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 2025

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

Protocol No _10__ of «__06__» __03___2025.

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

Protocol No. _3_ of «__20_» __12_2024.

The educational program 6B06301 «Information security" was developed by the academic committee in the direc

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Table of contents

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; the professional standard; the Atlas of New Professions, and is developed in accordance with the ESG and the Sustainable Development Goals (SDGs).

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.

The global goal of the Information Security education program is to contribute to the achievement of the Sustainable Development Goals (SDGs):

- Goal 4: Quality education (Ensuring inclusive and equitable quality education and encouraging lifelong learning opportunities for all);
- Goal 8: Decent work and economic growth (Promoting sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all);
- Goal 9: Industrialization, Innovation and Infrastructure (Building resilient infrastructure, promoting inclusive and sustainable industrialization and innovation);
- Goal 11: Sustainable cities and human settlements (Ensuring openness, security, resilience and environmental sustainability of cities and human settlements);
- Goal 16: Peace, Justice and effective institutions (Promoting a peaceful and inclusive society for sustainable development, ensuring access to justice for all, and creating effective, accountable, and participatory institutions at all levels)

EP tasks:

– socio-humanitarian and professional bachelor's degree training in the field of information security in accordance with the development of science and production, as well as with the needs of information security clusters in Kazakhstan, National Security of the Republic of Kazakhstan, national research centers for sustainable development. (SDG 4)

- integration of educational and scientific activities; (SDG 4)
- establishing partnerships with leading universities of the near and far abroad in order to improve the quality of education; (SDG 4,17)
- 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. (SDG 17)

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:	LO 1 Know the basics of information security and its problematic aspects. Be able to apply basic indicators of information security. The ability to apply biometric information security technologies. To be able to use a number of implementation of algorithms to solve practical problems LO 2 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, encrypt database objects. LO 3 The ability to think logically, use induction and deduction methods, determine cause-and-effect relationships, be economically literate, understand various situations, including when working in a team with people with special needs. LO 4Know 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 the devices and determine their characteristics; determine the parameters of semiconductor devices and circuit elements. LO 5Perform typical tasks of design, deployment and technical support of local and global networks; Administer networks in modern operating systems. Ensure the safety and resiliency of the network and servers. LO 6The ability to understand and apply methodologies and technologies for performing graphic work on a computer, express technical ideas using a drawing, present diagrams in a graphical form, use computer graphics and graphic dialogue tools. LO 7Use the methods of constructing various models of data types, information processing algorithms; make rational use of the opportunities provided by the algorithmization technique. Apply a unified modeling language, implement a structural and object-oriented approach to working with tools. LO8 Analyze the principles of constructing cryptographic algorithms; develop and apply cryptographic systems; analyze and resolve issues of cryptographic protection of information and the application of modern cryptographic methods of information protection in order to promote innovation. Ability to apply the mathematical foundations of cryptosystem algorithms. LO 9 The ability to organize measures to ensure their own safety and the safety of teams in professional activities and social emergencies. LO 10 Apply the basic methods of formalizing reasoning, the basic concepts of the theory of logical functions, theory of algorithms, graph theory, coding theory; use the conceptual apparatus and methods of discrete mathematics to analyze mathematical models in solving problems of professional activity. LO 11 Use the fundamental concepts of mathematics, physics and mechanics in professional activities. Conduct mathematical proofs, solve mathematical problems and problems. Be competent in the application of information theory to ensure the protection and security of information.

		LO 12 Apply database technology for the secure organization, receipt, storage, processing and transmission of information. Have a basic understanding of secure database design and protection. Ensure the integrity and reliability of data in databases, including for the sustainability of their development. Be competent in the creation, development and design of secure Web applications. LO 13 Ability to perform hands-on analysis and use data leak prevention systems. To manage security policies and all types of work of the information protection service .. The ability to determine the optimal structure of the information protection service. Develop regulatory and methodological documents on the organization and functioning of the information protection service. LO 14 Select elements of electronic circuits, make the necessary calculations. Participate in the development of projects of various electrical components and assemblies using microcontrollers. Program in C language. LO15 The ability to identify possible channels of information leakage, to carry out technical protection measures. Apply passive and active methods and means of information protection. Perform engineering and technical protection measures and practically apply measures to protect objects and information from technical intelligence tools. LO 16 The ability to apply virtualization systems and cloud technologies to solve practical problems and find vulnerabilities in virtual machines. Be able to apply secure cloud technologies and the Internet of Things for system security sustainability
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	Bachelor's Degree in Information and Communication Technology
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)															
				PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15	PO 16
The cycle of general education subjects is a mandatory 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 language proficiency. When moving from level to level, the prerequisites and post-requirements of discipline are observed.	10																
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 students' professional and communication skills. The course allows students to practically master the basics of scientific style and develops the	10																

		ability to perform structural and semantic text analysis.																	
3.	Physical Culture	The purpose of the discipline is the practical use of skills in performing the basic elements of athletics techniques, sports games, gymnastics and a set of standards for general physical training, including professionally applied physical training or one of the sports, methods of conducting independent physical exercises.	8																
4.	Information and communication technologies (in English)	Required component. The objective of studying the discipline is to acquire theoretical knowledge about information processes, new information technologies, local and global computer networks, information security methods; gain skills in using text editors and tabular processors; create databases and various categories of application programs.	5				v												
5	The history of Kazakhstan	The course examines historical events, phenomena, facts, and processes that took place in 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	5																

		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 conflict and in the conditions of a totalitarian system; Kazakhstan during the Great Patriotic War; Kazakhstan during the period of independence and at the present stage.																	
6.	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and provides them with 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 you how to think and act correctly, develops practical	5																

		and cognitive skills, and helps you find ways to live in harmony with yourself, society, and the world around you.																	
7.	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, forming a political culture, developing a personal position and a clearer understanding of their responsibilities and tolerant attitude towards people with special needs.	3			v													
8.	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 culture formation and development, to develop their aspirations and skills to independently comprehend the wealth of values of world culture for self-improvement and professional	5			v													

		growth. During the cultural studies course, the student will consider the general problems of cultural theory, leading cultural concepts, universal patterns and mechanisms of culture formation and development, the main historical stages of the formation and development of Kazakh culture, its most important achievements. During the course, students acquire theoretical knowledge and practical skills, forming their professional orientation from the perspective of psychological aspects.																	
The cycle of general education subjects Component of choice																			
1.	Fundamentals of anti-corruption culture and law	Purpose: to increase public and individual legal awareness and legal culture of students, as well as to form a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Content: improvement of socio-economic relations of Kazakh society, psychological features of corrupt behavior, formation of an anti-corruption culture, legal responsibility for acts of corruption in various fields.	5			**v**						**v**							
2	Fundamentals of financial literacy	Purpose: formation of financial literacy of students on the basis	5			**v**						**v**							

		of building a direct link between the acquired knowledge and their practical application. Content: practical use of various financial management tools, saving and increasing savings, competent budget planning, obtaining practical skills in calculating and paying taxes and correctly completing tax reports, analyzing financial information and navigating financial products to choose an adequate investment strategy.																	
3	Fundamentals of Economics and Entrepreneurship	Purpose: Formation of basic knowledge about economic processes and business skills. Content: The discipline is studied in order to develop skills in analyzing economic concepts such as supply and demand, market equilibrium. The basics of business creation and management, development of business plans, risk assessment and strategic decision-making are included.	5			v						v								
4	Ecology and life safety	Purpose: formation of ecological knowledge and consciousness, obtaining theoretical and practical knowledge on modern methods of rational use of natural resources and environmental protection. Contents: the study of the	5		v						v									

		problems of ecology as a science, 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, ways to solve environmental problems; safety of life in the technosphere, natural and man-made emergencies.																	
The cycle of basic disciplines The university component																			
5	Algorithmization and programming basics	The course covers the basic concepts of programming: operator, variable, procedure, function, and data type. The basic structures of algorithms such as linear, branched, and cyclic are considered. The course covers the basic forms of data representation: strings, structures, arrays, lists. Separate topics are devoted to the creation of widespread sorting algorithms, searching for the minimum and maximum values in an array, string processing, iterative and recursive algorithms, building flowcharts of algorithms and developing programs based on them.	4								**v**		**v**						
6	Architecture of computer systems	Computing systems of various architectures are the hardware	5										**v**		**v**				

		part of information technology, which reached a global character and content by the end of the 20th century. Multiprocessor systems, which also include computer networks, make it possible by changing their architecture to optimize the parameters of the main processes of information technology: processing, accumulation, data transmission and knowledge representation.																	
7	Operating system security	The purpose of the discipline is to master the basic means and methods of ensuring information security. Upon graduation, students will learn to understand the principles of building information security. They will be able to classify and assess threats to information security; they will master professional terminology in the field of information security. They will be able to use the tools of operating systems to ensure the effective and safe functioning of automated systems; they will learn how to evaluate the effectiveness and reliability of operating system protection.; they will acquire skills in	5					v											v

		planning the security policy of operating systems																	
8	Introduction to the blockchain	The course is aimed at mastering various aspects of blockchain technology. Students study related topics of cryptography, wallets, nodes, smart contracts, and tokens. Main topics: the basics of blockchain, consensus algorithms, understanding cryptocurrencies and smart contracts, the use of blockchain technology in the real world	4					v							v				
9	Introduction to the specialty	Security facilities. Data processing systems. Areas of information security. Information security and problematic aspects. Basic information security indicators. Information security risks. Socio-technical attacks. Information resource protection technologies. Methods and tools of information protection. Software products for information protection. Physical tools to protect information. Prospects for the development of information security systems, intellectualization. Information security management.	5	v									v						
10	Introduction to Web programming	The methods of designing WEB applications using modern web programming technologies and software tools for solving applied	5							v			v						

		problems using methods of debugging and testing web applications in the loop-back system are studied. The discipline examines the basics of creating web applications; classification of software tools; structure of web programs; web applications running on the client and server sides; principles of developing an interactive user interface; organization of navigation; interface of server interaction with application programs; syntax and notation of markup languages, data structures, and scripting languages. Students gain skills and insight into current perspectives and trends in the development of web programming.																	
11	Discrete mathematics	The discipline covers coding theory, set theory, graph theory, and mathematical logic. Namely, the basics of coding theory, set theory, graph theory; the theory of logic algebra; the mathematical apparatus of synthesis and analysis of digital devices, convert Boolean functions, synthesize minimal combination schemes; perform coding.	5									**v**	**v**						

12	Information fundamentals 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 information.	5										v	v					
13	Computer graphics	The course covers computer image generation, namely the mathematical and algorithmic foundations of computer graphics, raster graphics algorithms, 2D and 3D modeling, and polygonal models. The technologies of using the OpenGL graphics library for generating 2D and 3D images, and the use of auxiliary libraries are considered. After studying the discipline, students will be able to master any graphic tools, continue studying and using graphic libraries.	5						v										
14	Computer networks	The program of the training course is aimed at familiarizing students with the basics of organization, construction, architecture and principles of	5					v											

		functioning of computer networks. The course focuses on the application of skills to organize the work of real networks and examines 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.																
15	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytic geometry and mathematical analysis. Develop the ability to solve typical and applied tasks of the discipline. Content: Elements of linear algebra, vector algebra and analytic geometry. Introduction to analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.	5										**v**	**v**					
16	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the original. To teach how to apply a certain	5									**v**	**v**						

		integral to solve practical problems. Contents: integral calculus of a function of one and two variables, theory of series. Indefinite integrals and methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations.																
17	Mathematics III	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the original. 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 are studied.; calculation of numerical	5										v	v					

		characteristics of random variables; the use of statistical methods for processing experimental data.																	
18	Microelectronics	The principles of operation, parameters, characteristics and application features of semiconductor devices are considered. Designing various circuits for electrical signal amplifiers and generators based on diodes, bipolar and field-effect transistors and working out the features of their functioning. Operational amplifiers. Differential amplifiers. Feedback. The effect of feedback on the main indicators and characteristics of amplifiers. Power amplifiers. Classification of filters and their composition.	5			v							v			v			
19	Fundamentals of cryptographic information protection	This course covers the basic concepts, terms and concepts of the discipline. Cryptology, cryptography, cryptanalysis. Durability, security, imitation, authenticity. Modern cryptographic methods of information protection. The basic principles of building cryptoalgorithms.	5								v			v					
20	Designing and protecting server databases	The course examines the basics of designing secure databases and ensuring their protection.	5		v										v				

		Students will learn how to apply database technologies to solve practical problems of developing and protecting secure server databases. In addition, they will study ways to store data at the physical level, types and ways of organizing file systems;– understanding problems and the main ways to solve them when sharing data; – exploring the capabilities of databases that support various models of data organization.																	
21	Designing digital devices	The program of the training course is aimed at familiarizing students with the basics of designing digital devices. The course focuses on the application of formal logic and automata theory to solve practical problems of designing digital devices.	5				v						v						
22	Physics I	Purpose: to study the basic physical phenomena and laws of classical and 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. Contents: mechanics, dynamics of	5										v	v					

		rotational motion of a solid, mechanical harmonic waves, fundamentals of molecular kinetic theory and thermodynamics, transport phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell's equations.																
23	Physics II	Objective: to develop students' knowledge and skills in using fundamental laws, theories of classical and modern physics, as well as methods of physical research as the basis of a professional activity system. Contents: harmonic vibrations, damped vibrations. alternating current, wave motion, laws of refraction and reflection of light, quantum optics. the laws of thermal radiation, photons, their characteristics, wave function, electrical conductivity of metals, atomic nucleus, its structure and properties, binding energy, radioactivity.	5										**v**	**v**				
24	Digital circuitry	Fundamentals of construction of electrical circuit diagrams of nodes (blocks) of various electronic devices, including modern computers, methods of application of various (semiconductor) logic elements.	5				**v**						**v**				**v**	

		Creation of examples of schematic diagrams of the simplest electronic components based on CAD "Altium Designer" and design of a printed circuit board. Modeling the operation of electrical circuits using various programs (for example, MICROCAP).																	
25	Java technologies	The purpose of the study is to master and understand the basic properties, tools and utilities of the Java platform, to teach students how to develop applications for a wide range of tasks, and to provide the basis for further study of Java technologies. Summary: The course is dedicated to studying the principles of OOP necessary for Java development, reviewing the basics of the language, working with loops, arrays, libraries for working with files, databases, the network, for building a windowed user interface (GUI), etc. Expected results: Creation of a graphical user interface, use of classes, establishment of communication with the database and with the server.	5							**v**			**v**						
The cycle of basic disciplines Component of choice																			

	1C configuration	The discipline studies the mechanisms of the 1C platform.:The enterprise". Working with the mechanisms of the platform is demonstrated by the example of solving a learning task similar to tasks in real enterprises. Topics such as operational accounting, accounting, complex periodic calculations, business process mechanisms, and managed data locks during document processing will be considered. Mastering the course will allow you to understand the principles of building the 1C: Enterprise system and master the configurator's tools and skills of working with the system.	5		v					v			v						
27	Vulnerability identification and analysis	The purpose of mastering the discipline is the 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 program memory corruption, code	5													v		v	

		injection on the client or server side, etc., as well as techniques and properties of modern programming languages to prevent the appearance of vulnerabilities of this kind are considered.																	
28	Inclusive education	The purpose of the discipline: to give students an idea of the foreign and domestic learning experience based on an ideology that excludes any discrimination; on the development and implementation of conditions that ensure equal treatment of all people and the need for special conditions with special educational needs; to introduce the principles of inclusive education; with the organization of inclusive education in educational institutions.	5			v													
29	Pentest Tools and Ethical Hacking	The course examines standards and penetration testing tools, and their role in information security audits. Subjects of the discipline studied: Categories of pentest, their features. Programs and distributions for pentest, the principles of their construction and functionality. Ethical hacking. The use of pentest tools in ethical hacking to detect	5					**v**								**v**			

		vulnerabilities, study threats, and identify cybercrimes.																	
30	The basics of artificial intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	5							v									
31	Fundamentals of students' research work	The course is aimed at forming a comprehensive understanding of the specifics of scientific research; mastering research methods that are most relevant to the subject of research; acquiring skills and abilities for 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	5			v				v	v								

		research work of university students. The requirements for the technical design of scientific work are considered.																	
32	Fundamentals of sustainable development and ESG projects in Kazakhstan	Objective: students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to form an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Content: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, the analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	5			v													
	Legal regulation of intellectual property	Objective: to form a holistic view of the system of legal regulation of intellectual property, including the basic principles, mechanisms for the protection of intellectual property rights and the specifics of their implementation. Content: The discipline covers the fundamentals of IP law, including copyright, patents, trademarks, and industrial	5			v													

		designs. Students learn how to protect and manage intellectual property rights, as well as consider legal disputes and how to resolve them.																	
34	1C programming	The course provides a theoretical framework and discusses solutions to specific problems. The objects with which the business logic of any solutions operating on the 1C platform is implemented are being studied.:Company. Topics are discussed on how to configure the system depending on the needs of a particular organization, make changes to software solutions so that users can use them as efficiently as possible, configure databases and update the system.	5		v					v			v						
35	Designing secure Web applications	The main trends in the development of Web technologies. Basic standards of the Web network. The concept of Web applications and approaches to their development. Server controls. The structure and design of the Web application. Web application security. Development of Web services. Organization of Web application security.	5					v							v					
36	Capstone project 2	The course is aimed at studying and developing students'	5	v						v			v	v						

		understanding of the process of attracting investments and scaling a business; developing practical skills in the field of attracting investments in a startup. During the course of the discipline, students consider the following issues: searching and identifying various sources of financing and selecting potential investors for a business; applying to accelerators; preparing investment documentation; creating investment presentations; presenting a project to a potential investor.																	
37	Capstone project 1	The purpose of the course is to apply project management techniques, ways to transform ideas into a specific solution, and determine the most optimal approach to its implementation. Course participants will gain a holistic understanding of the process, key techniques, and tools needed to design, develop, and further develop their products and services.	5	**v**						**v**			**v**	**v**					
The cycle of profile disciplines Component of choice																			

38	Cloud Technology Security	The course is designed to explore the basic aspects of security in cloud environments. The training includes familiarization with the main threats and risks associated with cloud computing, as well as methods and tools for their prevention and management. Students study the principles of data protection, authentication, authorization, encryption, monitoring, and auditing in the context of cloud environments.	4	v				v											
39	Biometrics and neural networks	The course is aimed at studying biometric methods of information security. Issues under consideration: Static and dynamic biometrics. Artificial neural networks. Classification, areas of application. Neural network learning algorithms. Errors of the first and second kind. Neural network models for biometric image recognition.	4	v						v			v						
40	Information security and object-oriented programming	The course covers the basic concepts of object-oriented programming and application development. The following issues are considered: application vulnerabilities, their classification; technologies for ensuring information security of applications. Students gain skills in using specialized tools to	5	v						v									

		identify vulnerabilities and protect applications at the design and implementation, configuration and operation stages.																	
41	Database organization and security	The course program is aimed at familiarizing students with the basics of organizing secure databases and their application to solve real-world problems. The course is dedicated to the application of database technology to solve practical problems of database development and database applications.	5							v					v				
42	Socio-legal aspects of IS and computer forensics	The purpose of mastering the discipline is to familiarize students with the legal and social aspects of information security and the basics of computer forensics and cybercrime investigation. Issues covered in the course regarding the application of regulatory legal and other documents regulating information security. Students' knowledge and skills will help them solve computer-related crimes, study digital evidence, and use methods to find, obtain, and consolidate such evidence.	5			v													v	
43	Computer information protection technologies	Basic concepts, methods and technologies for protecting	4	v				v												

		computer information, technologies for countering bookmarks; the use of modern technologies to solve practical problems of protecting computer information.																	
44	Python for solving information security problems	The purpose of mastering the discipline is to explore the possibilities of the Python language for solving information security problems. The issues covered in the course are: Basic Python language constructs, embedded and third-party Python libraries for solving information security problems, authentication, reverse engineering, test automation, data protection from cross-site query forgery, correction and deletion of incorrect data (data cleaning), extraction and selection of various data characteristics. Cryptography library, development of cryptographic algorithms.	4	v						v					v				
	Cycle of profile disciplines, elective component																		
45.	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 set up company servers, and network	5					v								v			v

		engineers, since most of the network equipment runs Linux and Windows.																	
46.	Smart Contract Architecture	The course aims to understand the many possibilities of creating decentralized applications using the Web3 stack and Solidity language on the Ethereum Virtual Machine (EVM).Main topics: introduction to blockchain and Ethereum, introduction to smart contracts, blockchain technology and support for Turing-complete languages, virtual machines, introduction to the pipeline deep development, deep immersion in Solidity, global variables and functions, expressions and control structures, object-oriented constructions, experiments with external libraries, unit testing and debugging of contracts, deployment and other smart contract platforms.	5					v							v				
47	Internet of Things security	Current components of typical IoT devices; trends for the future; limitations and interactions between the physical world and the IoT device; key network components for connecting an IoT device to the Internet; IoT security issues.	5					v											v
48	Network technology security	Modern network technologies and the main trends in the	5					v								v			

		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. Networking technologies. Standards, protocols, access methods, network configurations. Routing protocols, addressing, and switching. VLSM, CIDR, and VLSM technologies. Wireless technology. Designing local area networks. Cybersecurity. Vulnerabilities of software and hardware of network technologies, classification. Cybersecurity of network technologies. Corporate network security. Security management.																	
49	Blockchain business models	The course focuses on the analysis of entrepreneurship and innovation management based on blockchain technology. Main topics: the importance of innovation, the innovative nature of digital currencies / blockchain / DLT, the management and dissemination of blockchain innovations, the transformation of blockchain ideas into a business plan, the application of	5			**v**					**v**				**v**				

		design thinking and strategy in blockchain projects, the analysis and management of risks associated with blockchain, fundraising for the blockchain project, the explanation of smart contracts and algorithmic management, the study of decentralized autonomous organizations (DAO), understanding issues related to human resource management in the blockchain.																	
50	Introduction to web3	The course is based on an understanding of the basic principles of decentralization and the use of web 3 to create various types of decentralized applications. Main topics: the difference between web2 and web3, the basic principles of decentralization, distributed IPFS and Swarm systems, Ethereum protocols, creation of smart contracts for voting tasks, asset management and identification.	5							v			v						
51	Decentralized Applications	The course aims to learn the technical skills needed to create decentralized applications on public blockchains. Also, the development of applications that perform business transactions without the participation of a trusted third party. The course	5			v				v					v				

		covers the main components of a decentralized application (App), social and design issues that hinder the implementation of dApps, smart contracts written in the Solidity programming language, and the development environment necessary for writing, testing, and deploying Ethereum dApps.																	
52	Cryptographic information security systems	Block-based encryption systems. The 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. Key distribution. Cryptographic protocols. Hash functions. Electronic and digital signatures.	5										v	v	v				
53	The Mathematics of Cryptography	Purpose: to study the mathematical foundations of cryptography, to teach students information security methods and their use in the field of information security. Contents: cryptology, cryptography, cryptanalysis, encryption, durability, security, image security, authenticity, modern	5						v		v			v					

		cryptographic methods of information protection, encryption, 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 algorithms of electronic digital signature, cryptographic key management, steganography.																	
54	Microcontrollers	Programmable logic controllers (PLCs, PLC) are microprocessor-based devices designed to perform control algorithms, the principle of operation of the PLC is to collect and process data from the user's application program with the output of control signals to 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		
55	Organization and management of the information security service	The purpose of the information security service. Information Security Service as an information security management	5									v					v		v	

		body and an integral part of the security system. Types and types of organizational structures of the information security service. Organizational foundations and principles of the information security service. The procedure for creating an information security service. Principles of organization and operation 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																	
56	Organization of microprocessor systems	The main definitions, characteristics, applications and features of microprocessor tools.. Organization of microprocessor systems. Designing microprocessor systems. Representation levels of a microprocessor system. Architecture of Intel family of microprocessors. Operating modes of microprocessors. Organization of the memory subsystem in a PC. The main features of RISC processors. A system of interruptions and exceptions. Types and	5									v				v		v	

		characteristics of interfaces. Programming the operation of individual blocks of microprocessor systems. Digital Signal Processors (DSPs). Trends in the development of microprocessors.																	
57	Designing cryptographic information security systems	The course program 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						
58	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 (DLPs). Tasks of DLP systems, components of a data leak prevention system. Classification of DLP systems, methods for detecting confidential information. Stages of DLP systems. Development of a data leak prevention system.	5	v				v									v			v

		Analytical tools for incident investigation and analysis. IPC technologies, IPC tasks, components. Integration of DLP systems with IPC/IDS and SIEM systems.																	
59	Standardization and certification of cryptographic tools	Development of standardization and certification in the field of information security. Standardization and certification – prerequisites, goals and objectives. The 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 information technology security. Problems and prospects of standardization and certification development. Technical specifications and regulatory standards for standardization and certification. Modern principles of standardization and certification.	5								v		v						
60	Technical means and methods of information protection	Information protection should ensure that damage is prevented as a result of loss (theft, loss, distortion, forgery) of information in any form. Information security measures					v											v	v	

		should be organized in full compliance with applicable laws and regulations on information security and the interests of information users. To ensure a high degree of information protection, it is necessary to constantly solve complex scientific and technical problems of developing and improving its protection tools.																	

5. Curriculum of the educational program