaces for web applications and mobile applications, the ability to develop models of information system components, including database models, the ability to develop components of software systems and databases, use modern programming tools and technologies, the ability to organize the interaction of devices connected via the Internet, in order to solve the stated problem, as well as organize the necessary data processing and visualization for this PC8. The ability to use the methodology for developing measures to protect confidential information, the ability to draw up technical specifications in accordance with the requirements of state, industry and corporate standards, to comply with work time standards, the ability to prepare materials for presentation to the customer, the ability to use modern information and communication technologies in subject activities, the ability to own project management methods and implement them using modern information and communication technologies, the ability to use an information approach to assessing the quality of information security systems functioning PC9. The ability to apply methods to protect information from leaks through technical channels, the ability to apply technical means of ensuring information security, the ability to apply cryptanalysis, the ability to audit enterprise information security, the ability to apply international, national and corporate standards, the ability to identify possible ways of leaking confidential information, the ability to fulfill the requirements instructions for ensuring the information security of the department, the ability to organize workplaces, their technical equipment, placement of facilities and equipment for info communication facilities
11	LO1. Explain and understand the Legislative base of the Republic of Kazakhstan and the countries of the world, as well as the procedures for standardization and certification in the field of information security LO2. Apply practical programming skills and explain the general methodological foundations of software development, write system programs for device drivers, interface modules with non-standard equipment and program microcontrollers

	LO3. Demonstrate knowledge about the architecture of computer systems, manage operating systems. LO4. Implement basic network communication between devices, calculate and apply addressing schemes, configure and configure network devices. LO5. Design the layout of printed circuit boards, constructive and technological modules of the first level using application software packages, analyze microprocessor devices, use tools for debugging and testing embedded systems. LO6: Develop secure server-side client web and mobile applications LO7: Model systems for the Internet of Things LO8. Develop enterprise information security policies, apply project management tools at various stages of the project life cycle, make a qualitative and quantitative assessment of project risks, determine the effectiveness of the project, LO9: Apply data protection technologies in computer systems and networks LO10. Analyze the basic principles of building access control systems and understand the procedure for ensuring security when using biometric ACS in the enterprise. LO11. On one's own diversify and critically analyze modern sources, draw conclusions, argue them and make decisions based on information. LO12. Demonstrate the ability to use basic mathematical tools, methods of mathematical modeling.	
12	Form of study	full-time
13	Languages of instruction	English
14	Volume of loans	240
15	Awarded Academic Degree	Bachelor in Information and Communication Technologies in the educational program "6V06302-Hardware security"
16	Developer(s) and authors	JSC "International University of Information Technologies", department Cyber security: - Amanzholova S.T. associate 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

	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10	LO 11	LO 12
PC1	V											V
PC 2		V				V	V					
PC 3		V	V	V	V							
PC 4				V	V	V	V					
PC 5				V								
PC 6					V							V

PC 7						V	V					V
PC 8								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	Postrequisites
		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	5	OK1	No	Philosophy

		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 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	PC4	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	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	Psychology
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	Sociology	Research methodology
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 various formats; case study (analysis of specific situations); project method.	2	OK1	Sociology	Research methodology
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, personnel and management in a business operation.		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 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 University 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	4	PC3 OK5	No	Mathematical analysis

		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.				
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	PC3 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	Information theory	The course is aimed at studying error-correcting codes, taking into account the information redundancy limit. Estimate discretization and quantization errors	4	PC3, PC5	Algebra and geometry	Theory of electrical circuits
19	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	PC3 OK5	Algebra and geometry	Theory of Probability and Mathematical Statistics
20	Digital circuit design	This course is designed and formulated to help students understand, solve and develop digital logic circuits. This course contains detailed lectures that not only define or describe gates, but also examples and problems through which you can learn the actual implementation and operation of gates.	4	PC3, PC6	Physics	Digital signal processing
21	Algorithmization and programming	An introductory programming course that studies the linear, conditional, repetitive structures of algorithms; one-dimensional and two-dimensional arrays and strings in the C++ programming language. Programming using procedures, functions and standard modules is considered.	6	PC2	Information and Communication Technologies	Object Oriented Programming (Java)
22	Object Oriented Programming (Java)	A course to learn how to write applications using Java technologies	6	PC2	Algorithmization and programming	Web technologies
23	Legal basics for	A course to study politics and information security on a global scale. Study of Kazakhstani	4	PC1 PC8 OK1		Computer technologies for

	information security	and international laws and regulations in the field of information security.				information security
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	Diploma design
25	Professionally oriented foreign language	Includes a grammar course, lexical material of a professional nature and texts of a professional orientation.	2	OK4	Foreign language	Diploma design
26	Educational practice	The course is designed to study the basics of information security	2	PC4	Algorithmic languages and programming	
		Cycle of basic disciplines Selectable Component				
27	Computer Networking Basics	The course is aimed at studying the principles of network technologies, gaining access to local and remote network resources.	6	PC5	Information and Communication Technologies	Routing and Switching Fundamentals
28	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	Information and Communication Technologies	System Programming
29	Basic Circuit Theory	The course has been designed to introduce the fundamental principles of electrical circuit theory commonly used in engineering research and scientific applications. Methods and principles of electrical circuit analysis, including basic concepts such as voltage, current, resistance, impedance, Ohm's law and Kirchhoff's; basic methods for analyzing electrical circuits, resistive circuits, circuits of the 1st and 2nd order; circuits with direct and alternating current sources.	4	PC6	Physics	Digital Circuitry
30	Fundamentals of Switching, Routing,	Teach students how to configure routers and switches for advanced functionality, configure aggregation,	6	PC5	Fundamentals of computer networks	Operating system security

	and Wireless Networking	redundancy, and routing protocols, troubleshoot devices, and fine-tune routing protocols				
31	Organization of database management systems	The course provides knowledge and skills in database design, from the conceptual stage to physical implementation.	4	PC7	1) Discrete mathematics, 2) Object-oriented programming	Fundamentals of Scientific Research
32	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	PC7	Object Oriented Programming (Java)	Python programming language
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	Philosophy	Writing and defense of the graduation project
34	Network Operating System Security	The course is devoted to the study of the principles of construction, types and functions of operating systems and their protection system	4	PC4	Linux operating system basics	Digital devices and microprocessors
35	Computer Information Protection Technologies	Basic methods and principles of information security	4	PC8	1) Fundamentals of computer networks 2) Linux operating system basics	Internet of Things Security
36	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	PC8	Legal basis for information security	Writing and defense of the graduation project
Cycle of major disciplines University Component/Elective Component						
37	Internship	Study of information security technologies	8	PC8 PC8	2 course: Technologies for protecting computer information 3 course:	Diploma design

					Industrial practice 2 courses	
38	Undergraduate practice	Collecting material for writing a graduation project	5	PC8 PC8	Disciplines 3rd and 4th course	Diploma design
39	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). Create your own business projects.	5	OK2, OK3,		Diploma design
40	Data analysis (Python)	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
41	HCI - UI/UX in AR/VR	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
41	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
43	IoT technologies	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

44	Data Analytics	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 creating interactive UI/UX elements. Data visualization in Power BI. Review of PowerBI.com, Mobile App.	5	PC7	Python for data analysis	Introduction to cloud technology
45	Applied 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
46	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
47	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	4	PC2	Python programming language	Diploma design

		and signaling, interaction of applications with geolocation and mapping services				
48	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
49	IoT Security	The course examines the means and methods for protecting devices, software and data in IoT systems.	6			
50	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
51	DA6: NoSQL Databases	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
52	Algorithmic aspects of 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	Machine learning 1	Diploma design
53	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
54	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	5	PC8, PC9	Corporate cybersecurity	Diploma design

		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.				
55	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
56	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
57	Information Security Center Analytics	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
58	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: __Information security hardware _____
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 \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.	History of Kazakhstan
			Philosophy
			Political science
			Sociology
			Psychology
			Culturology
Language 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.	Foreign language
			Kazakh (Russian) language
			Office work in Kazakh
			Professionally oriented foreign language
ICT 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.	Information and Communication Technologies

BASIC MODULES			
Natural science module	LO 12	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)
			Web technologies
			Organization of database management systems (cw)
Hardware module	LO5	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.	Digital circuitry
			Theory of electrical circuits
			Microelectronics
			Fundamentals of computer networks

Computer Network Fundamentals Module	LO 4	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 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.	Linux operating system basics
			Security of Operating Systems
Module of scientific activity and project management	LO 8, 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.	Research Methodology
			Project Management in Information Security
			Economics and organization of production
Information security technology module	LO 1, LO 8, LO 9	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
			Legal basis for information security
PROFESSIONAL MODULES			
Hardware security module	LO 7, LO 10	O \u003d (F / P) * 100%,	IoT Security
			Biometric access control systems

		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.	
Hardware component module	LO 5, 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.	IoT technologies
			Digital signal processing
Mobile security module	LO 6	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.	Mobile technology security
Final assessment module	LO 1-LO 12		Writing and defense of the graduation project

5. Curriculum of the educational program

Module code	Module name	The cycle of discipline Component	Discipline code	Name of the discipline	Academic credits	Academic period of study	Control by academic periods			Number of hours								Distribution of credits by academic periods							
											Classroom work					SRO		1 course		2 course		3 course		4 course	
																		1	2	3	4	5	6	7	8
																		Weeks in academic period							
							Exams	Differentiated offset	Course work / project	Total	Lectures	Laboratory	Practical	Studio classes	Practice	SROP	SRO	15	15	15	15	15	15	15	15

General modules																										
Specialty/educational program modules																										
Additional modules outside the qualification																										
Optional modules																										
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	SPS6005	Psychology	2	2	2			2/60	15		15			15	15		2.0						
5		OOD	OK	LAN6002A	Foreign language	5	2	2			5/150			45			15	90		5.0						
6		OOD	OK	LAN6002KR	Kazakh (Russian) language	5	2	2			5/150			45			15	90		5.0						
7		OOD	OK	ICT6001	Information and Communication Technologies	5	2	2			5/120	15	30.0				15	60		5.0						
8		OOD	OK	SPS6004	Culturology	2	2	2			2/60	15		15			15	15		2.0						
9		OOD	OK	PhC6005	Physical Culture	4	2	2			4/120			45			15	60		4.0						
10		OOD	OK	SPS6003	Political science	2	3	3			2/60	15		15			15	15			2.0					
eleven		OOD	OK	SPS 6002	Sociology	2	3	3			2/60	15		15			15	15			2.0					
12		OOD	OK	PhC6006	Physical Culture	4	3	3			4/120			45			15	60			4.0					
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	8	8			5/150	15		30			15	90								5.0
15		OOD	HF	MGT6706	Startups and Entrepreneurship						5/150	15		30			15	90								
16		OOD	HF	JUR 6470	Fundamentals of law and anti-corruption culture						5/150	15		30			15	90								
17		OOD	HF	JUR 6507	Fundamentals of ecology and life safety						5/150	15		30			15	90								
18		DB	VC	MAT6002	Mathematical analysis	6	1	1			6/180	30		30			15	105	6.0							

19		DB	VC	SFT6201	Algorithmization and programming	6	1	1			6/150	15	30.0	15			15	75	6.0							
20		DB	VC	SEC6217	Legal basis for information security	4	1	1			4/120	15		30			15	60	4.0							
21		DB	VC	MAT6001	Algebra and geometry	4	2	2			4/120	15		30			15	60		4.0						
22		DB	VC	PP6205	Educational practice	2	2				2/60					60	0	0		2.0						
23		DB	VC	PHY6001	Physics	4	3	3			4/90	15	30.0				60	-15			4.0					
24		DB	VC	MAT6018	Mathematical foundations of information security	6	3	3			6/180	30		30			15	105			6.0					
25		DB	VC	SFT6207	Object Oriented Programming (Java)	6	3	3			6/150	15	30.0	15			15	75			6.0					
26		DB	VC	NET6201	Computer Networking Basics	6	3	3			6/150	15	30.0	15			15	75			6.0					
27		DB	VC	LAN6007K	Office work in the state language	2	4	4			2/60	15		15			15	15				2.0				
28		DB	VC	LAN6004PA	Professionally oriented foreign language	2	4	4			2/60	15		15			15	15				2.0				
29		DB	VC	SFT6208	Web technologies	4	4				4/105	15	15.0	15			15	45				4.0				
thirty		DB	VC	EGR6201	Linux operating system basics	4	4	4			4/105	15	15.0	15			15	45				4.0				
31		DB	VC	NET6202	Basics of Switching, Routing, and Wireless Networking	6	4	4			6/150	15	30.0	15			15	75				6.0				
32		DB	VC	EEC6001	Theory of electrical circuits	4	4	4			4/90	15	30.0				15	30				4.0				
33		DB	VC	EGR6202	Information theory	4	5	5			4/90	15	30.0				15	30					4.0			
34		DB	VC	SFT6211	Organization of database management systems	4	5	5			4/105	15	15.0	15			15	45					4.0			
35		DB	VC	EEC6661	Digital circuitry	4	5	5			4/90	15	30.0				15	30					4.0			
36		DB	VC	EEC6662	Electronics	5	5	5			5/120	15	30.0				15	60					5.0			
37		DB	VC	SEC6204	Project Management in Information Security	4	6	6			4/90	15	30.0				15	30						4.0		
38		DB	VC	HRD6202	IoT technologies	4	6	6			4/105	15	15.0	15			15	45						4.0		
39		DB	VC	RM6202	Research Methodology	2	8	8			2/60	15		15			15	15								2.0
40		PD	VC	PP6202	Internship	4	4				4/120					120	0	0				4.0				
41		PD	VC	SEC6201	Technologies for protecting computer information	4	4	4			4/105	15	15.0	15			15	45				4.0				
42		PD	VC	SFT6210	Python programming language	4	5	5			4/105	15	15.0	15			15	45					4.0			

43		PD	VC	PP6203	Internship	4	6				4/120					120	0	0						4.0		
44		PD	VC	SEC6202	Network 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	SEC6215	IoT Security	6	7	7			6/150	15	30.0	15			15	75							6.0	
47		PD	VC	HRD6204	Microcontroller programming	6	7	7			6/150	15	30.0	15			15	75							6.0	
48		PD	VC	PP6204	Undergraduate practice	5	8				5/150					150	0	0								5.0
49		PD	HF	SFT6503	Data Analysis (Python)	5	5	5			5/120	15	30.0				15	60					5.0			
50		PD	HF	SFT6309	UX/UI development						5/120	15	30.0				15	60								
51		PD	HF	EPP4106	Internet entrepreneurship						5/120	15	30.0				15	60								
52		PD	HF	SFT6508	Introduction to machine learning	5	6	6			5/120	15	30.0				15	60						5.0		
53		PD	HF	SFT6311	Front End Development						5/120	15	30.0				15	60								
54		PD	HF	SFT6185	Data Analytics						5/120	15	30.0				15	60								
55		PD	HF	SEC6233	Introduction to Intelligent Cybersecurity	4	6	6			4/105	15	15.0	15			15	45						4.0		
56		PD	HF	HRD6205	Computer systems architecture						4/105	15	15.0	15			15	45								
57		PD	HF	SFT6540	Machine learning-2	5	7	7			5/120	15	30.0				15	60								
58		PD	HF	SFT6314	Full stack development						5/120	15	30.0				15	60							5.0	
59		PD	HF	BDO 4310	Oracle NoSQL databases						5/120	15	30.0				15	60								
60		PD	HF	SEC6205	Mobile technology security	4	7	7			4/105	15	15.0	15			15	45							4.0	
61		PD	HF	SEC6213	Digital forensics						4/105	15	15.0	15			15	45								
62		PD	HF	SEC6234	Introduction to cloud technology	4	7	7			4/105	15	15.0	15			15	45							4.0	
63		PD	HF	SEC6211	Securing database management systems						4/105	15	15.0	15			15	45								
64		PD	HF	SFT6206	Development of corporate applications on the Django framework	6	7	7			6/150	15	30.0	15			30	60							6.0	
65		PD	HF	SEC6208	Practical Pentesting						6/150	15	30.0	15			30	60								
66		PD	HF	NET6207	DevNet	5	8	8			5/135	15	15.0	15			15	75								5.0
67		PD	HF	SEC6237	Information Security Center Analytics						5/135	15	15.0	15			15	75								

68		PD	HF	SEC6222	Reverse engineering	4	8	8			4/90	15	30.0				15	30								4.0
69		PD	HF	SEC6235	Biometric access control systems						4/90	15	30.0				15	30								
Average weekly load in hours																			0	0	0	0	0	0	0	0
1	General education disciplines (OOD)					56		14	0	0	1650	120	30	420	0	0	210	870	15	23	8	0	5	0	0	5
	Required Component(OOD/OK)					51		13	0	0	1500	105	30	390	0	0	195	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
	Optional component(OOD/KV)					5		1	0	0	150	15	0	30	0	0	15	90	0	0	0	0	0	0	0	5
2	Basic disciplines (DB)					93		20	0	0	2370	345	360	285	0	60	360	1020	16	6	22	22	17	8	0	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)					93		20	0	0	2370	345	360	285	0	60	360	1020	16	6	22	22	17	8	0	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)					83		15	0	0	1755	225	345	150	0	390	240	795	0	0	0	8	9	21	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)					41		6	0	0	705	90	135	75	0	390	90	315	0	0	0	8	4	12	12	5
	Selectable component (PD/CV)					42		9	0	0	1050	135	210	75	0	0	150	480	0	0	0	0	5	9	19	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
	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	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	0
	University component (BDLR / VK)					0		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	0
Total Curriculum						232			0	0	5775	690	735	855	0	450	810	2685	31	29	30	30	31	29	31	21
6	Additional types of training														Amount of credits			Semester			Number of hours			Number of weeks			

7	Final assessment module (MIA)	8		240.0			
Total with account. IGA		240		7200.0			

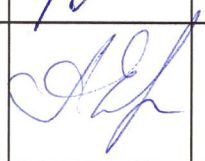
6. Additional educational programs(Minor)

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 sheetwith developers

Name of the educational program:6B06302"Hardware Security" (Hardware information 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