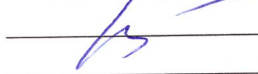


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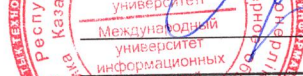
Chairman of the Educational and Methodological Council JSC «International University of Information Technologies»


A.K. Mustafina
2023

APPROVE

Rector

JSC «International University of Information Technologies»


A.K. Khikmetov
2023



DOUBLE DEGREE EDUCATIONAL PROGRAM

6B06305 «Hardware security»

Education Area Code and Classification: 6B06 – Information and Communication Technologies
Code and Classification: 6B061 – Information and Communication Technologies
Group of education programs: B063 – Information security
Level according to the International Standard Classification of Education (ISCE): 6
Level according National Qualifications Framework (NQF): 6
Level according Industry Qualifications Framework (IQ): 6
Duration of study: 4 years
Credits: 240

AGREED

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


V.V. Pokusov
2023



APPROVE

Director of the National Innovation Center


2023



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List of abbreviations and symbols

IN	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	European Association for Quality Assurance in Higher Education/European-Russian Association for Quality Assurance in Higher Education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
FIBAA	International agency (non-profit foundation) for accreditation and examination of the quality of higher education (Bonn, Germany)
IQM-HE	Internal Quality Management in Higher Education
TACIS	Technical Assistance for the Commonwealth of Independent States
WSI	WorldSkills International

1. Description of the educational program

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 recommendations 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 dated 12/05/2022), follows new trends from the Atlas of Emerging Jobs, Regional With standards, national framework and qualifications and Sectoral qualifications framework according to level 6.

Educational program "6B06305- Hardware Security" 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 based on 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

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.

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. Prepare graduates for professional activities in the field of information security using technical means.
3. ABOUT to provide market demand by specialists in information security hardware.
4. WITH create 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 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	6B06305 "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

		<p>4) Maintenance of the technical section of the information security system during its operation</p> <p>5) Conducting special inspections and evaluations security objects of protection</p> <p>Application of the main provisions of regulatory legal acts in the field of information security</p>
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	6th level
10	<p>List of competencies of the educational program:</p> <p>CC1. 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, development of cultural wealth as a factor in the harmonization of personal and interpersonal relationships.</p> <p>CC2. 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</p> <p>CC3. The ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology, and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.</p> <p>CC4. The ability for written and oral communication in the state language and the language of interethnic communication, the ability to use foreign sources of information, to have communication skills, to public speaking, argumentation, discussion, and polemics in a foreign language</p> <p>CC5. 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 during professional activity, and the ability to involve the appropriate mathematical apparatus to solve it</p> <p>PC1. The ability to find organizational and managerial solutions in non-standard conditions and in the conditions of various 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</p>	

	<p>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</p> <p>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</p> <p>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</p> <p>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</p> <p>PC6. The ability to apply equipment diagnostics and testing tools, the ability to consider 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</p> <p>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, to 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 processing and visualization of data necessary for this</p> <p>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</p> <p>PC9. The ability to apply methods of protecting 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</p>
11	<p>LO1. Ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology, and life safety. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.</p> <p>LO2. The ability for written and oral communication in the state language and the</p>

language of interethnic communication, the ability to use foreign sources of information, to have communication skills, to public speaking, argumentation, discussion, and polemics in a foreign language

LO3. The ability to form and develop skills and intercultural competencies in the field of organization, planning and management of production, the ability to generalize, analyze, predict when setting goals in the professional field and choose ways to achieve them using scientific research methodology, as well as apply psychological techniques for social advancement

LO4. 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 during professional activity, and the ability to involve the appropriate mathematical apparatus to solve it

LO5. The ability to find organizational and managerial solutions in non-standard conditions and in the conditions of various 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

LO6. 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, as well as reverse-engineer program code

LO7. Master the mathematical apparatus for engineering calculations in the field of design and modeling of software and AO, as well as use data science to develop advanced application software in the field of information security and be able to use artificial intelligence and machine learning methods

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LO9. Master the mathematical apparatus for engineering calculations in the field of design and modeling of software and AO, as well as use data science to develop advanced application software in the field of information security and be able to use artificial intelligence and machine learning methods

LO10. The ability to consider 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 relation to modern biometrics and authentication tools

LO11. The ability to develop user interfaces for web applications and mobile applications, organize tools and methods for their protection from modifications, the ability to develop database models and solutions using cloud computing, the ability to develop components of software systems, protect databases and cloud storage, use modern tools and programming technologies, the ability to organize the interaction of devices, the architecture of components, as well as organize the processing and visualization of data necessary for this

LO12. Design the topology of printed circuit boards, constructive and technological modules of the first level using application packages, analyze microprocessor devices, apply tools for debugging and testing embedded systems, apply them for the design and security of IoT devices and biometric access systems

LO13. The ability to apply the theory and principles of design, organization, administration, and security of operating systems, debugging wired and wireless networks, the ability to install, debug network devices and system software components, configure hardware and element base for putting information systems into operation

12	Form of study	full-time
13	Languages of instruction	English
14	Volume of loans	240
15	Awarded Academic Degree	Bachelors in information and communication Technologies in the educational program "6B06305-Hardware security"
16	Developer(s) and authors:	JSC "International University of Information Technologies", Department of Cybersecurity: - 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

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO 11	LO 12	LO 13
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	V
PC 8								V	V	V	V	V	V
PC 9									V	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	<p>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 under 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 the key point of 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 development of Kazakhstan, as an independent sovereign state. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural, and ideological ties between East and West, South and North, between Europe and Asia, between the largest state formations of the Eurasian continent. At various stages of history, states with an original cultural history arose and developed on the territory of Kazakhstan, the heir of which was modern Kazakhstan. The task of teaching the discipline is to trace the continuity of the idea of statehood through all the above periods of history and to transfer the rich historical and cultural heritage through the centuries to the current generation. Located in the center of Eurasia, Kazakhstan found itself at the crossroads of the most ancient civilizations of the world, at the intersection of transport arteries, social and economic, cultural, and ideological ties between East and West, South and North, between Europe and Asia, between the largest state formations of the</p>	5	CC1	No	Philosophy

		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	CC1	History of Kazakhstan	Culturology
3	Foreign language 1 (German)	The course is designed to study the basic vocabulary of a common language, representing a neutral scientific style and professional vocabulary; the basic lexical and grammatical norms of a foreign language, the lexical minimum in the amount necessary to work with professional literature and interact in German;	10	CC4	Professionally oriented foreign language	Foreign language
4	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	CC4	No	Professional foreign language

5	Kazakh (Russian) language	The course occupies a special place in the system of training bachelors with an engineering education. For students at 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	CC4	No	Professional Kazakh (Russian) language
6	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
7	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	CC1	No	Culturology
8	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 conducted 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	CC1	No	Psychology

9	Psychology	This course presents the issues of psychology in a broad educational and social context. The knowledge, abilities and skills acquired and formed because 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 collaborating with people - representatives of different social groups and age categories.	2	CC1	Sociology	Culturology
10	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	CC1	Sociology	Psychology
11	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	CC1	No	
Cycle of general education disciplines University Component/Elective Component						
12	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	CC2	Mathematical analysis	Diploma design
13	Fundamentals of Scientific Research	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 completion of a graduation project (work).	5	CC 3	ICT	Diploma design

Cycle of basic disciplines University component						
14	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	PC3 CC5	No	Mathematical analysis
15	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 CC5	Algebra and geometry	Information theory
16	Physics	Study the basic laws of classical mechanics, special relativity, electromagnetic phenomena, quantum mechanics, thermodynamics in search of ways to solve physical problems	4	CC5	Mathematical analysis	Theory of electrical circuits
17	Information theory	The course aims to study error-correcting codes, considering the information redundancy limit. Estimate discretization and quantization errors	4	PC3, PC5	Algebra and geometry	Theory of electrical circuits
18	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 CC5	Mathematical analysis	Information theory
19	Design and simulation of	This course provides a basic understanding of semiconductor materials - characteristics, principles of operation and applications; provides insight useful for understanding	4	PC3, PC6	Physics	IoT technologies

	electronic devices	semiconductor devices and technologies; semiconductor physics, pn-junction diodes, metal-semiconductor contacts, heterojunctions, transistors.				
20	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)
21	Object Oriented Programming (Java)	A course to learn how to write applications using Java technologies	6	PC2	Algorithmization and programming	Subject elective module 1
22	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	PC1, PC8, CC1	No	Technologies for protecting computer information
23	Professional Kazakh (Russian) language	Training in the discipline "Professional Kazakh (Russian) Language" is aimed at developing students' in-depth linguistic and communicative competence based on the language of the specialty and professional terminology, which will contribute to the improvement of professional training and provide systematic self-training.	2	CC4	Kazakh (Russian) language	Diploma design
24	Professionally oriented foreign language	Includes a grammar course, lexical material of a professional nature and texts of a professional orientation.	2	CC4	Foreign language	Diploma design
25	Educational practice	The course is designed to study the basics of information security	2	PC4	Algorithmic language	Internship

					ges and progra mmin g	
Cycle of basic disciplines Selectable Component						
26	Compute r Networki ng Basics	The course is aimed at studying the principles of network technologies, gaining access to local and remote network resources.	6	PC5	Infor matio n and Com munic ation Techn ologie s	Routin g Basics, switchi ng and wireles s networ ksth
27	Linux Operatin g System Essential s	The course provides students with basic knowledge of working with Linux and basic Linux command line skills.	4	PC4	Infor matio n and Com munic ation Techn ologie s	Operati ng system security
28	Theory of electrical circuits	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	Physic s	IoT technolo gies
29	Fundame ntals of Switchin g, Routing, and Wireless Networki ng	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	PC5	Funda menta ls of comp uter netwo rks	Operati ng system security

30	Organization of database management systems	The course provides knowledge and skills in database design, from the conceptual stage to physical implementation.	4	PC7	Object Oriented Programming	data science
31	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	Diploma design
32	Computer Information Protection Technologies	Basic methods and principles of information security	4	PC8	Fundamentals of computer networks	Linux operating system basics
Cycle of major disciplines University Component/Elective Component						
33	Internship	Study of information security technologies	4	PC8	2 course: Technologies for protecting computer information 3 course: Industrial practice 2 course s	Diploma design
34	Undergraduate practice	Collecting material for writing a graduation project	5	PC8	Disciplines 3rd and	Diploma design

					4th course	
35	Python programming language	The course teaches how to use data structures, functions, modules, classes when programming in Python.	4	PC2, PC7	Algorithmization and programming	Operating system security
36	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.	6	PC6	Theory of electrical circuits	Design and simulation of electronic devices
37	Blockchain technologies	The course is dedicated to learning the basics of blockchain technology. The course examines the practice of applying blockchain technologies in bitcoin and ethereum cryptocurrencies, as well as other industries. The discipline is based on cryptographic knowledge and includes materials on the development of smart contracts, various consensus algorithms, etc.	4	PC9	Biometric access control systems	Diploma design
38	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.	4	PC1, PC5	Blockchain technologies	Diploma design
39	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.		PC9	data science	Diploma design
40	Reverse engineering	This course is devoted to the study of the process of analysis (disassembly) of the machine code of the program, the restoration of the algorithm, the detection of undocumented program features using the methods of static or dynamic code		PC8, PC9	Blockchain technologies	Diploma design

		analysis. During the course, both methods and special programs for restoring the source code are used.				
41	Fundamentals of Logic Design	"This course is designed and formulated to help students understand, solve, and design digital logic circuits. By completing this course, students will learn about the logic behind 21st century technology. This course contains detailed lectures that go beyond defining or describing logical elements, but also examples and problems through which you can learn the actual implementation and operation of logic elements. "	4	PC6	IoT technologies	Theory of electrical circuits
42	Cloud computing	The discipline is aimed at obtaining practical skills in using modern cloud infrastructures, platforms, and services to create applications and solve typical problems. The course examines the concept and models of cloud computing, the architecture and implementation principles of scalable, universally available cloud-based applications, modern practices for developing cloud-native applications, as well as existing cloud solutions for organizing data storage and processing. The discipline has a practical focus and includes homework for developing, deploying, and testing applications in a real public cloud.	5	PC6	Information Security Center Analytics	Diplom a design
43	Advanced Software Development	This course is devoted to the study of command programming, the correct distribution of workload and tasks, the modular implementation of projects and methods for integrating separately implemented modules.	5	PC7, PC3	Interdisciplinary software development project	Diplom a design
44	Intercultural competence	Intercultural competence is part of a family of concepts including global competence, graduate qualities, employability skills, global citizenship, education for sustainable development, and global employment opportunities. At the heart of all these concepts is the recognition of globalization as a driver of change in all aspects of the modern world, as well as the importance of graduates being able to participate and act globally.	5	PC4	Culture	Philosophy
45	Interdisciplinary software	Software projects are inherently interdisciplinary, drawing on many diverse types of skills and knowledge, both IT-related (e.g.,	5	PC8	Advanced Software	Diplom a design

	development project	project management, analysis and design, user interfaces, coding, testing, ...) and non-IT (for example, knowledge of a software application area, say, accounting, healthcare, or the arts).			re Development	
46	data science	This course is devoted to the study of methods for processing and extracting useful information from arrays of structured or unstructured data. The course includes a set of techniques and methods of Cyber Threat Hunting, with the help of which Hunting is conducted and which carry specific principles of working with data.	5	PC7	Information Security Center Analytics	Organization of database management systems
47	Applied AI	Introduction to the field of applied AI. The basic principles are taught, and the chosen methods and approaches are theoretically explained and evaluated in practice.	5	PC2	Biometric access control systems	Diploma design
48	Subject elective module 1	The elective is chosen from the following subjects <ul style="list-style-type: none"> - Data Analysis and Data Mining (FWPM) - Deep Learning for Natural Language Understanding (FWPM) - Digital technology (FWPM) - Embedded Systems (FWPM) - Industry 4.0 in planning and production (FWPM) - Industrial Data Analysis (FWPM) - Cryptology (FWPM) - Project Management (FWPM) - RESTful Web Services (FWPM) - Corporate Governance (FUUP) 	5	PC2	Object Oriented Programming (Java)	Subject elective module 2
49	Subject elective module 2	The elective is chosen from the following subjects <ul style="list-style-type: none"> - Data Analysis and Data Mining (FWPM) - Deep Learning for Natural Language Understanding (FWPM) - Digital technology (FWPM) - Embedded Systems (FWPM) - Industry 4.0 in planning and production (FWPM) - Industrial Data Analysis (FWPM) - Cryptology (FWPM) - Project Management (FWPM) - RESTful Web Services (FWPM) - Corporate Governance (FUUP) 	5	PC2	Subject elective module 1	Subject elective module 3

50	Subject elective module 3	<p>The elective is selected from the following subjects:</p> <ul style="list-style-type: none"> - .NET Programming in C# (FWPM) - Artificial Intelligence in Robotics (FWPM) - Introduction to Microsoft Dynamics NAV (FWPM) - Evaluation and selection of a standard software package (FWPM) - Geographic Information Systems (GIS) -Principles of Electrical Engineering (FWPM) - Internet of Things (FWPM) - IT security (FWPM) - Software Reverse Engineering (FWPM) -Web Technology and Web Marketing in the Cloud (FWPM) 	5	PC2	Subject elective module 2	Subject elective module 4
51	Subject elective module 4	<p>The elective is selected from the following subjects:</p> <ul style="list-style-type: none"> - .NET Programming in C# (FWPM) - Artificial Intelligence in Robotics (FWPM) - Introduction to Microsoft Dynamics NAV (FWPM) - Evaluation and selection of a standard software package (FWPM) - Geographic Information Systems (GIS) -Principles of Electrical Engineering (FWPM) - Internet of Things (FWPM) - IT security (FWPM) - Software Reverse Engineering (FWPM) -Web Technology and Web Marketing in the Cloud (FWPM) 	5	PC2	Subject elective module 3	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	LO1, LO4	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
			Intercultural competence
Language module	LO2	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.	Culturology
			Foreign language
			Kazakh (Russian) language
			Foreign language 1 (German)
			Professional Kazakh (Russian) language
			Professionally oriented foreign language

ICT module	LO5	$O \geq (F / P) * 100\%$ <p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	Information and Communication Technologies
BASIC MODULES			
Natural science module	LO3	$O \geq (F / P) * 100\%$ <p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	Algebra and geometry Mathematical analysis Physics Information theory Mathematical foundations of information security
Programming languages module	LO7	$O \geq (F / P) * 100\%$ <p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	Algorithmization and programming Object Oriented Programming (Java) Python programming language Subject elective module 1 Subject elective module 2 Subject elective module 3

			Subject elective module 4
	LO10, LO11	$O \setminus u003d (F / P) * 100\%$ <p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	Organization of database management systems data science Theory of electrical circuits
Hardware module			Fundamentals of Logic Design
Computer Network Fundamentals Module	LO8	$O \setminus u003d (F / P) * 100\%$ <p>where O - assessment of academic performance (training, productivity), F - the actual amount of acquired knowledge, skills; P - the full amount of knowledge, skills, proposed for assimilation.</p>	IoT technologies Fundamentals of computer networks Fundamentals of Switching, Routing, and Wireless Networking
OS security module	LO5		Linux operating system basics

		<p>$O = \frac{F}{P} * 100\%$, 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.</p>	Operating system security
Module of scientific activity and project management	LO1	<p>$O = \frac{F}{P} * 100\%$, 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.</p>	Fundamentals of Scientific Research Economics and organization of production Interdisciplinary software development project
	LO6, LO9, LO12	<p>$O = \frac{F}{P} * 100\%$, 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.</p>	Computer Information Protection Technologies Cloud computing Legal basis for information security Reverse engineering Database system management protection Blockchain technology Information Security Center Analytics
Information security technology module			

PROFESSIONAL MODULES

<p>Hardware security module</p>	<p>LO11, LO13</p>	<p>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.</p>	<p>Applied AI Biometric access control systems</p>
<p>Final assessment module</p>	<p>LO1-LO13</p>		<p>Writing and defense of the graduation project</p>

5. Curriculum of the educational program

Module code	Module name	The cycle of discipline	Discipline Component	Discipline Code	Name of the discipline	Academic credits	Academic period of	Control by academic periods			Number of hours						Distribution of credits by academic periods													
								Exams	Differentia	Coursewor	Total		Classroom work		SRO		Lectures		Laboratory		Practical		Studio		Practice		SROP		SRO	
General modules																														
Specialty/educational program modules																														
Additional modules outside the qualification																														
Optional modules																														
1	OO D	OO D	O K	PhC6001	Physical Culture	2	1	1		2/6	0	30				15	15	2.0												
2	OO D	OO D	O K	SPS6003	Political science	2	1	1		2/6	0	15				15	15	2.0												

33		DB	V C	EGR6202	Information theory	4	5	5						15	30					4.0	
33		DB	V C	EEC6005	Fundamentals of Logic Design	4	5	5						15	30					4.0	
34		DB	V C	HRD6202	IoT technologies	6	5	5					15	15	30	15	75			6.0	
35		DB	V C	SFT6211	Organization of database management systems	4	5	5					15	15	15	45				4.0	
36		DB	V C	SEC6223(HOF)	Foreign language 1 (German, part 1)	5	6	6					15	15	15	75				5.0	
37		DB	V C	SEC6225(HOF)	Cloud computing	5	6	6					15	15	15	75				5.0	
38		DB	V C	SFT6209(HOF)	Advanced Software Development	5	7	7					15	15	15	75				5.0	
39		DB	V C	SEC6228(HOF)	Foreign language 1 (German, part 2)	5	7	7					15	15	15	75				5.0	
40		DB	V C	SEC6230(HOF)	Intercultural competence	5	7	7					15	15	15	75				5.0	
41		DB	V C	ECO6004	Economics and organization of production	4	8	8					15	15	15	60				4.0	

43	DB	H F	SEC6226(HOF)	Subject elective module 1	5	6	6		5/1 35	15	15.0	15	15	75				5.0
44	PD	V C	PP6202	Internship	4	4			4/1 20	120				0	4.0			
45	PD	V C	SEC6202	Operating system security	4	5	5		4/9 0	15	30.0	15	30			4.0		
46	PD	V C	SFT6210	Python programm ing language	4	5	5		4/1 05	15	15.0	15	15	45		4.0		
47	PD	V C	PP6209(H OF)	Interdiscipli nary software developmen t project	5	6	6		5/0					0				5.0
48	PD	V C	SEC6224(HOF)	data science	5	6	6		5/1 35	15	15.0	15	15	75				5.0
49	PD	V C	SEC6229(HOF)	Applied AI	5	7	7		5/1 35	15	15.0	15	15	75				5.0
50	PD	V C	PP6204	Undergradu ate practice	5	8			5/1 50			150		0				5.0
51	PD	V C	SEC6238	Blockchain technology	4	8	8		4/9 0	15	30.0	15	30					4.0
52	PD	H F	SEC6227(HOF)	Subject elective module 2	5	6	6		5/1 35	15	15.0	15	15	75				5.0
53	PD	H F	SEC6231(HOF)	Subject elective module 3	5	7	7		5/1 35	15	15.0	15	15	75				5.0
54	PD	H F	SEC6232(HOF)	Subject elective module 4	5	7	7		5/1 35	15	15.0	15	15	75				5.0

5	PD	H F	SEC6235	Biometric access control systems	4	8	8	4/1 05	15	15	15	15	15	45	15	45	4.		
5	PD	H F	SEC6237	Information Security Center Analytics				4/1 05	15	15	15	15	15	45			0		
5	PD	H F	SEC6222	Reverse engineering				4/1 05	15	15	15	15	15	45			0		
7	Average weekly load in hours																		
1	General education disciplines (OOD)				56			1 0 0	165 0	12 30	45 0	0 0	24 81	1 1 1	7 2 4	0 0 0	0 0 0	0 0 0	
	Required Component (OOD/OK)				51		1 0 0	150 0	10 30	42 0	0 0	22 72	1 1 1	7 2 4	0 0 0	0 0 0	0 0 0	0 0 0	
	University component (OOD / VK)				5		1 0 0	150 0	15 0	30 0	0 0	15 90	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)				0		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
2	Basic disciplines (DB)				12		2 0 0	315 0	42 42	39 0	60 0	42 15	1 1 1	2 2 1	2 2 1	1 1 1	1 1 1	4 4 4	
	Required Component (DB/OK)				1		6 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	2 5 2	5 2 8	5 5 5	0 0 0	0 0 0	0 0 0
	University component (DB/VC)				11		2 0 0	301 5	40 40	37 0	60 0	40 14	1 1 1	2 2 1	2 2 1	1 1 1	1 1 1	4 4 4	
	Optional Component (OD/KV)				5		1 0 0	135 5	15 15	15 0	0 0	15 75	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
3	Major disciplines (PD)				55		1 0 0	106 5	13 16	10 0	27 0	13 52	0 0 0	0 0 0	4 8 1	5 5 5	1 1 1	1 1 1	3 3 3
	Mandatory component (PD/OK)				0		0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0
	University component (PD / VC)				36		6 0 0	555 0	75 10	45 5	27 0	75 25	0 0 0	0 0 0	4 8 1	5 0 0	1 5 9	0 0 0	0 0 0
	Selectable component (PD/CV)				19		4 0 0	510 0	60 60	60 0	0 0	60 27	0 0 0	0 0 0	0 0 0	0 0 0	5 1 4	0 0 0	0 0 0
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 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 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0	0 0 0



6. Additional educational programs (Minor)

The name of the additional educational program (Minor) indicating the list of disciplines that form the Minor	Total amount 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: 6B06305 "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	Imankulova Binara Bakytzhanovna Master of Science Senior Lecturer	05/21/2023	