Institute of Automation and Information Technology
Department of "Cybersecurity, information processing and Storage"

EDUCATIONAL PROGRAM
6B06301 - "INFORMATION SECURITY"

Code and classification of the field of education: 6B06 Information and communication technologies.
Code and classification of training directions: 6B063 Information security
Group of educational programs: B058 Information Security
Level based on NQF: 6
Level based on IQF: 6
Study period: 4
Amount of credits: 240

Almaty 2024

Educational program «6B06301 - Information security» was approved at a meeting of the Academic Council of KazNTU named after K.I.Satpayev.

Protocol No 1 of 1 «18» August 2024.

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of Kazntu named after K.I.Satpayev.

Protocol No. 7 of «26» ___04___2024.

The educational program "6B06301 - Information security" was developed by the academic committee in the direction "6B063 Information security"

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List of abbreviations and designations

IS Information security
ITP Individual training plan
EP Educational Program

1. Description of the educational program.

The educational program «Information Security» is aimed at teaching students general education, basic and specialized disciplines with the achievement of appropriate competencies:

- To provide practice-oriented training of specialists in the field of information security, ensuring the security of systems and networks, cryptographic and technical protection of information for operational and project activities.
- To prepare graduates for production and technological activities related to the process of organization, design, provision, management of databases, network technologies, cloud technologies, intrusion prevention and detection systems, organizational and legal aspects of information security, focused on meeting the expectations and requirements of users; to organizational and managerial activities related to maintenance, organization and information security management.

Create conditions for continuous professional self-improvement, development of social and personal competencies of graduates (broad cultural outlook, active citizenship, commitment, organization, diligence, sociability, ability to argue and make organizational and managerial decisions, knowledge of modern information technologies, fluency in several languages, striving for self-development and commitment to ethical values and a healthy lifestyle life, the ability to work in a team, responsibility for the final result of their professional activities, civic responsibility, tolerance), social mobility and competitiveness in the labor market.

The EP is based on the state educational standard for higher professional education; on the professional standard; Atlas of New Professions.

The content of the disciplines of the educational program has been developed taking into account the relevant educational programs of the world's leading universities, the international classifier of professional activity in the field of information security.

Graduates of the educational program "Information Security" are focused on the organization, design and development of systems for the protection and security of applied information for all sectors of the economy, government organizations and other fields of activity.

The educational program ensures the application of an individual approach to students, the transformation of professional competencies from professional standards and qualification standards into learning outcomes. Student–centered learning is provided - the principle of education, which assumes a shift of emphasis in the educational process from teaching (as the main role of the teaching staff in the "translation" of knowledge) to teaching (as an active educational activity of the student).

The educational program provides training of specialists in the field of information security in 3 directions:

- Security of systems and networks. Training of specialists who ensure the security of systems and network technologies of a wide range. The educational program provides the acquisition of knowledge on computer information security technologies, network technologies, organization of computing systems and networks, administration of systems and networks, security of cloud technologies, acquisition of skills in designing and developing secure databases, intrusion prevention and detection systems.
- Cryptographic protection of information. Training of specialists in cryptographic protection of information. The educational program provides the acquisition of knowledge on the mathematical foundations of cryptography, various models, methods and means of

cryptographic information protection, computer information protection technologies, the development and design of cryptographic information protection tools, the basics of standardization and certification of information security tools, the acquisition of skills in the construction of cryptographic information security tools.

Technical protection of information. Training of specialists in technical protection of information. The educational program provides the acquisition of knowledge in the field of electronics, digital circuitry, microprocessor technology, programming of microcontrollers, knowledge of various methods and means of technical protection of information, organization and management of the information security service, ensuring the continuous functioning and operational activities of IT support.

The educational program was developed on the basis of an analysis of the labor functions of information security engineers, system administrators, information security specialists stated in professional standards.

Representatives of Kazakhstani companies and associations, specialists of departmental structures in the field of protection and security participated in the development of the educational program.

In case of successful completion of the full bachelor's degree course, the graduate is awarded a bachelor's degree in information and communication technologies under the educational program "Information Security".

2. The purpose and objectives of the educational program

The purpose of the EP:
Training of a competitive generation of technical specialists in the field of information protection and security in the labor market, proactive, able to work in a team, possessing high personal and professional competencies

EP tasks:

– socio-humanitarian and professional training of bachelors in the field of information security in accordance with the development of science and production, as well as with the needs of clusters of information security of Kazakhstan, National Security of the Republic of Kazakhstan, national research centers, master's and doctoral studies of higher educational institutions;

- integration of educational and scientific activities;

- establishing partnerships with leading universities of the near and far abroad in order to improve the quality of education;

- expansion of relations with customers of educational services, employers in order to determine the requirements for the quality of training of specialists, conducting courses, seminars, master classes, internships, industrial practices.

The content of the educational program «Information Security» is implemented in accordance with the credit technology of training and is carried out in the state and Russian languages.

The educational program will make it possible to implement the principles of the Bologna process. Based on the choice and independent planning by students of the sequence of studying disciplines, they independently form an individual study plan (IUP) for each

semester according to the Working Curriculum and the Catalog of elective disciplines. The volume of mathematical, natural science, basic and language disciplines has been increased in the educational program.

The following disciplines are studied: "Digital circuitry", "Algorithmization and programming basics", "Information fundamentals of information security", "Organizational and legal aspects of information security and computer forensics", "Computer architecture and consistency of operations", "Security of operating systems", "Cryptographic information security systems", "Security of cloud technologies", "Computer Networks", "Blockchain Technologies", "Computer Information Protection Technologies", "Design and protection of server databases", "Social Engineering and Ethical Hacking", "Technical means and methods of information protection", "Designing secure Web applications", etc.

Students undergo practical training in banking structures, government and departmental structures, in such companies as JSC "National Information Technologies", LLP "Pacifica" - integrator in the field of information security, LLP "Galaxy", ALE «for Analysis and Investigation of Cyber Attacks», etc.

According to the academic mobility program, the best students have the opportunity to study at leading foreign universities according to the corresponding EP.

3. Requirements for evaluating the learning outcomes of an educational program

3. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	6B06 Information and communication technologies
2	Code and classification of training areas	6B063 Information security
3	Group of educational programs	B058 Information security
4	Name of the educational program	6B06301 Information Security
5	Brief description of the educational program	The purpose of the educational program is to teach students general education, basic and specialized disciplines with the achievement of relevant competencies.
6	Purpose of the EP	Preparation of a competitive generation of technical specialists in the field of information protection and security for the labor market, proactive, able to work in a team, possessing high personal and professional competencies
7	Type of EP	New EP
8	The level of the NRK	6
9	ORC Level	6
10	Distinctive features of the EP	
11	List of competencies of the educational program:	Information security, Network technology security, Cryptographic protection of information, Technical protection of information.
12	Learning outcomes of the educational program:	1 Ensure the integrity and reliability of data in databases using integrity constraints, views, triggers, and stored procedures. Perform backup, restore, monitoring and audit of database systems. Use the capabilities of the SQL language to protect database systems, manage access rights, and encrypt database objects. 2 The ability to understand and apply methodologies and technologies for performing graphic work on a computer, express technical ideas using a drawing, present diagrams in graphical form, use computer graphics tools and graphical dialogue. 3 To use the fundamental concepts of mathematics, physics and mechanics in professional activity. Carry out the proof of mathematical statements, solve mathematical problems and problems. Be competent in the application of information theory

		to ensure the protection and security of information. 4 Apply the basic methods of formalization of reasoning, the basic concepts of the theory of logical functions, the theory of algorithms, graph theory, coding theory; use the conceptual apparatus and methods of discrete mathematics for the analysis of mathematical models in solving problems of professional activity 5 Use methods of constructing various models of data types, algorithms for information processing; rationally use the opportunities provided by the algorithmization technique. Apply a unified modeling language, implement a structural and object-oriented approach to working with tools. 6 Perform typical tasks of designing, deploying and maintaining local and global networks; administer networks in modern operating systems. Ensure the security and fault tolerance of the network and servers. 7 Apply database technology for the safe organization, receipt, storage, processing and transmission of information. Master the basics of designing secure databases and ensuring their protection. Ensure the integrity and reliability of data in databases. Be competent in the creation, development and design of secure Web applications. 8 Know the architecture of computer systems, the principles of construction. Select the elements of electronic circuits, make the necessary calculations, make a mathematical description of the functioning of devices and determine their characteristics; determine the parameters of semiconductor devices and circuit elements. 9 Know the basics of information security and its problematic aspects. Be able to apply basic information security indicators. Ability to apply biometric information security technologies. Be

		able to use a number of algorithm implementations to solve practical problems 10 The ability to use virtualization systems and cloud technologies to solve practical problems and find vulnerabilities of virtual machines. Be able to apply standard security recommendations for cloud technologies and the Internet of Things. 11 Analyze the principles of building cryptographic algorithms; develop and apply cryptographic systems; analyze and solve issues of cryptographic protection of information and the use of modern cryptographic methods of information protection. The ability to apply the mathematical foundations of cryptosystem algorithms. 12 Select the elements of electronic circuits, make the necessary calculations. Participate in the development of projects of various electrical components and assemblies using microcontrollers. Programming in C. 13 Ability to perform practical analysis and use data leakage prevention systems. Manage security policies and all types of work of the information security service. Develop regulatory and methodological documents on the organization and functioning of the information security service. Be able to identify an attack based on social engineering and counteract the invasion. 14 The ability to identify possible channels of information leakage, to carry out technical measures for protection. Apply passive and active methods and means of information protection. Perform engineering and technical measures to protect and practically apply measures to protect objects and information from technical means of intelligence. 15 The ability to think logically, to master the methods of induction and deduction, to determine cause-and-effect relationships, to understand various situations, to be economically literate.

		16 The ability to organize events to ensure their own safety and the safety of teams in professional activities and social emergencies.
13	Form of training	Full - time
14	Duration of training	4-7 years old
15	Volume of loans	240
16	Languages of instruction	Russian, Kazakh, English (30%)
17	Academic degree awarded	
18	Developer(s) and authors:	

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)															
				RO1	RO2	RO3	RO4	RO5	RO6	RO7	RO8	RO9	RO10	RO11	RO12	RO13	RO14	RO15	RO16
Cycle of general education disciplines Required component																			
1.	Foreign language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency. During the transition from level to level, the prerequisites and post-prerequisites of discipline are observed.	10			V												V	
2.	Kazakh (Russian) language	The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course highlights the specifics of the scientific style in order to develop and activate professional and communicative skills and abilities of students. The course allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text.	10															V	
3.	Physical Culture	The purpose of the discipline is the practical use of the skills of performing the basic elements of athletics techniques, sports games, gymnastics and a set of standards	8																

		for general physical training, including professionally applied physical training or one of the sports, methods of conducting independent physical exercises.																	
4.	Information and communication technologies (in English)	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, about new information technologies, local and global computer networks, methods of information protection; to acquire skills in using text editors and tabular processors; to create databases and various categories of application programs.	5								v								
5.	History of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: introduction to the history of Kazakhstan; steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol conquest (XIII century); medieval states in the XIV-XV centuries. The main stages of the formation of the Kazakh statehood are also considered: the era of the Kazakh Khanate of the XV-XVIII centuries. Kazakhstan as part of the Russian Empire; Kazakhstan during the period of civil confrontation and under the conditions of a totalitarian system; Kazakhstan during the Great Patriotic War; Kazakhstan during the period of independence and at the present stage.	5																
	Philosophy	Philosophy forms and develops	5															v	

		critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and gives them a methodology for solving various theoretical and practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, promotes self-esteem, awareness of the value of human existence. It teaches how to think and act correctly, develops practical and cognitive skills, helps to search and find ways and means of living in harmony with oneself, society, and the world around us.																	
	Module of socio-political knowledge (sociology, political science)	The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is the key to effective professional activity of a future specialist, as well as for understanding political processes, for the formation of political culture, developing a personal position and a clearer understanding of the measure of their responsibility.	3																v
	Cultural studies and psychology	The module of socio-political knowledge (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal patterns of formation and development of culture, to develop their aspirations and skills of independent	5																v

		comprehension of the wealth of values of world culture for self-improvement and professional growth. During the course of cultural studies, the student will consider the general problems of the theory of culture, the leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of the formation and development of Kazakh culture, its most important achievements. During the course, students acquire theoretical knowledge, practical skills and skills, forming their professional orientation from the perspective of psychological aspects.																	
Cycle of general education disciplines University component																			
1	Fundamentals of anti-corruption culture	The discipline studies the essence, causes, causes of sustainable development of corruption from both historical and modern points of view. Examines the prerequisites and impacts for the development of an anti-corruption culture. Studies the development of anti-corruption on the basis of social, economic, legal, cultural, moral and ethical norms. Studies the problems of the formation of an anti-corruption culture based on the relationship with various types of social relations and various manifestations.	5															**V**	**V**
2	Fundamentals of Entrepreneurship and Leadership	The discipline studies the basics of entrepreneurship and leadership from the point of view of science	5															**V**	**V**

		and law; features, problematic aspects and prospects of development; theory and practice of entrepreneurship as a system of economic, organizational and legal relations of business structures; readiness of entrepreneurs for innovative receptivity. The discipline reveals the content of entrepreneurial activity, career stages, qualities, competencies and responsibilities of an entrepreneur, theoretical and practical business planning and economic expertise of business ideas, as well as risk analysis of innovative development, introduction of new technologies and technological solutions.																	
3	Ecology and life safety	The discipline studies the problems of ecology as a science, environmental terms, the laws of the functioning of natural systems and aspects of environmental safety in working conditions. Environmental monitoring and management in the field of its safety. Sources of pollution of atmospheric air, surface, groundwater, soil and ways to solve environmental problems; life safety in the technosphere; natural and man-made emergencies	5																v	v
Cycle of basic disciplines University component																			
1	Mathematics I	The course is designed to study the basic concepts of higher	5			v	v												

		mathematics and its applications. The main provisions of the discipline are used in the study of all general engineering and special disciplines taught by graduate departments. The course sections include elements of linear algebra and analytical geometry, an introduction to analysis, differential calculus of a function of one and several variables. The questions of methods for solving systems of equations, the application of vector calculus to solving problems of geometry, mechanics, physics are considered. Analytical geometry on the plane and in space, differential calculus of functions of one variable, derivative and differentials, study of the behavior of functions, Directional derivative and gradient, extremum of a function of several variables.																	
	Physics I	Objectives: to study the basic physical phenomena and laws of classical, modern physics; methods of physical research; the influence of physics on the development of technology; the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty. The sections are considered: mechanics, dynamics of rotational motion of a solid, mechanical harmonic waves,	5			v	v												

		fundamentals of molecular kinetic theory and thermodynamics, transport phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell equations.																	
	Mathematics II	The discipline is a continuation of Mathematics I. The sections of the course include integral calculus of a function of one variable and several variables, series theory. Indefinite integrals, their properties and methods of their calculation. Definite integrals and their applications. Improper integrals. Theory of numerical series, theory of functional series, Taylor and Maclaurin series, application of series to approximate calculations.	5			v	v												
	Physics II	The course studies the laws of physics and their practical application in professional activity. Solving theoretical and experimental-practical educational problems of physics for the formation of the foundations in solving professional problems. Assessment of the degree of accuracy of the results of experimental or theoretical research methods, modeling of physical condition using a computer, study of modern measuring equipment,	5			v	v												

		development of skills for conducting test studies and processing their results, distribution of the physical content of applied tasks of the future specialty.																	
	Mathematics III	The discipline is a continuation of Mathematics II. The course includes sections: ordinary differential equations and elements of probability theory and mathematical statistics. Differential equations with separable variables, homogeneous, in full differentials, linear inhomogeneous differential equations with constant coefficients, systems of linear differential equations with constant coefficients, finding the probability of events, calculating the numerical characteristics of random variables, using statistical methods for processing experimental data are studied.	5			v	v												
	Algorithmization and programming basics	The course examines the fundamental concepts of programming: operator, variable, procedure, function, data type. The basic structures of algorithms, such as linear, branched, cyclic, are considered. The course examines the basic forms of data representation:	4				v	v											

		strings, structures, arrays, lists. Separate topics are devoted to the creation of widespread sorting algorithms, the search for the minimum and maximum values in an array, string processing, iterative and recursive algorithms, the construction of block diagrams of algorithms and the development of programs based on them.																	
2	Архитектура компьютерных систем	Computing systems of various architectures are the hardware part of information technology, which reached a global character and content by the end of the XX century. Multiprocessor systems, which also include computer networks, allow by changing their architecture to optimize the parameters of the main processes of information technology: processing, accumulation, data transmission and knowledge representation.	5				v			v									
3	Operating System Security	The purpose of the discipline is to master the basic means and methods of ensuring information security. Upon completion, students will learn to understand the principles of building information security. Will be able to classify and evaluate threats to information security; master professional terminology in the	5						v				v						

		field of information security. Will be able to use the means of operating systems to ensure the efficient and safe functioning of automated systems; learn how to evaluate the effectiveness and reliability of protection of operating systems; acquire skills in planning the security policy of operating systems																	
4	Introduction to the specialty	The methods of designing WEB applications using modern web programming technologies and software tools for solving applied problems using methods of debugging and testing web applications in the loop-back system are studied. The discipline studies the basics of creating web applications; classification of software tools; structure of web programs; web applications running on the client and server side; principles of developing an interactive user interface; organization of navigation; interface of server interaction with application programs; syntax and notations of markup languages, data structures, and scripting languages. Students gain skills and an understanding of the current prospects and trends in	6				v					v							

		the development of web programming.																	
5	Introduction to Web Programming	The methods of designing WEB applications using modern web programming technologies and software tools for solving applied problems using methods of debugging and testing web applications in the loop-back system are studied. The discipline studies the basics of creating web applications; classification of software tools; structure of web programs; web applications running on the client and server side; principles of developing an interactive user interface; organization of navigation; interface of server interaction with application programs; syntax and notations of markup languages, data structures, and scripting languages. Students gain skills and an understanding of the current prospects and trends in the development of web programming.	5				v	v											
6	Discrete mathematics	The discipline deals with coding theory, set theory, graph theory, mathematical logic. Namely, the foundations of coding theory, set theory, graph theory; theory of logic algebra; mathematical apparatus for the synthesis and analysis of digital devices, transform Boolean functions, synthesizing minimal combinational circuits;	5			v	v												

		performing coding.																	
7	Information bases of information protection	Application of information theory in information security systems, basic concepts of information theory, measures and forms of representation of discrete information, number systems for representing numerical information, problems of information transmission, alphabetical representation of information, basics of encoding and encryption of discrete informatio	5			v	v												
8	Computer graphics	The course studies the generation of images on a computer, namely the mathematical and algorithmic foundations of computer graphics, raster graphics algorithms, 2D and 3D modeling, polygonal models. The technologies of using the OpenGL graphics library for generating 2D and 3D images, the use of auxiliary libraries are considered. After studying the discipline, students will be able to master any graphic tools, continue to study and use graphic libraries.	5		v														
9	Computer networks	The program of the training course is aimed at familiarizing students with the basics of organization, construction,	5						v										

		architecture and principles of functioning of computer networks. The course focuses on the application of skills to the organization of real networks and examines the communication tools, protocols and standards of networks. As a result of mastering the discipline, students will learn how to configure and configure communication tools, select firewalls, and operate computer networks.																	
13	Microelectronics	The principles of operation, parameters, characteristics and features of the use of semiconductor devices are considered. Designing various circuits of amplifiers of electrical signals and generators based on diodes, bipolar and field-effect transistors and testing the features of their functioning. Operational amplifiers. Differential amplifiers. Feedback. The influence of feedback on the main indicators and characteristics of amplifiers. Power amplifiers. Filter classification and composition	5			v					v				v				
14	Basics of cryptographic protection of information	This course examines the basic concepts, terms and concepts of the discipline. Cryptology, cryptography, cryptanalysis. Durability, security, imitation durability, authenticity. Modern cryptographic methods of	5			v								v					

		information protection. Basic principles of building cryptoalgorithms.																	
15	Designing and protecting server databases	The course examines the basics of designing secure databases and ensuring their protection. Students will learn how to use database technologies to solve practical problems of developing and protecting secure server databases. In addition, they will study ways of storing data at the physical level, types and ways of organizing file systems; – understanding problems and the main ways to solve them with collective access to data; – exploring the capabilities of DBMS that support various data organization models.	5	v						v									
16	Designing digital devices	The program of the course is aimed at acquainting students with the basics of designing digital devices. The course is devoted to the application of formal logic and the theory of automata for solving practical problems of designing digital devices.	5				v				v								
19	Digital Device Design	The program of the course is aimed at acquainting students with the basics of designing digital devices. The course is devoted to the application of formal logic and the theory of	5				v				v				v				

		automata for solving practical problems of designing digital devices.																	
Cycle of basic disciplines Component of choice																			
1	Vulnerability identification and analysis	The purpose of mastering the discipline is theoretical and practical training of students in the field of information security. The course content includes questions about typical vulnerabilities of network protocols, operating systems and applications. Concepts such as ethical hacking and social engineering are also considered. Methods of attacks on software systems, such as damage to program memory, code injection on the client or server side, etc., as well as methods and properties of modern programming languages to prevent the appearance of vulnerabilities of this kind are considered.	5														v	v		
2	Designing secure Web applications	The main trends in the development of Web technologies. The main standards of the Web network. The concept of Web applications and approaches to their development. Server	5						v	v									

		controls. Structure and design of the Web application. Web application security. Development of Web services. Organization of Web application security.																	
3	Blockchain Technologies	Principles, methods and means of blockchain technology to ensure the protection of information, countering threats to information security. The principles of using a replicated distributed database of blocks to ensure information security and the application of the blockchain network in various fields are also considered.	5						v	v			v						
4	Capstone project 1	The course will allow students to learn how to transform an idea into a concrete solution and determine the most optimal approach to its implementation. The course participants will gain a holistic understanding of the process, key techniques and tools necessary for the design, development and further development of their products and services. As a result, students will master the key principles of product design, get acquainted with the methods of rapid design of prototype solutions, apply	5			v	v	v					v						

		various techniques to form the optimal MVP functionality, learn how to plan the stages of work on the product and evaluate their complexity, will be able to find non-standard solutions to take into account the specific conditions of the tasks performed and develop innovative solutions.																	
5	Capstone project 2	The course is aimed at solving the problems of scaling your business and attracting investment. The purpose of the course is to form students' understanding of the process of attracting investment and scaling business and the formation of practical skills in the field of attracting investment in a startup. Planned results: Be able to search for various sources of financing and select potential investors for business, Be able to apply to accelerators, Be able to prepare investment documentation, Be able to create an investment presentation, Be able to present a project to a potential investor, Have pitching skills, Be able to make infographics.	4			v	v	v				v							
6	Java EE technologies	Basic concepts and terms. Java EE application architecture, client layer, medium layer, data access layer. Java EE technologies at various levels. Application servers, component	5				v	v											

		containers and components, their communication. Types of containers. Included APIs and functions: Servlet API, Java Server Pages, Java EE Security. Common design patterns in Java Enterprise.																		
Cycle of profile disciplines University component																				
1	Cloud Technology Security	The program of the training course is aimed at familiarizing students with the basics of cloud technologies and virtualization, ensuring their security. The course is dedicated to the application of virtualization technologies and cloud services for cloud computing.	5						v				v							
2	Cryptographic Information Security systems	Block encryption systems. Components of a modern block cipher. Execution modes of block ciphers. Streaming encryption systems. Pseudorandom number generators. Principles of using pseudorandom number generators in stream encryption. Asymmetric encryption systems. Effective encryption. Distribution of keys. Cryptographic protocols. Hash functions. Electronic digital signatures.	5			v	v			v				v						
3	Organizational and legal aspects of information security and computer	The purpose of mastering the	4															v	v	

	forensics	discipline is to familiarize students with the legal and organizational aspects of information security and the basics of computer forensics and cybercrime investigation. Issues considered in the course regarding the application of regulatory legal and other documents regulating information security. Students' acquisition of knowledge and skills will help in solving crimes related to computer information, in the study of digital evidence, methods of searching, obtaining and securing such evidence.																	
4	Database organization and security	The program of the training course is aimed at familiarizing students with the basics of organizing secure databases, their use for solving real problems. The course is devoted to the application of database technology to solve practical problems of database development and database applications.	5					v		v									
5	Fundamentals of students' research work	The course is aimed at forming a comprehensive understanding of the specifics of research work; mastering research methods that are most relevant to the subject of research; acquiring	4		v			v											v	

		skills and abilities of independent research activities. The course content includes the basic concepts and classification of science and scientific information: its sources and methods of processing; types and forms of educational research and research work of university students. The requirements for the technical design of scientific work are considered.																	
6	Social Engineering and Ethical Hacking	A systematic approach to computer security, methods of checking the security of various nodes of a computer network. Studying the tools of attackers, with their advantages and limitations. Methods of successful identification and elimination of security problems in mixed computer networks. The study of hacking techniques and methods of hacking in the context of the application of defensive practices and recommendations outlined by real hackers.	4						v								v			
7	Computer information protection technologies	Basic concepts, methods and technologies of computer information protection, anti-bookmarking technologies; application of modern technologies to solve practical	4						v			v								

		problems of computer information protection.																	
8	Human-computer interaction	A discipline dealing with the design, evaluation and implementation of interactive computing systems for human use, as well as with the study of the main phenomena related to these issues. The main place is devoted to approaches, methods and tools for the formation and evaluation of the user interface. The procedures of iterative prototyping of the interface, types of prototypes, software packages for prototyping and their comparative capabilities are considered.	4		v														
Cycle of profile disciplines Component of choice																			
1	Administration of systems and networks	The material is mostly practical and contains a minimal amount of theory. The course is suitable for both novice system administrators who want to configure the company's servers, and for network engineers, since most of the network equipment runs Linux and Windows.	5						v				v			v			
2	Internet of Things Security	Current components of typical IoT devices; trends for the future; limitations and interaction between the physical world and an IoT device; key network components for connecting an IoT device to the Internet; IoT	5						v				v						

		security issues.																	
3	Network technology security	Modern network technologies and the main trends in the creation of computer networks. Fundamentals of network technologies and terminology. Basic network models. Methods of network structuring, topologies, types of networks, services, requirements. Switching methods. Technologies for building networks. Standards, protocols, access methods, network configurations. Routing protocols, addressing, switching. VLSM, CIDR, VLSM technologies. Wireless technologies. Local area network design. Cybersecurity. Vulnerabilities of software and hardware of network technologies, classification. Cybersecurity of network technologies. Security of corporate networks. Security management.	5						v							v			
4	The Mathematics of Cryptography	Basic concepts, terms and concepts of the discipline. Cryptology, cryptography, cryptanalysis. Encryption. Durability, security, image resistance, authenticity. Modern cryptographic methods of	5		v	v								v					

		information protection, encryption. The basic principles of building crypto algorithms. Mathematical foundations of algorithms of asymmetric cryptosystems. Mathematical foundations of algorithms of symmetric cryptosystems. Research methods of cryptographic algorithms. Models of encryption systems. Mathematical foundations of electronic digital signature algorithms. Cryptographic key management. Steganography. Mathematical foundations and algorithms.																	
5	Microcontrollers	Programmable logic controllers (PLC, PLC) are microprocessor devices designed to perform control algorithms, the principle of operation of the PLC is to collect and process data according to the user's application program with the output of control signals to the actuators; the PLC can process discrete and analog signals, control valves, servos, frequency converters and other devices; solved tasks represent a set of programs; tasks can be called cyclically, by event, with maximum frequency.	5								V				V				
6	Organization and management of the information security service	Purpose of the information security service. The Information	5																

		Security Service as an information security management body and an integral part of the security system. Types and types of organizational structures of the information security service. Organizational bases and principles of the information security service. The procedure for creating an information security service. Principles of organization and activity of the information security service. Organization of interaction between the information security service and departments and external information security services. Technology, principles and methods of information security service management																
7	Organization of microprocessor systems	The main definitions, characteristics, areas of application and features of the operation of microprocessor tools. Organization of microprocessor systems. Design of microprocessor systems. Levels of representation of the microprocessor system. Architecture of Intel family microprocessors. Modes of operation of microprocessors. Organization of the memory subsystem in a PC. The main features of RISC processors. A system of interrupts and exceptions. Types and	5													v	v		v

		characteristics of interfaces. Programming the operation of individual blocks of microprocessor systems. Digital Signal Processors (DSP). Trends in the development of microprocessors.																	
8	Design of cryptographic information security systems	The program of the training course is aimed at familiarizing students with the basic principles of designing cryptographic information security systems, the use of cryptographic information security methods in the design and operation of information and communication technologies, cryptographic key management, key generation, storage and distribution.	5				v							v					
9	Intrusion prevention and detection systems	Risks and channels of information leakage, classification of information security violators. Extended persistent threats. Data leakage protection technologies. Data Leakage Prevention Systems (DLP). Tasks of DLP systems, components of the data leakage prevention system. Classification of DLP systems, methods for detecting confidential information. Stages of DLP systems. Development of a data leakage prevention system. Analytical tools for investigation and analysis of incidents. IPC technologies, IPC tasks, components. Integration of DLP systems with	5						v			v	v			v			

		IPS/IDS and SIEM systems.																
10	Standardization and Certification of cryptographic tools	Development of standardization and certification in the field of information security. Standardization and certification – prerequisites, goals and objectives. Conceptual model of information security. Theory and practice of standardization and certification in the field of information security. Development of a functional model of standardization and certification. General criteria for assessing the security of information technologies. Problems and prospects of standardization and certification development. Technical specifications and regulatory standards of standardization and certification. Modern principles of standardization and certification.	5				v							v					
11	Technical means and methods of information protection	Information protection should ensure the prevention of damage as a result of loss (theft, loss, distortion, forgery) of information in any form. The organization of information protection measures should be carried out in full compliance with applicable laws and regulations on information security, the interests of information users. In order to guarantee a high degree of information protection, it is necessary to constantly solve complex scientific and technical problems of developing and improving the means of its	5								v				v		v		

		protection.																	
12	Technologies for building cryptographic information security tools	The use of cryptographic protection of information. Principles of using encryption keys. Types of encryption using cryptographic protection of information. Public key infrastructure. Certificates. Certification authorities. Virtual private networks. Classification of virtual private networks. Technology for building a virtual private network. New directions in cryptography. Multibase cryptography. Quantum key distribution.	5			v							v					

5. Curriculum of the educational program

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board - Rector of KazNRTU named after K.Satpayev
M.M. Begentaev
«23» 05 2024 y.

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 6B06301 - "Information security"
Group of educational programs B058 - "Information security"

Form of study: full-time | Duration of study: 4 years | Academic degree: Bachelor's Degree in Information and Communication Technology

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lek/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters							
								I course		II course		III course		IV course	
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-1. Module of language training															
LNG 108	Foreign language	GED, RC	5	150	0/0/6	150	E	5							
LNG 108	Foreign language	GED, RC	5	150	0/0/6	150	E		5						
LNG 104	Kazakh (Russian) language	GED, RC	5	150	0/0/6	150	E	5							
LNG 104	Kazakh (Russian) language	GED, RC	5	150	0/0/6	150	E		5						
M-2. Module of physical training															
KFK 101-104	Physical Culture	GED, RC	8	240	0/0/8	120	Diff.credit	2	2	2	2				
M-3. Module of information technology															
CSE677	Information and communication technology	GED, RC	5	150	2/1/0	105	E			5					
M-4. Module of socio-cultural development															
HUM137	History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE	5							
HUM132	Philosophy	GED, RC	5	150	1/0/2	105	E			5					
HUM120	Module of socio-political knowledge (sociology, political science)	GED, RC	3	90	1/0/1	60	E			3					
HUM134	Module of socio-political knowledge (cultural studies, psychology)		5	150	2/0/1	105	E				5				
M-5. Module of anti-corruption culture, ecology and life safety base															
HUM136	Fundamentals of anti-corruption culture and law	GED, CCH	5	150	2/0/1	105	E				5				
MNG489	Fundamentals of Economics and Entrepreneurship														
CHE 656	Ecology and life safety														
MNG564	Fundamentals of financial literacy														
CYCLE OF BASIC DISCIPLINES (BD)															
M-6. Module of physical and mathematical training															
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	E	5							
PHY 111	Physics I	BD, UC	5	150	1/1/1	105	E	5							
MAT102	Mathematics II	BD, UC	5	150	1/0/2	105	E		5						
PHY112	Physics II	BD, UC	5	150	1/1/1	105	E		5						
MAT103	Mathematics III	BD, UC	5	150	1/0/2	105	E			5					
M-7. Module of basic training															
SEC114	Introduction to the specialty	BD, UC	5	150	2/1/0	105	E	5							
CSE536	Computer graphics	BD, UC	5	150	1/1/1	105	E					5			
ELC500	Microelectronics	BD, UC	5	150	2/1/0	105	E					5			
CSE603	Discrete mathematics	BD, UC	5	150	2/0/1	105	E			5					
SEC180	Digital circuitry	BD, UC	5	150	1/1/1	105	E						5		
CSE122	Computer networks	BD, UC	5	150	1/1/1	105	E				5				
SEC187	Designing digital devices	BD, UC	5	150	2/0/1	105	E						5		
CSE549	Architecture of computer systems	BD, UC	5	150	2/0/1	105	E							5	
CSE809	Designing and protecting server databases	BD, UC	5	150	2/1/0	105	E							5	
AAP179	Educational practice	BD, UC	2						2						
M-8.Programming module															
CSE554	Algorithmization and programming basics	BD, UC	4	120	1/1/1	75	E		4						
CSE827	Introduction to Web Programming	BD, UC	5	150	1/1/1	105	E			5					
CSE101	JAVA EE technologies	BD, CCH	5	150	1/1/1	105	E					5			
CSE551	Capstone project 1				0/0/3										
CSE530	1C programming				1/1/1										
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan				2/0/1										
M-9. Information protection and Security module															
SEC118	Information bases of information protection	BD, UC	5	150	2/0/1	105	E				5				
SEC100	Operating system security	BD, UC	5	150	1/1/1	105	E				5				

SEC181	Fundamentals of Cryptographic Information Protection	BD, UC	5	150	1/1/1	105	E					5			
CSE818	Introduction to the Blockchain	BD, UC	4	120	1/1/1	75	E						4		
CSE810	Designing secure Web applications	BD, CCH	5	150	1/1/1	105	E							5	
SEC532	Capstone project 2				0/0/3										
CSE817	1C configuration				1/1/1										
MNG562	Legal regulation of intellectual property				2/0/1										
CSE807	Pentest Tools	BD, CCH	5	150	2/1/0	105	E					5		0	
CSE550	Vulnerability identification and analyses														
CSE831	The basics of artificial intelligence														
CYCLE OF PROFILE DISCIPLINES (PD)															
M-10. Professional activity module															
SEC189	Database organization and security	PD,UC	5	150	1/0/2	105	E					5			
CSE546	Computer information protection technologies	PD,UC	4	120	2/0/1	75	E						4		
CSE825	Python for solving information security problems	PD,UC	4	120	2/1/0	75	E							4	
SEC111	Cloud Technology Security	PD,UC	5	150	2/1/0	105	E								5
CSE824	Socio-legal aspects of information security and computer forensics	PD,UC	5	120	1/0/2	75	E							5	
CSE806	Information security and OOP	PD,UC	5	150	1/1/1	105	E					5			
CSE547	Fundamentals of students' research work	PD, UC	4	120	1/0/2	75	E							4	
CSE805	Biometrics and neural networks	PD, UC	4	120	1/1/1	75	E								4
SEC185	Network technology security	PD, CCH	5	150	2/1/0	105	E						5		
SEC199	The Mathematics of Cryptography				2/0/1										
SEC151	Organization of microprocessor systems				1/1/1										
CSE 819	Decentralized applications				1/1/1										
CSE411	Administration of systems and networks	PD, CCH	5	150	2/1/0	105	E							5	
SEC190	Cryptographic Information Security systems				1/1/1										
SEC152	Microcontrollers				2/0/1										
CSE820	Introduction to web3				1/1/1										
SEC176	Intrusion prevention and detection systems	PD, CCH	5	150	2/1/0	105	E								5
SEC169	Standardization and Certification of cryptographic tools				2/0/1										
SEC142	Technical means and methods of information protection				2/0/1										
CSE821	Smart Contract Architecture				1/1/1										
SEC175	Internet of Things Security	PD, CCH	5	150	2/1/0	105	E								5
SEC170	Design of cryptographic information security systems				1/1/1										
SEC166	Organization and management of the information security service				2/0/1										
CSE822	Blockchain business Models				1/1/1										
AAP408	Production practice I	PD, UC	3								3				
AAP187	Production practice II	PD, UC	2									2			
M-11. Final certification module															
ECA109	Writing and defending a thesis (project)	FA	8												8
M-12. Additional training module															
AAP500	Military affairs	ДВО	0												
	Total based on UNIVERSITY:							32	28	30	30	35	35	33	27
								60		60		60		60	

Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits: required component (RC)	university component (UC)	component of choice (CCH)	Total
GED	Cycle of general education disciplines	51		5	56
BD	Cycle of basic disciplines		100	15	176
PD	Cycle of profile disciplines		41	20	
	Total for theoretical training:	*51*	*141*	*40*	*232*
FA	final attestation	8			8
	TOTAL:	59	141	40	240

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol №12_ "22" _04_ 2024 y.

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 "19" _04_____2024 y.

Decision of the Academic Council of the Institute_____. Protocol №8 от "29" _02_ 2024 г.

Vice-Rector for Academic Affairs — **Uskenbayeva R.K.**

Institute Director IaET — **Kalpeyeva J.B.**

Department Head CIPaS — **Satybaldiyeva R.Zh.**

Representative of the Council from employers — **Batyrgalin A. B.**