

**«TURAN-ASTANA» UNIVERSITY**



**APPROVED**

The Academic Council of «Turan-Astana»  
University  
dated " \_\_\_\_ " \_\_\_\_\_ 2023 Ү.  
Protocol № \_\_\_\_

Academic Council  
Chairman

\_\_\_\_\_ G. A. Japarova

**BACHELOR'S PROGRAM**

**EDUCATIONAL PROGRAM**

**6B06102-«COMPUTER ENGINEERING AND SOFTWARE»**

**full-time study form  
term of study – 4 years  
admission 2023**

**ASTANA, 2023**

**Educational program “6B06102-Computer technology and software”:**

**Recommended for approval** by the Academic Committee of the School of Business and Information Technology

(Protocol №   5   dated “   14   ” \_\_\_April\_\_\_ 2023)

Chairman of the Academic Committee

\_\_\_\_\_ (signature)

R. A. Aimkulov

\_\_\_\_\_ (F.M. Last name)

**Approved at a meeting of the Department of Information Technologies**

(Protocol №   9   dated “   10   ” \_\_\_April\_\_\_ 2023)

Head of the department

\_\_\_\_\_ (signature)

\_\_\_\_\_ (F.M. Last name)

**Agreed by the employer:**

Director of «Agile Technologies» LLP Zhilkibaeva D.B.

## МАЗМУНЫ/СОДЕРЖАНИЕ/CONTENT

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**SECTION 1. PASSPORT OF THE EDUCATIONAL PROGRAM**  
**6B06102-« COMPUTER ENGINEERING AND SOFTWARE »**  
**(Admission-2023)**

**Developed on the basis of the State Compulsory Standard of Higher Education and Postgraduate Education dated July 20, 2022 No. 2 (as amended and supplemented), Rules for organizing the educational process on credit technology of education dated October 12, 2018 No. 563 (as amended and supplemented), Professional Standard " Information and Communication Technologies", approved by the order of the Acting Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 222 dated 05.12.2022.**

- 1. School:** Business and information technologies
- 2. Name and code of the OP:** 6B06102-«Computer Engineering and software»
- 3. A view-OP:** the current
- 4. The learning curve:**
  1. «Computer software»;
  2. «Software engineering»

**5. The purpose of the educational program:** training of highly qualified specialists in computer technology and software, with fundamental knowledge of information technology, capable of applying conceptual knowledge and engineering skills for the design, software development of computer technology and information systems.

- 6. The levels on the NQF:** level 6  
**IQF level:** level 6

**7. List of qualifications and positions:** A graduate of bachelor of educational program 6B06102-«Computer Engineering and software» is awarded the degree of Bachelor of Science in Information and Communication Technologies under the educational programme «6B06102-Computer Engineering and software».

Bachelors of this profile are designed for economic, managerial, entrepreneurial, commercial and research work in organizations of different forms of ownership and in various fields of activity.

Qualifications and positions of graduates of EP 6B06102 - "Computer Engineering and Software" are determined in accordance with the qualification directory of positions, managers, specialists and other employees, professional standard:

- Software engineer (programmer);
- Programmer (webmaster, web designer);
- Information security specialist in the main information infrastructure systems;
- Technician of the computing (information and computing) center;
- Technician-programmer;
- Software developer;
- Software Support Specialist;
- Information technology testing specialist;
- Systems Analyst;
- Specialist in system and network administration;
- Software designer;
- Software Maintenance Specialist;
- Information security specialist;
- Specialist in the creation and management of information resources (content manager).

**8 Qualification characteristics of the graduate:**

**8.1 Scope of professional activities**

The sphere of professional activity of graduates are public and private enterprises and organizations, development, implementation and use of computing equipment and software in various fields, namely engineering, metallurgy, transport, telecommunications, science and

education, health, agriculture, the service sector, administration, Economics, business, management, different technologies, that is, in almost all spheres of human activity.

### **8.2 Objects of professional activity**

The objects of professional activity of graduates are:

- computer systems of information processing and management;
- computer-aided design systems;
- software of information systems (programs, software systems and systems).

### **8.3 Subject of professional activity**

The subjects of professional activity of graduates are - mathematical, information, technical, ergonomic, organizational and legal support of these systems.

### **8.4 Types of professional activity**

Bachelors of educational program 6B06102-« Computer Engineering and software » can perform the following professional activities:

- design and engineering;
- industrial-technological;
- experimental research;
- organizational and managerial.

## **9.Key competence**

### **9.1. General core competencies:**

#### **9.1.1 in the field of native and foreign languages:**

**Know:** the technology of communication, a communication strategy (**KC1**).

**Be able to:** build a constructive dialogue, communication in a multicultural, multiethnic and multi-confessional society (**KC2**).

**Possess skills:** competent and developed speech, native and foreign languages (**KC3**).

#### **-in the field of fundamental mathematical, natural science and technical training:**

**Know:** fundamental mathematical, natural science and technical disciplines that contribute to the formation of a highly educated person with a broad outlook and a culture of thinking (**KC4**).

**Be able to:** formulate and solve problems, to analyze; to prove the results obtained; apply formulas, basic laws of natural-science disciplines in professional activity (**KC5**).

**Possess skills:** apply methods of analysis, synthesis to solve applied problems, apply methods of mathematical analysis and modeling, theoretical and experimental research (**KC6**).

#### **-in the field of computer technology:**

**Know:** basic concepts, principles, theories and facts related to computer science; basic information technology (**KC7**).

**Be able to:** apply and use information technology in professional activities (**KC8**).

**Possess skills:** programming using modern tools (**KC9**).

### **9.2 General competences:**

#### **-in the field of social and cultural activities:**

**Know:** ethical, spiritual and cultural values, basic laws and forms of regulation of social behavior, sociological approaches to the individual, traditions and culture of the peoples of Kazakhstan, trends in the development of society (**KC10**).

**Be able to:** adequately navigate in different social situations, to think creatively, to be tolerant to traditions, culture of other peoples of the world, to have an active life position (**KC11**).

**Possess skills:** methods of socio-cultural research, analysis of problem situations (**KC12**).

#### **-in the field of training activities:**

**Know:** fundamental of a discipline of the emerging science of psychology (**KC13**).

**Be able to:** use the system of categories and methods necessary to solve typical problems in various fields of professional practice, apply theoretical and experimental research, basic methods of mathematical analysis and modeling for processing data obtained in solving various professional problems, to carry out bibliographic and information retrieval work, followed by the use of data in solving professional problems and design of scientific articles, reports, conclusions, etc. (**KC14**).

**Possess skills:** perception of the personality of another, empathy, establishment of trusting contact and dialogue, persuasion and support of people; finding organizational and managerial decisions in non-standard situations and readiness to take responsibility for them, effective consolidation of theoretical knowledge during the passage of educational and industrial practices, conscious choice of disciplines of specializations, analysis of their activities and the ability to apply methods of emotional and cognitive regulation (to optimize) their own activities and mental state **(KC15)**.

**- in the field of business and economic activity:**

**Know:** fundamentals of Economics and entrepreneurship; the role of entrepreneurial risks in the business, the value of the public sector in the economy and entrepreneurship; the main provisions of the current legislation of the RK; the critical success factors of the project, documentation project management, standard tools of the decomposition of the project work; a framework for assessing the effectiveness of the developed innovative processes, principles of methodology design and research activities **(KK16)**.

**Be able to:** identify methods of state regulation of the economy, apply the principles and norms governing business and government relations; use methods of risk management in business; navigate the current legislation; develop documents for project management, risk management plan; apply the knowledge to solve practical problems in innovative development; determine the goals and objectives of project and research work **(CC17)**.

**To possess skills:** use of the received knowledge on a subject in business activity; the analysis of economic and business relations and risks; use of legal norms for achievement of positive results in economy; management of innovative projects in development of the company, reading of scientific, analytical, statistical reports and methods of an assessment of innovative development; registration of theoretical and experimental results of research and project work **(KK18)**.

### **9.3 Professional (special) key competences:**

**Know:**

-about the main regularities of the functioning of systems and system analysis **(KC19)**.

-on the use of packages and libraries in programming, modern algorithmic languages, their applications and features **(KC20)**.

**Know:**

-the main classes of models and modeling methods, principles of construction of models of processes, methods of formalization, algorithmization and implementation of models of computer systems **(KC21)**.

-basic provisions of the control theory, methods of analysis and synthesis of linear continuous and discrete control systems **(KC22)**.

-technology, methods and means of production of the software product **(KC23)**.

-principles of ensuring the safety of life in the development and operation of automated systems for various purposes **(KC24)**.

**Be able to:**

-use the formal apparatus for the analysis of organizational, functional and technical structures of automated systems, to determine the composition of the tasks to be solved by the system **(KC25)**.

-to apply the methods of system modeling in the study and design of systems, schemes of modeling algorithms, modeling languages and software packages for modeling discrete systems **(KC26)**.

-apply methods and tools for the development of algorithms and programs, structural programming techniques, methods of recording the algorithm in a high-level language, methods of debugging, testing and documentation of programs **(KC27)**.

-apply models of knowledge representation and formalization of tasks in the development of intelligent components of computer systems **(KC28)**.

Possess skills: analysis of security conditions and selection of technical and organizational security measures at the stage of design, manufacture and operation of computer systems of information processing and management **(KC29)**.

**Be competent in matters:**

-application of models, methods and means of analysis and development of mathematical, linguistic, information and software of computer systems of information processing and management **(KC30)**.

-development of components of software systems and databases, the use of modern tools and programming technologies **(KC31)**.

-selection of modern tools in the field of computer technology, methods and techniques of structural programming, methods of debugging, testing and documentation of programs **(KC32)**.

**10. Learning outcome:**

According to Dublin Descriptors the following learning outcomes are generated:

Dublin descriptors	Learning outcome:
1. Demonstrate knowledge and understanding in the field of study, based on advanced knowledge of this field	1. To know and understand the importance of information technology and the system for solving professional tasks, using a wide range of IT technologies 2. Apply knowledge about modern IT tools on the basis of knowledge of world trends in information technology development
2. Apply knowledge and understanding at a professional level, formulate arguments and solve problems in the field of study	3. To have a representation of the state and trends in the development of computer architecture, computer systems, complexes and networks 4. To have the ability to configure and service system, tool and application software, computer hardware and computer systems
3. To collect and interpret information for the formation of judgments, taking into account social, ethical and scientific considerations	5. To be able to choose technologies, instrumental software and means of computational techniques in the organization of the process of development and research of objects of professional activity 6. Ability to program in languages of high level, using a huge demand in the field of IT 7. Recognize the social significance of the profession of IT specialist, have a high motivation to perform their professional activities
4. Communicate information, ideas, problems and solutions to both professionals and non-specialists	8. To have an understanding and to apply basic concepts, principles, theories related to previous scientific developments in the field of information technology and computer systems.
5. Learning skills necessary to independently continue further education in the field of study	9. To search, process, store, transmit and analyze the necessary information from various sources, presenting it in the required format, using computer technology
6 Know the methods of scientific research and academic writing and apply them in the field of study	10. To have the ability to acquire new, expand and deepen the acquired knowledge, skills and competencies, necessary for the implementation and application in all areas, including professional
7 Apply knowledge and understanding of facts, phenomena, theories and	11. Be guided by the principles of a culture of academic integrity, the values of a democratic society, be able to analyze current problems of society, feel business and ethical,

complex relationships between them in the field of study	professional responsibility, be able to take risks within the framework of advanced ideas in society,
8 Understand the importance of the principles and culture of academic integrity	12. Have creative design skills, be able to act as a person with an established physical culture and internal culture

General information about the educational program is given in the form "Passport of the educational program" (Table 1).

**Table 1 - Passport of the educational program**

<b>№</b>	<b>Field name</b>	<b>Note</b>
1	Registration number	-
2	Education area code and classification	6B061 Information and communication technologies
3	Code and classification of training areas	6B061 Information and communication technologies
4	Group of educational programs	B057 Information technology
5	Name of educational program	Computer Engineering and software
6	Look EP	Current EP
7	Arm of EP	Training of highly qualified specialists in computer technology and software, with fundamental knowledge of information technology, capable of applying conceptual knowledge and engineering skills for the design, software development of computer technology and information systems.
8	Level by ISCE	0610
9	Level by NQF	6 level
10	Level by IQF	6 level
11	Distinctive features of EP	No
	The university partner (JEP)	-
	The university partner (DDEP)	-
12	List of competences	<b><i>Paragraph 2.1</i></b>
13	Learning outcome	
14	Form of training	Full time
15	Language of instruction	Russian\kazakh
16	Volume of credits	240
17	Awarded degree	Bachelor of Science in Information and Communication Technologies under the educational programme «6B06102- Computer Engineering and software »
18	Availability of an Annex to the license for the direction of training	Annexes to the state license №0137367 from 29.12.2014 year (№009 from 15.03.2009 year)
19	Availability of accreditation of OP	Yes Certificate of specialized accreditation Registration number: №AB0491, 30.01.2015 y.
	The name of the accreditation body	IQAA
	The period of validity of	28.01.2015 y.-27.01.2020 y.



	accreditation	
20	Information about disciplines	<i>Paragraph 2.2</i>
21	Learning outcome	<ol style="list-style-type: none"> <li>1. To know and understand the importance of information technology and the system for solving professional tasks, using a wide range of IT technologies</li> <li>2. Apply knowledge about modern IT tools on the basis of knowledge of world trends in information technology development</li> <li>3. To have a representation of the state and trends in the development of computer architecture, computer systems, complexes and networks</li> <li>4. To have the ability to configure and service system, tool and application software, computer hardware and computer systems</li> <li>5. To be able to choose technologies, instrumental software and means of computational techniques in the organization of the process of development and research of objects of professional activity</li> <li>6. Ability to program in languages of high level, using a huge demand in the field of IT</li> <li>7. Recognize the social significance of the profession of IT specialist, have a high motivation to perform their professional activities</li> <li>8. To have an understanding and to apply basic concepts, principles, theories related to previous scientific developments in the field of information technology and computer systems.</li> <li>9. To search, process, store, transmit and analyze the necessary information from various sources, presenting it in the required format, using computer technology</li> <li>10. To have the ability to acquire new, expand and deepen the acquired knowledge, skills and competencies, necessary for the implementation and application in all areas, including professional</li> <li>11. Be guided by the principles of a culture of academic integrity, the values of a democratic society, be able to analyze current problems of society, feel business and ethical, professional responsibility, be able to take risks within the framework of advanced ideas in society,</li> <li>12. Have creative design skills, be able to act as a person with an established physical culture and internal culture</li> </ol>





<p>CC15 - possess the skills of perceiving the personality of another, empathy, establishing trusting contact and dialogue, persuading and supporting people; finding organizational and managerial decisions in non-standard situations and readiness to take responsibility for them, effectively consolidating theoretical knowledge during the period of training and production practices, conscious choice of disciplines of specializations, analysis of their activities and the ability to apply methods of emotional and cognitive regulation (for optimization) of one's own activity and mental state</p>												+
<p>CC16 -to know the basics of economics and entrepreneurship; the role of entrepreneurial risks in business, the importance of the public sector in the economy and entrepreneurship; the main provisions of the current legislation of the Republic of Kazakhstan; critical factors of project success, the composition of project management documentation, standard tools for the decomposition of project work; the basics of evaluating the effectiveness of innovative processes being developed; the basics of the methodology of project and research activities</p>	+								+	+		

<p>CC17 -be able to identify methods of state regulation of the economy, apply principles and norms governing business and government relations; use methods of risk management in entrepreneurship; navigate the current legislation; develop project management documents, risk management plan; apply the knowledge gained to solve practical problems in innovative development; determine the goals and objectives of project and research work</p>									+	+		
<p>CC18 -possess the skills of using the acquired knowledge on the subject in entrepreneurial activity; analysis of economic and entrepreneurial relations and risks; use of legal norms in order to achieve positive results in the economy; management of innovative projects in the development of the company, reading scientific, analytical, statistical reports and methods of assessing innovative development; registration of theoretical and experimental results of research and project work</p>									+	+		
<p>CC19 - have an idea of the trends and prospects of modern information technologies</p>			+						+			
<p>CC20 - have an idea about the use of packages and libraries in programming, about modern algorithmic languages, their scope and features</p>		+				+						



CC28 apply models of knowledge representation and formalization of tasks in the development of intelligent components of computer systems				+							+	
CC29 safety conditions and the choice of technical and organizational measures for safety at the stage of design, manufacture and operation of computer systems for information processing and control				+					+			
CC30 have skills in applying models, methods and tools for analysis and development of mathematical, linguistic, information and software for computer systems for information processing and management									+			+
CC31 have skills in developing components of software systems and databases, using modern programming tools and technologies		+				+						
CC32 have the skills of choosing modern tools in the field of computer technology, methods and techniques of structured programming, methods of debugging, testing and documenting programs.					+	+					+	

## 2.2 Data on disciplines

№	Name of discipline	Short description of the discipline (30-50 words)	Number of loans	The competence generated
1	2	3	4	5
<b>Cycle of General subjects</b>				
<b>High school component</b>				
1	<b>Basics of economics</b>	<b>The purpose of studying the subject:</b> obtaining knowledge, skills and abilities on the basics of economics.		CC15,CC 16, CC17

		<p><b>Within the framework of this subject, the following is studied:</b> the idea of the role of law in a market economy. Education of legal culture and thinking. The knowledge and skills gained while studying law and economics in universities can serve as the basis for legal education, which will allow you to consciously choose your future profession, having comprehensively studied its basics.</p>		
2	Basics of law	<p><b>The purpose of studying the subject:</b> obtaining theoretical knowledge about the basics of legislation and the scope of its application, as well as acquiring the skills of independent work with regulations in life.</p> <p><b>Within the framework of this subject, the following is studied:</b> society, state and law, the foundations of the theory of state and law, the foundations of constitutional law, the foundations of administrative law, the foundations of family law, the foundations of criminal law. foundations of civil law, foundations of labor law, foundations of financial law. Fundamentals of intellectual property law, Fundamentals of tax law, Fundamentals of environmental law, Fundamentals of business law, Fundamentals of customs law, Fundamentals of information law</p>		CC15,CC16,CC17
3	Basic of anti-corruption culture	<p><b>The purpose of studying the subject:</b> to develop in students a system of knowledge, skills and abilities of the correct and reasonable practice of applying the anti-corruption legislation of the Republic of Kazakhstan. These circumstances should be studied in more depth, taking into account the use of regulatory legal acts, as well as regulatory resolutions of the Supreme Court of the Republic of Kazakhstan. Also, the purpose of teaching the discipline is to provide students with knowledge in the field of criminal law, administrative law, penitentiary on prevention, prevention of corruption offenses and types of punishment for corruption offenses.</p> <p><b>Within the framework of this subject, the following is studied:</b> The history of the emergence of corruption. The main stages of the fight against corruption in the Republic of Kazakhstan. The concept and types of corruption. Criminal-legal and criminological characteristics of corruption offenses. Strategic position in the Republic of Kazakhstan in matters of combating corruption. Legal basis for combating corruption in the Republic of Kazakhstan Authorized anti-corruption bodies. Prevention of corruption in the activities of state bodies. Implementation of regional anti-corruption programs. Legal bases of activity and structures of local authorities. Issues of ensuring the transparency of the activities of local authorities. The concept and role of public control institutions. Public organizations as a source of assessment of the activities of the authorities. The role of the media in combating corruption. Mechanisms for interaction with government agencies on anti-corruption issues. Formation of an anti-corruption culture. Creating an atmosphere of rejection of</p>		CC1,CC4



		corruption in society.		
4	Ecology and life safety	<p><b>The purpose of studying the subject:</b> formation of students' ideas about ecology as a science</p> <p><b>Within the framework of this subject, the following is studied:</b> General ecology, individual ecology-autecology. environmental factors. Population ecology-demecology. Community ecology is synecology. The doctrine of the biosphere and noosphere. The concept of sustainable development. Natural resources and rational nature management. Anthropogenic factors of instability in the biosphere. Socio-ecological problems of our time. Nature protection and sustainable development of human society. Actual environmental problems of sustainable development of the Republic of Kazakhstan. Fundamentals of life safety. Tasks and principles of construction and functioning of civil defense. Basic principles and methods of protecting the population in natural emergencies. Means of collective protection. Medical characteristics of conditions requiring first aid. Formation of a healthy lifestyle. Health and ecology</p>		CC4, CC14, CC15, CC20
5	Innovative entrepreneurship	<p><b>The purpose of studying the subject:</b> formation of knowledge and skills in innovative entrepreneurship.</p> <p><b>Within the framework of this subject, the following is studied:</b> Modern business conditions, characterized by the instability of the economic environment and increasing fierce competition, place increased demands on the innovative development of organizations. This academic discipline is aimed at the formation of knowledge and professional competencies among students related to the development of scientific, technical, innovative and entrepreneurial activities, its planning, marketing of innovations, technology transfer and protection of intellectual property.</p>		CC1, CC16, CC17, CC18
6	Methods of scientific research	<p><b>The purpose of studying the subject:</b> to acquaint students with the basics of scientific activity and applied in the course of “research activity with various methods.</p> <p><b>Within the framework of this subject, the following is studied:</b> ontological, epistemological, methodological foundations of scientific activity, integral scientific methodological paradigm, principles of scientific and methodological paradigm, methods: the method of conceptual analysis, the method of frame modeling, the method of experiment (pedagogical), the method of associative experiment, the method of distributive analysis, cognitive-semantic analysis, introspective analysis, etc.; development of plans for the use of research methods in the research work of students.</p>		CC4 CC5 CC6 CC16 CC17 CC18
<b>The cycle of basic disciplines University component</b>				
1.	Creative project	<b>The purpose of studying the subject:</b> the formation of students' readiness and ability to develop creative projects in the disciplines of educational programs of a higher educational	4	CC15,CC16, CC17

		<p>institution.</p> <p><b>Within the framework of this subject, the following is studied:</b> The essence of the concept of a creative project. Goals and strategy for the implementation of projects. Types of creative projects. Requirements for the development of a creative project. Structure, functions and content of sections of the creative project. Section of the creative project "concept, review, summary". Section of the creative project "description of the product (products, services, products)". Section of the creative project "market analysis, marketing and sales". Section of the creative project "production plan".</p>		
2	Morality and ethics	<p><b>The purpose of studying the subject::</b> the formation of a holistic view of ethics among students as an independent field of knowledge, presented in various concepts, schools and directions; reflection of the place of moral regulation in the history of world culture; understanding of the ethical understanding of modern processes of globalization; the formation of students' moral values and orientations, their moral culture, moral consciousness, a sense of duty and responsibility.</p> <p><b>Within the framework of this subject, the following is studied:</b> Ethics as a science. Morality and its main characteristics. The history of genesis and the formation of ethical thought. Ethical teachings of the ancient East. Ancient ethics. medieval ethics. Basic principles of Christian and Muslim ethics. Ethical teachings of the Renaissance. Ethics of the New Age. Moral theory in German philosophical classics. Ethics of modernity XIX-XXI centuries. Ethics as the core of Kazakh philosophy. The main categories of ethics. Good and evil as landmarks of moral consciousness. Moral foundations of friendship, love, marriage and family. multimedia lecture. Watch the movie and then discuss. Applied Ethics. Problems of bioethics. Euthanasia. Ethics and etiquette. Etiquette as a reflection of culture. Norms and rules of interpersonal communication and business (service) etiquette</p>	5	CC10, CC11
3	Business communication	<p><b>The purpose of studying the subject:</b> To give knowledge in the field of theory and practice of business communications, to form and develop communicative competencies that will allow them in the future to carry out professional activities based on the most effective techniques and forms of business communications.</p> <p><b>Within the framework of this subject, the following is studied:</b> Business communication, their features, structure. Specificity and forms of business communication. The image of a business person. Imaging. Business documentation. Description of organizational and administrative documentation. Employment Relationship Documentation. Document management</p>	3	CC1, CC2, CC3, CC10

		(processing at the entrance, accounting and storage procedure, transfer to the archive). Electronic document management systems.		
4	Fundamentals of Algorithms and Programming	<p><b>The purpose of the discipline:</b> mastering the skills of developing and implementing algorithms, writing code in programming languages and solving problems of computational mathematics.</p> <p><b>Within the framework of this discipline, it is studied:</b> Data types and variables. Conditional statements. Cycles and iterations. Arrays and data structures. Functions and procedures.</p>	3	KK20, KK31
5	Mathematics	<p><b>The purpose of the discipline::</b> to familiarize students with the mathematical apparatus for describing data models, logical relationships between them and constructing data processing algorithms in those applied areas of informatics, studying by students the basics of the mathematical apparatus used to solve problems of control and algorithmization of information processing processes</p> <p><b>Within the framework of this discipline, it is studied:</b> Theoretical and practical foundations of the theory of matrices and determinants, methods of transforming coordinates; study of linear geometric objects, curves and surfaces of the second order, quadratic forms, polynomials with real and complex coefficients; mastering fundamental concepts, methods of the theory of algebra and geometry; the ability to use the studied methods of algebra and geometry in solving practical problems.</p>	3	CC21, CC22
6	Discrete Math	<p><b>The purpose of the discipline:</b> to familiarize students with the mathematical apparatus for describing data models, logical relationships between them and constructing data processing algorithms in those applied areas of informatics, studying by students the basics of the mathematical apparatus used to solve control problems and algorithmization of information processing processes.</p> <p><b>Within the framework of this discipline, it is studied:</b> The method of mathematical induction. Statements. logical operations. Basic identities of propositional logic. Disjunctive normal forms. Conjunctive normal forms. Perfect disjunctive normal forms. Perfect conjunctive normal forms. Applications of propositional algebra. Zhegalkin polynomials. Discrete analysis. Introduction to set theory.</p>	4	CC21, CC22
7	Physics	<p><b>The purpose of studying the subject:</b> The purpose of studying the discipline: understanding the foundations of the laws of nature and their application to solve practical problems.</p> <p><b>Within the framework of this subject, the following is studied:</b> Within the framework of this discipline, the following is studied: Mechanics: motion, force, work, energy, Newton's laws. Thermodynamics: temperature, heat, entropy,</p>	3	CC22

		equation of state, Carnot cycles. Electromagnetism: electricity, magnetism, electromagnetic waves, Ohm's law, Maxwell's laws. Optics: light, mirrors, lenses, refraction, diffraction. Quantum mechanics: wave function, particles, measurements, uncertainty principle, tunneling		
8	Electronics	<p><b>The purpose of studying the subject:</b> Electronics researches, designs and analyzes electrical systems, manages electronic components, designs circuits, creates and repairs electronic devices, implements innovative technologies, provides electronic connections, optimizes performance and ensures efficient signal transmission in various applications such as telecommunications, medicine and energy.</p> <p><b>Within the framework of this subject, the following is studied:</b> the basics of semiconductor technology, diodes, transistors, amplifiers, operational amplifiers, digital electronics, logic circuits, combinational and serial circuits, counters, memory, analog-to-digital and digital-to-analog converters, the basics of microprocessor technology, circuitry, basic principles of designing electronic devices.</p>	3	CC22
9	Multimedia technologies, term paper	<p><b>The purpose of the discipline:</b> a discipline that studies the creation, editing and playback of media content that combines text, graphics, audio, video and interactive elements. It is based on the use of computer tools to create multimedia projects.</p> <p><b>Within the framework of this subject, the following is studied:</b> Graphic design, animation, video editing, sound processing, virtual reality, interactive design, web development, computer graphics, 3D modeling, digital photography, audiovisual effects, multimedia design, user interface design, audio production, computer animation, game design, multimedia art, multimedia presentations, interactive media.</p>	5	CC32
10	English for Information Technology	<p><b>The purpose of the discipline:</b> preparing students for effective professional communication in English using terminology in the field of study.</p> <p><b>Within the framework of this discipline, it is studied:</b> Includes a grammar course, lexical material of a professional nature and texts of a professional orientation. When studying this discipline, the student will be able to learn to carry out oral and written communication in a foreign language in the professional field. Upon completion of the course, students are able to read and translate texts in various fields in order to extract information of a professional nature, the ability to conduct conversations on professional topics and increase the level of general culture. The course also contributes to broadening the horizons of bachelors.</p>		CC1, CC2, CC3
11	Professional Kazak Language	<p><b>The purpose of studying the subject</b> show the lexical-phraseological and grammatical features of the service-business style; acquaintance with the norms of the business language in the field of</p>	5	CC1,CC2, CC3

		<p>vocabulary, morphology, syntax, style; assistance in mastering special language tools of formal and business style; development of stylistic details;</p> <p><b>Within the framework of this subject, the following is studied:</b> formation of a common base of professional linguistic knowledge, terms, professional words, polysemantic words related to the topics of the studied sections and the necessary situations of professional communication, requirements for the preparation and maintenance of documents in the professional business sphere, professional etiquette and rules of speech culture.</p>		
<b>Cycle of basic disciplines</b>				
<b>Component of choice</b>				
12	Graphic design in the Adobe environment	<p><b>The purpose of the discipline:</b> to teach the creation of high-quality graphic images and design using professional tools Adobe Photoshop, Illustrator.</p> <p><b>This discipline studies:</b> Introduction to graphic design: basic principles of design. History and evolution of graphic design. The role of the designer. Adobe tools: Adobe Photoshop, Adobe Illustrator, Adobe InDesign and their functionalities.</p>	5/5	CC23
13	Computer image processing Corel Draw	<p><b>The purpose of the discipline:</b> to work with graphic images, which can be useful in various fields, such as design, marketing, advertising, multimedia and web development.</p> <p><b>This discipline studies:</b> Introduction to Corel: an introduction to the interface, tools, and features of the program. Image editing: basic editing techniques, resizing, rotating and cropping images.</p>	5/5	CC23
14	Differential equations	<p><b>The purpose of the discipline:</b> the study of the basic concepts of the theory of differential equations and mastering the basic techniques of solving practical problems.</p> <p><b>This discipline studies:</b> Ordinary differential equations of the first order; Differential equations of higher orders; Systems of differential equations. Differential equations in partial derivatives; Approximate methods of integrating differential equations.</p>	5/5	CC21,CC22
15	Computational Mathematics	<p><b>The purpose of the discipline:</b> the formation of skills and abilities in the field of computational mathematics.</p> <p><b>This discipline studies:</b> Error Theory; Numerical Methods for Solving Algebraic and Transcendental Equations; Solving Systems of Nonlinear Equations; Solving Systems of Linear Algebraic Equations; Approximation of Functions.</p>	5/5	CC21,CC22
16	Business analysis in information and communication	<p><b>The purpose of the discipline:</b> to learn how to analyze business processes and optimization in information technology solutions, to formulate</p>	5/5	CC18

	technologies	requirements for software development.  <b>This discipline studies:</b> Fundamentals of business analysis. The project life cycle and the roles of the business analyst. Methods and techniques for requirements gathering and analysis. Business process analysis and optimization.		
17	Business Intelligence and IT Project Management	<b>The purpose of the discipline:</b> to master the skills of business process analysis and information technology project management.  <b>This discipline studies:</b> Analysis of data and processes. Business process modeling. Systems design and optimization. Organizational change management. Project lifecycle management.	5/5	CC18
<b>Cycle of basic disciplines</b>				
<b>Component of choice</b>				
1	Object oriented programming technology	<b>The purpose of the discipline:</b> to study the basic principles of object-oriented programming, the use of modern tools for software development.  <b>This discipline studies:</b> Object-oriented environment C++; Features of OOP. C++ language; Simple, enumerated, interval and structural data types; Classes; Library of visual components; Application of methods and methodology of system analysis and decision-making and capabilities of C++ in the development of applications of various types of information systems.	4/4	CC20,CC 27
2	Programming in high-level languages	<b>The purpose of the discipline:</b> aimed at acquiring skills in developing programs using modern programming languages to solve practical problems.  <b>This discipline studies:</b> Introduction to programming in high-level languages. Data types. Operations on data. Syntax of high-level languages. Basics of algorithm development. Object-oriented programming and patterns.	4/4	CC20,CC 27
3	No-code platform	<b>The purpose of the discipline:</b> to master the tools to create applications and automate business processes without writing code, accelerate and simplify the development process and use their resources more efficiently. <b>This discipline studies:</b> Data Base in No Code-Airtable. Chatbots. Mobile applications without programming. Web applications without programming. Graphic design tools. Spark AR Studio.	6	CC32
4	IT optimization tools and methods	<b>The purpose of the discipline:</b> to master the skills of searching and applying effective tools and methods of optimization of information and technological systems to improve efficiency and economic benefit.  <b>This discipline studies:</b> Structural analysis and basics of process management. Modeling of organization activities and methods of analysis and optimization of business processes. Applied aspects of Process Mining.	6	CC32
5	Maintenance of	<b>The purpose of the discipline:</b> maintenance of	3/3	CC21,CC

	peripheral devices and personal computers	<p>hardware of personal computers, servers, peripheral devices, equipment and computer office equipment and related professional competencies.</p> <p><b>This discipline studies:</b> General appearance and structure of a personal computer. The system board of a personal computer. The personal computer processor. Organization and basic devices of internal computer memory.</p>		32
6	Repair and modernization of a personal computer	<p><b>The purpose of the discipline:</b> mastering the basic components of a personal computer, learn to repair and upgrade a personal computer, learn to install applications.</p> <p><b>This discipline studies:</b> History of computer development. The concept of the personal computer. Basic computer devices. System board, interface. Basic memory. Video card and monitor.</p>	3/3	CC21,CC 32
7	Python Programming	<p><b>The purpose of the discipline:</b> mastering the basics of programming and the Python language to create effective and scalable software solutions.</p> <p><b>This discipline studies:</b> Introduction to Python programming, syntax. Different styles of writing programs. Applications of Python language in different areas. Python for data analysis.</p>	5/5	CC20,CC 27
8	PHP programming	<p><b>The purpose of the discipline:</b> mastering the skills of developing web applications using PHP language to create dynamic and interactive sites and services.</p> <p><b>This discipline studies:</b> Fundamentals of Personal Home Page (PHP) programming language. Personal Home Page (PHP) data types. Personal Home Page (PHP) variables. Elements of PHP: constants and expressions, functions, classes, operators, regular expressions. Cycles. Working with strings and arrays.</p>	5/5	CC20,CC 27
9	Operating systems	<p><b>The purpose of the discipline:</b> mastering the knowledge of working with the basic components of operating systems.</p> <p><b>This discipline studies:</b> The purpose and functions of the operating system. Types of operating systems. The main components of an operating system. Files and directories. Processes and threads.</p>	5	CC25,CC 30
10	Linux operating system basics	<p><b>The purpose of the discipline:</b> acquiring knowledge to work in the environment of the operating system Linux.</p> <p><b>This discipline studies:</b> history of Unix and Linux operating systems. Virtual machines. Linux operating systems and their distributions. Linux operating system shells. Processes. Interaction of processes and synchronization. The file system of the Linux operating system</p>	5	CC25,CC 30
11	Java Programming	<p><b>The purpose of the discipline:</b> to master the skills of creating programs in Java to develop applications and solve problems in various fields.</p> <p><b>This discipline studies:</b> Object-oriented environment of Java. Features of OOP. The language of Java. Simple, enumerated, interval and</p>	5/5	CC20,CC 27

		structured data types. Classes. Library of visual components.		
12	Ruby Programming	<p><b>The purpose of the discipline:</b> to understand the basics of object-oriented programming in Ruby.</p> <p><b>This discipline studies:</b> The basics of Rails, models. REST, paths, controllers and templates. Bundler, bootstrap, devise, i18n. Security, design and testing. RSpec + rails: unit tests, integration tests, TDD. Background tasks, authorization, oauth, web sockets.</p>	5/5	CC20,CC 27
13	Database management systems	<p><b>The purpose of the discipline:</b> mastering the skills of designing, creating and managing databases to effectively organize the storage and processing of data in various fields of business and science.</p> <p><b>The discipline studies:</b> The basics of database theory. Database management systems. Overview of modern database management systems. Levels of representation of databases. Data models. Database languages.</p>	5/5	CC31
14	SQL Language	<p><b>The purpose of the discipline:</b> to acquire the skills of working with relational databases and the ability to effectively perform queries to extract and process information.</p> <p><b>This discipline studies:</b> Basic concepts and definitions of the database. Data models. Relational calculus of relationships. Distributed databases. Creating a database. Structured query language SQL - DDL.</p>	5/5	CC31
15	3D-Printing Technologies	<p><b>The purpose of the discipline:</b> to acquire knowledge and skills to design and create 3D models, as well as to study methods and materials for their production with 3D-printing.</p> <p><b>This discipline studies:</b> Geometric modeling. Basic concepts of three-dimensional computer modeling. Software for three-dimensional modeling. Object models. Methods of three-dimensional computer modeling.</p>	5/5	CC23
16	Animation and visual effects	<p><b>The purpose of the discipline:</b> to master the technologies and tools to create animation and visual effects.</p> <p><b>This discipline studies:</b> History of animation cinema. The creative conception of animated film. Stages of creation of animation film. Digital technologies of designing three-dimensional models and scenes.</p>	5/5	CC23
17	Algorithms and construction of robotic systems	<p><b>The purpose of the discipline:</b> mastering algorithms and building robotic systems to automate processes and solve various problems.</p> <p><b>This discipline studies:</b> History of robotics. Basic concepts of robotics. Microprocessors, controls. Servomotor and sensors. Creating and programming a robot according to the instructions of the construction kit.</p>	5	CC24,CC 26
18	Cross-platform programming	<p><b>The purpose of the discipline:</b> to develop software on different operating systems and platforms.</p>	5	CC23,CC 31



		<b>This discipline studies:</b> Basic concepts and modern means of cross-platform programming. Overview of the hierarchy of Qt classes. The philosophy of the object model. Basics of working with Qt. Library of containers.		
19	Networks and Principles of creating WEB servers	<b>The purpose of the discipline:</b> getting the theoretical and practical skills of creating, setting up and configuring a fully functional Web application using ASP.NET.  <b>This discipline studies:</b> Markup Languages. XML technology. Rules for building XML documents. Properly constructed XML documents. Creating Web forms. Adding code to a Microsoft ASP.NET Web form.	6	CC23,CC 28
20	Organization of local networks	<b>The purpose of the discipline:</b> to acquire knowledge and practical skills in the design, configuration and maintenance of computer networks in the organization.  <b>This discipline studies:</b> Arithmetic basics of an electronic computer. Representation of information in an electronic computer. Logical foundations of electronic computing machine, elements and units. Fundamentals of building an electronic computer machine. Internal organization of a processor. Organization of computer memory operation.	6	CC29
21	Fundamentals of AutoCAD and CAD systems	<b>The purpose of the discipline:</b> mastering the graphic environment AutoCad with its use in further professional activities, the creation of drawings and assemblies in the graphical environment AutoCad.  <b>This discipline studies:</b> Introduction to the interface of the graphic environment AutoCad. Tools of spatial orientation. Working with primitives. Drawing construction.	4/4	CC23
22	Modern three-dimensional graphics. Autodesk 3ds MAX	<b>The purpose of the discipline:</b> mastering Autodesk 3dsMAX tools for creating three-dimensional models and animation, as well as developing skills in working with three-dimensional graphics.  <b>This discipline studies:</b> The basic concepts of three-dimensional graphics. The basics of modeling in 3D MAX. Overview of the interface elements of 3D MAX. The conceptual foundations of modeling objects.	4/4	CC23
23	System programming	<b>The purpose of the discipline:</b> mastering the skills of creating high-performance, reliable and secure system software in different programming languages and platforms.  <b>The discipline studies:</b> System software: basic concepts and definitions; location of system software in the overall structure of the electronic computer, classification and structure of system software; organization of interaction between the hardware of the electronic computer, system software and application software.	4/4	CC19,CC 23
24	System software	<b>The purpose of the discipline:</b> to gain knowledge about the principles and methods of developing complex software systems to ensure their reliability and efficiency.	4/4	CC19,CC 23

		<p><b>The discipline studies:</b> The concept of operating system . Definition of system software, the place of the operating system and system software among the software and hardware of the electronic computer, the concept of the operating system kernel.</p>		
25	Artificial Intelligence in Robotics	<p><b>The purpose of the discipline:</b> to program a device that can perform tasks that require a high degree of autonomy and adaptability in various areas of life.</p> <p><b>This discipline studies:</b> Learning the basic concepts of artificial intelligence. Problem statement for artificial intelligence. Basic steps for building a fuzzy system. Phasing.</p>	5/5	CC28
26	Data analysis and machine learning	<p><b>The purpose of the discipline:</b> to learn how to effectively extract information from large amounts of data, create models for forecasting and optimization of business processes.</p> <p><b>This discipline studies:</b> Introduction to machine learning. Logical models of machine learning. Decision trees. Ranking trees. Learning ordered rule lists. Learning unordered rule sets.</p>	5/5	CC28
27	Development of applications for mobile devices	<p><b>The purpose of the discipline:</b> to master the skills of creating and optimizing applications for iOS and Android platforms.</p> <p><b>This discipline studies:</b> The basics of working with the application development environment for mobile devices. Creating the framework of a workable application. Formation of the user interface. Transferring the program to the user, tweaking programs.</p>	5/5	CC23,CC 25
28	Android application development	<p><b>The purpose of the discipline:</b> to master the skills of creating high-quality mobile applications for the Android operating system, using modern tools and technologies.</p> <p><b>This discipline studies:</b> Introduction to Android. An overview of mobile technology. Activity lifecycle. View Group Portrait and landscape. Save In stant State. Mobile application design. Adapter. RecyclerView. Android snippets. View Pager and TabLayout.</p>	5/5	CC23,CC 25
29	Game Development with Unity	<p><b>The purpose of the discipline:</b> mastering the skills of creating games using Unity, understanding the basic principles and methods of development of computer games.</p> <p><b>This discipline studies:</b> Overview of the Unity 3D environment. The basics of working with objects in the Unity 3D environment. Setting physics parameters for objects. Creating and using prefabs.</p>	5/5	CC23,CC 25
30	Fundamentals of game development	<p><b>The purpose of the discipline:</b> to develop the mastery of basic knowledge and skills to create and develop modern computer games.</p> <p><b>This discipline studies:</b> Introduction to computer game design. Introductory class. Safety rules. Interface. Working windows. Setting up the workspace. Working with the scene. Layers: Landscape.</p>	5/5	CC20,CC 27

31	UX/UI development	<p><b>The purpose of the discipline:</b> mastering the skills of designing user experience interfaces that will create user-friendly and attractive products for users.</p> <p><b>This discipline studies:</b> UI-design and UX-design as areas of digital design. The main stages of web project development. Methods for developing an idea for a digital product project. The basics of user experience research.</p>	5/5	CC23
32	Full Stack development	<p><b>The purpose of the discipline:</b> to master the skills of creating full-fledged web applications, covering both client and server parts, using programming languages.</p> <p><b>This discipline studies:</b> Frontend development. Basics of HTML and CSS, introduction to JS, ES6, Typescript, React, Redux, SPA creation, frontend architecture, frontend-backend interaction methods, basics of adaptive layout, testing.</p>	5/5	CC20, CC31
33	Programming and robotics on the Arduino platform	<p><b>The purpose of the discipline:</b> to acquire the skills of programming and creating robotic devices based on the Arduino platform.</p> <p><b>This discipline studies:</b> Getting to know Arduino and the ScratchDuino programming environment. Programming the I/O ports. Connection of actuators. Autonomous robots, elements of control theory.</p>	5/5	CC24,CC 26
34	Programming of microcontrollers	<p><b>The purpose of the discipline:</b> mastering the skills of designing and programming electronic devices on microcontrollers to solve various problems in automation and robotics.</p> <p><b>This discipline studies:</b> Introduction to Microcontroller Programming. Integrated development environment. Debugging boards based on AVR controllers. Description, types, characteristics. Basics of programming in C++ environment.</p>	5/5	CC24,CC 26
35	Bases of cloud technologies	<p><b>The purpose of the discipline:</b> mastering the basic principles and capabilities of cloud computing to rationally use resources and improve business processes.</p> <p><b>This discipline studies:</b> "Cloud Computing. General information Basic characteristics Scaling. Elasticity. Multitenancy. Fault tolerance. Pay-per-use. The difference between server-based and cloud-based technologies Advantages of cloud computing Risks associated with the use of cloud computing.</p>	6/6	CC21,CC 28
36	Cloud Development	<p><b>The purpose of the discipline:</b> mastering the skills of creating, deploying and managing applications in the cloud.</p> <p><b>This discipline studies:</b> Virtualizing cloud resources. Deploying cloud applications. Automation of cloud integration processes. Cloud security and data protection.</p>	6/6	CC21,CC 28
37	Cyber security	<p><b>The purpose of the discipline:</b> mastering the threats and protection of information and information systems from cyber attacks.</p>	6/6	CC29

		<p><b>This discipline studies:</b> Basic security threats to automated information processing and control systems. Encryption by gamification method. Modern symmetric cryptosystems. Asymmetric cryptosystems.</p>		
38	Fundamentals of modern cryptographic systems	<p><b>The purpose of the discipline:</b> mastering the basic principles and methods of protecting information from unauthorized access and ensuring confidentiality, integrity and availability of data.</p> <p><b>This discipline studies:</b> Basic concepts of cryptography. The simplest methods of encryption with a private key. The principles of building block ciphers with a private key. Encryption algorithms DES and AES.</p>	6/6	CC29