ALIKHAN BOKEIKHAN UNIVERSITY

MODULAR EDUCATIONAL PROGRAM
SPECIALTY 6B06102 «Information systems»

Semey, 2024

Developed by the Department of "Information and Technical Sciences"

Discussed and approved at the meeting of the Department of "Information and Technical Sciences" (Protocol No. 06 of 02.08.2024).
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CONTENT

1. EXPLANATORY NOTE

The modular educational program (MOPP) is compiled on the basis of the following documents:

- The State Standard of Higher and Postgraduate Education approved by the Order of the Minister of Science and Higher Education of the Republicof Kazakhstan dated July 20, 2022 №2;
- Rules for the organization of the educational process on credit technology of education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated April 20, 2011 №152;
- Standard rules of activity of organizations of higher and (or) postgraduate education, approved by the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 30, 2018 №595;
- Forms 26 "Structure of the modular educational program"
- Professional standards:

• Professional standards: "Database designers and administrators", "Software Development" approved by the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan
"Atameken" dated 05.12.2022 No.222.
• Atlas of New Professions – AI Technologist

The MEP is designed as a set of sequential training modules for the entire period of study and is aimed at mastering the competencies necessaryforawarding a bachelor's degree in information and communication technologies under the educational program "6B06102 -Information Systems".

The modules of the block of general education disciplines (OOD) include disciplines of the mandatory component: (OK) – 51 credits and elective components (HC) - 5 credits.

The block of basic disciplines (DB) includes disciplines of the university component (OK) – 28 credits and elective components (KV) – 84 credits.The block of profile disciplines (PD) includes disciplines of the university component (OK) – 27 credits and elective components (KV) - 37
Additional types of training (DVO) – 8 credits, which include the Final certification.
The criterion for the completion of the educational process is the development of 240 credits by a student.The MOS consists of 14 modules.
During the development of the modular educational program, the wishes and recommendations of potential employers were taken into account, aimed at the formation of additional professional competencies that meet the requirements of the labor market (round table with employers "Employer -Higher education institution - Future specialist" dated 06.02.2024)

Social partners who took part in the discussion of the MOU: Khalilov Sh.T. – Technical Director of the branch of iMAS GROUP LLP, Duysenbayeva A.K. - Head of the Competence Center "Radio Engineering, Electronics and Telecommunications, Nugumanov G.T. - senior IT specialistof the KGKP "D. Kalmataev Medical College", Kanapin T.K. - programmer of the Automated Control System Department, State Institution "Semey Vodokanal", Zhubanov T. - Java developer, medware Atlanta GA.

The purpose of the educational program Training of innovation-oriented specialists in the field of automated information systems and technologies capable of designing, developing, implementing, maintaining and operating information systems of various profiles.

***Expected results of the educational program* 6B06102 "Information systems"**

RT 1 Demonstrate knowledge about the idea of a modern rule of law in order to instill skills of financial literacy, entrepreneurship, leadership, receptivity to innovation based on scientific research in compliance with the principles of academic integrity, as well as ensuring safety standards.

RT 2 to engage in communication in oral and written forms in Kazakh, Russian and foreign languages to solve problems of interpersonal, intercultural and professional communication

RT 3 to use the basic laws of natural science disciplines in professional activities with the use of physical and mathematical apparatus and information and communication technologies to solve applied problems.

RT 4 use digital technologies, various types of information and communication technologies for the search, storage, processing, protection and dissemination of information and apply entrepreneurial knowledge in various spheres of life.

RT 5 to argue the choice of basic standards, principles and design patterns, methods, tools and programming languages, to apply new theoretical and practical skills of system programming and operating systems at the level of program development

RT 6 perform the design, programming, administration, organization and security of the database of information systems and demonstrate knowledge and skills in the creation, processing and use of database management systems.

RT 7 develop documentation for artificial intelligence systems, know the principles of the Internet of Things, standardization of architecture, technical components, applications, be able to model IoT tools in software packages

RT 8 to develop mathematical and computer models in IS, to select and use tools for modeling information processes and data visualization.

RT 9 to develop information systems and their components in various subject areas using modern ICT and IT project management methods

RT 10 analyze data, develop (encode) and document each software component, integrate software modules and software components.

RT 11 to choose methods and means of building information security systems of modern ICT, to use algorithms and methods of information security.

RT 12 create, install, configure and administer network infrastructures of information systems.

RT 13 to develop prototypes of various systems, decision-making, multi-agent systems and artificial intelligence, image recognition and image processing systems and apply methods and tools for processing big data.

RT 14 to conduct an experiment, test, debug, determine the effectiveness of the developed concept on real data, analyze the results obtained, participate in the organization and management of technical support of information systems.In order to create special conditions for people with special educational needs to receive education, the graduate's competence model is supplemented with professional competencies that ensure the adaptive nature of the main educational program. For this purpose, courses for the formationof the ability of persons with special educational needs to successfully socialize in society and actively adapt to the labor market, taking into account thecharacteristics of the disease, are introduced into the catalog of courses of the additional educational program "Minor".

2. The graduate's competence model

Competencies that a graduate should have after mastering the MOS.

1. Competence of general education:

1) aimed at forming the ideological, civil and moral positions of the future specialist, competitive on the basis of knowledge of information and communication technologies, building communication programs in Kazakh, Russian and foreign languages, orientation to a healthy lifestyle, self-improvement and professional success;

2) form a system of general competencies that ensure the socio-cultural development of the personality of the future specialist on the basis of the formation of his ideological, civil and moral positions;

3) develop the ability to interpersonal social and professional communication in Kazakh, Russian and foreign languages;

4) contribute to the development of information literacy through the mastery and use of modern information and communication technologies in all spheres of their lives and activities;

5) form skills of self-development and education throughout life;

6) form a personality capable of mobility in the modern world, critical thinking and physical self-improvement;

7) to evaluate the surrounding reality on the basis of worldview positions formed by knowledge of the fundamentals of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical cognition, to reveal the meaning of the content and specific features of the mythological, religious and scientific worldview;

8) to show a civic position based on a deep understanding and scientific analysis of the main stages, patterns, peculiarities of the historical development of Kazakhstan, to use methods and techniques of historical description to analyze the causes and consequences of events in the history of Kazakhstan;

9) evaluate situations in various spheres of interpersonal, social and professional communication, taking into account basic knowledge of sociology, political science, cultural studies, psychology, arguing their own assessment of everything happening in the social and industrial spheres, as well as synthesize knowledge of these sciences as a modern product of integrative processes;

10) to use scientific methods, methods of research of a specific science, as well as the entire socio-political cluster, to select a methodology, analyze and summarize the results of the study;

11) develop their own moral and civic position on the basis of social, business, cultural, legal and ethical norms of the Kazakh society;

12) to put into practice knowledge in the field of social sciences and humanities, which has worldwide recognition, synthesize new knowledge and present it in the form of humanitarian socially significant products;

13) to engage in communication in oral and written forms in Kazakh, Russian and foreign languages, using language and speech means based on grammatical knowledge to solve the problems of interpersonal, intercultural and industrial (professional) communication, as well as to analyze information, actions and deeds of communication participants in accordance with the communication situation;

14) use various types of information and communication technologies in personal activities: Internet resources, cloud and mobile services for the search, storage, processing, protection and dissemination of information;

15) build a personal educational trajectory throughout life for self-development and career growth, focus on a healthy lifestyle to ensure full-fledged social and professional activities through methods and means of physical culture;

16) to know and understand the basic laws of the history of Kazakhstan, the basics of philosophical, socio-political, economic and legal knowledge, communication in oral and written forms in Kazakh, Russian and foreign languages;

17) apply the acquired knowledge for effective socialization and adaptation in changing socio-cultural conditions, possess the skills of quantitative and qualitative analysis of social phenomena, processes and problems.

2. Basic competencies:

1) to use the fundamental concepts of mathematics in professional activity; to carry out the proof of mathematical statements, solve mathematical problems and problems, identify their essence, translate into mathematical language problems posed in terms of other subject areas, in particular IT technologies, to set mathematical problems; to build mathematical models; to select suitable mathematical methods and algorithms for solving problems; conduct high-quality mathematical research;

2) apply the basic methods of formalization of reasoning, the basic concepts of the theory of logical functions, the theory of algorithms, graph theory, coding theory; use the conceptual apparatus and methods of discrete mathematics to analyze mathematical models used in computer computing;

3) apply theoretical knowledge to solve generalized typical physical problems, conduct a physical experiment; calculate, analyze and process the results of a physical experiment;

4) select the elements of electronic circuits, make the necessary calculations, make a mathematical description of the functioning of devices and determine their characteristics; determine the parameters of semiconductor devices and circuit elements;

5) use methods of constructing various models of data types, algorithms for information processing; rationally use the opportunities provided by the algorithmization technique to solve practical problems;

6) formulate technical requirements taking into account the functions performed by computing systems; justify the architecture; determine tools for evaluating the performance of systems; formulate technical requirements taking into account the functions performed by computing systems; justify the architecture;

7) use the basic structures and mechanisms of various operating systems, work with modern operating systems, apply the basic concepts of system programming, develop programs covering system programming issues.

3. Professional competencies:

1) design an information model of the subject area, install, configure, use and interact with a relational database management system, present data using various models, compile SQL queries;

2) know XML, HTML5 layout, principles of stylistic design — CSS, document model processing mechanisms, develop web scripts, program in PHP, JavaScript;

3) be able to create scalable WEB applications using the design pattern — Model — View — Controller, be able to create and configure advanced single-page web applications based on modern libraries and frameworks and establish a relationship with the server;

4) plan and carry out work on the organization of data collection, analysis and interpretation processes;

5) apply theoretical knowledge to develop and present their own conclusions when solving problems in the field of IT; the ability to make decisions in complex and non-standard situations in the field of organization and management of the enterprise;

6) use modern software for processing various types of graphic information to create, store, transmit and process graphic information;

7) perform typical tasks of designing, deploying and maintaining local and global networks; administer networks in modern operating systems; install architectures and key points of distributed client-server applications, apply technologies of network interaction of communication systems, create network interaction applications;

8) identify potential threats and dangers, apply methods and tools to ensure the security of software products;

9) program in modern algorithmic languages, understand the fundamental principles of software construction; possess various approaches in programming methodology, know the paradigms of modular and object-oriented programming;

10) analyze the subject area and coordinate project requirements with the customer; isolate information processes from business processes and model them to automate the subject area;

Table 1. The sequence of mastering disciplines in the process of forming special competencies

№	Competencies	The list of compulsory, elective disciplines and the sequence of their study		Expected results
		List of disciplines	The sequence of their study (sem.)	
1	Professional competencies	World Information Resources	3 term	**Know:** characteristics of the main sectors of the global information market and the use of business information in economic decision-making in government and commercial structures. **To be able to:** to organize work on access to business information on the basis of modern information technologies. **Skills:** skills for obtaining and using real information resources
		Global Information Systems	3 term	**Know:** methods of storing information on local media; technology of working with relational databases; basic concepts from the field of expert systems; promising areas of database development; methods of data storage and protection; areas of purpose and application of modern DBMS. **To be able to:** develop an infological data model; design a relational data model; formulate queries to an existing database using QBE and SQL; design a knowledge base. **Skills:** database development skills; techniques for using desktop DBMS; methods for ensuring data integrity.
2	Professional competencies	Operating systems	3 term	**Know:** concept, principles of construction, types and functions of operating systems; operating environment; machine-independent properties of operating systems. **To be able to:** install and maintain operating systems; take into account the specifics of working in a particular operating system, organize supportfor applications of other operating systems; use the tools of the operating system. **Skills:** skills of security and fault tolerance of operating systems; principles of building operating systems; ways of organizing support for devices, hardware drivers, network operating systems.

		Operating systems and environments	3 term	**Know:** the current state of the level and directions of development of computer technology and software; the main stages, methods, tools and standards of software development; the main types of operating systems, principles of resource management in the operating system; features of work in specific operating environments and shells; service software; ways of organizing, storing and processing information on a computer. **To be able to:** work in the selected environment; master a new operating system or software shell; receive information about users, processes, directories, help about system commands; exchange messages with other users; create and view directories, copy, move and delete files, manage file access mode; create, view and merge text files, perform a template search, search for files by specified properties, use pipelines and I/O redirection. **Skills:** skills of security and fault tolerance of operating systems; principles of building operating systems; ways of organizing support for devices, hardware drivers, network operating systems.
3	Professional competencies	Fundamentals of information systems	3 term	**Know:** methods of collecting, storing, transmitting and processing information by information systems. **To be able to:** build models of the information process; solve problems of optimizing the information process. **Skills:** skills in solving problems of organizing optimal accumulation, storage, transmission and processing of information; practical application of the basics of information systems processes.
4	Professional competencies	Intelligent information systems and technologies	3 term	**Know:** the main types and procedures of information processing, models and methods for solving information processing problems (data analysis, artificial intelligence, image processing); the theory of artificial intelligence technologies. **To be able to:** solve applied issues of intelligent systems, static expert systems, real-time expert systems. **Skills:** information technology skills of information retrieval and ways of their implementation, data mining technologies, intelligent decision support technologies, building knowledge representation models, approaches and techniques for solving artificial intelligence problems, information knowledge models, knowledge representation methods, knowledge engineering methods.

		New information technologies	3 term	**Know:** principles of using modern information technologies in professional activity; sources of information and principles of working with them; principles and possibilities of using information technologies in practice. **To be able to:** analyze information sources; navigate the information flow; use information tools to gain new knowledge. **Skills:** skills of acquiring and using new knowledge and skills with the help of information technology.
5	Professional competencies	Computer networks	4 term	**Know:** the main components of the network, types of communication lines, types of IP addresses; methods and means of network protection; PHP syntax; SQL syntax; types of domain and types of hosting. **To be able to:** create LAN schemes, clean PC from viruses, apply EDS, apply encryption principles, create PHP applications, create websites with databases, create databases using phpmyadmin and SQL, process form data. **Skills:** skills to create a LAN scheme, configure and administer thenetwork, create applications in PHP, create and maintain websites, publishwebsites on the Internet, system and network administration.
		Information Technologies and Telecommunications	4 term	**Know:** features of monitoring and diagnostics of hardware and software systems devices; basic diagnostic methods; application of service tools and built-in test programs; hardware and software configuration of computer systems and complexes. **To be able to:** to monitor, diagnose and restore the operability of computer and communication systems; to carry out system maintenance of computer and communication systems. **Skills:** skills of control, diagnostics and restoration of computer and communication systems operability; system maintenance of computer and communication systems.
6	Professional competencies	Data Mining	4 term	**Know:** basic models and methods of machine learning and data development. **To be able to:** adequately apply models and methods of machine learning and data development, as well as software tools in which they are implemented. **Skills:** skills of analyzing real data using the studied methods.

		Data Science	4 term	**Know:** basic concepts and terminology of big data; basic principles of using big data in enterprise architecture; basic methods of analytical processing of big data. **To be able to:** create programs for analytical processing of big data in the R language. **Skills:** skills in using Hadoop and MapReduce technologies when working with big data.
7	Professional competencies	Database programming	4 term	**Know:** methods of designing and developing applications with databases. **To be able to:** to characterize the means of ensuring the integrity and security of databases. **Skills:** possess the skills of forming SQL queries to a database interactively and from programs in a high-level language
		Database organization and security	4 term	**Know:** technologies for developing static web sites; techniques for using multimedia (graphics, video, animation) on web pages; client-side software used to create web pages. **To be able to:** design and develop the site structure; use the HTML hypertext markup language and cascading style sheets (CSS) to create web pages; develop scripts in the JavaScript programming language. **Skills:** web site creation skills.
8	Professional competencies	Programming technology	5 term	**Know:** basics of algorithmization of tasks, types and data structures used in the selected language, master the basic operators of the programming language, routines, built-in functions, procedures and functions, dynamic structures, basics of programming technology, software design methods, programming style, debugging and testing methods, programming algorithms for data processing using pointers, programming with using graphic editors. **To be able to:** develop block diagrams of various algorithms, organize the necessary data structures depending on the requirements of the task, choose the right methods for solving problems and develop programs using language tools, write programs in a good style, debug and test programs, compile high-quality software documentation. **Skills:** skills to develop and debug programs in one of the professional programming languages; to solve problems using standard information technologies in a PC environment.
		Web programming	5 term	**Know:** the essence and concept of information, information security and the characteristics of its components, the role and place of information security in the national security system of the Republic of Kazakhstan.

				To be able to: analyze and evaluate threats to the information security of an object, develop models of threats and violators of information security of automated systems. **Skills:** professional terminology in the field of information security, methods of forming requirements for the protection of information, skills in the selection, development and application of effective methods of protecting computer systems.
9	Professional competencies	Computer-aided design systems	5 term	**Know:** the main types of CAD according to their purpose, their comparative properties and application features; have an idea about the ways of creating CAD for various purposes, trends in their development and the CAD market. **To be able to:** create and edit drawings and three-dimensional models of objects in CAD; fill out documentation using CAD; use CAD software tools to create industry drawings. **Skills:** skills of practical work on a specific CAD system installed on a personal computer, practical use of methods and means of automation of project work.
		Design of information management systems	5 term	**Know:** modern practical approaches to the problem of designing information systems in management; to study the composition and content of the stages and stages of design; to get acquainted with the technology of design inspection of the management object. **To be able to:** to implement distributed algorithms for information processing; to choose the technology of distributed information, to choose the data model of a distributed system; to organize the security of distributed data. **Skills:** modern technologies for designing information systems, CASE-tools for designing information systems.
10	Professional competencies	Electronics	5 term	**Know:** purpose, scope and physical principles of operation of the main electronic systems and devices; the history of the development of electronics and modern microelectronics. **To be able to:** use reference literature to select elements of electronic circuits, make the necessary calculations, make a mathematical description of the functioning of devices and determine their characteristics. **Skills:** calculation and design skills of electronic devices, circuits and devices of various functional purposes in accordance with the terms of reference and with the use of design automation tools, voltage measurement on electronic circuits (using a digital voltmeter, oscilloscope, etc.); the use of materials and tools from the field of electronics in cases of simple

				maintenance, installation and repair work (manual tools, various soldering techniques)
		Fundamentals of digital electronics and microprocessor technology	5 term	**Know:** the basic concepts of the principles of operation of integrated and microprocessor technology, the structure and manufacturing technology of integrated circuits, various aspects of the application of the integrated element base of electronics in practice. **To be able to:** apply knowledge in determining the main characteristics and parameters of electronic devices and microcircuits. **Skills:** skills of constructing the simplest electronic circuits on electronic devices and microcircuits, skills of practical application of measuring equipment.
11	Professional competencies	Circuit design	5 term	**Know:**общие information about the element base of circuitry (resistors, capacitors, diodes, transistors, microchips, optoelectronics elements), determination of parameters of semiconductor devices and system engineering elements. **To be able to:** determine the parameters of semiconductor devices and system engineering elements. **Skills:** skills in designing functional nodes (decoders, encoders, multiplexers, demultiplexers, digital comparators, adders, triggers, registers, counters).
		Digital circuitry	5 term	**Know:** general information about the element base of circuitry (resistors, capacitors, diodes, transistors, microchips, ontoelectronics elements), functional nodes (decoders, encoders, multiplexers, demultiplexers, digital comparators, adders, triggers, registers, counters), storage devices for basic BIS/VLSI, logic elements and logic design in the bases of microcircuits, digital-to-analog and analog-to-digital converters. **To be able to:** determine the parameters of semiconductor devices and system engineering elements. **Skills:** skills in selecting types (families) of digital elements according to specified parameters; design and simulation of basic electrical circuits of digital devices; work with software packages of virtual laboratories and real measuring instruments.
12	Professional competencies	Databases in IS	5 term	**Know:** principles of organization and architecture of database systems; data models; sequence and stages of database design; modern methods of synthesis and optimization of database structures; basic constructions of the data processing language (SQL); methods of optimization of query processing processes; modern methods of ensuring data integrity; methods of physical organization of databases; standards, methodological and

				regulatory materials defining the design, creation and maintenance of databases. **To be able to:** apply modern methodology: for research and synthesis of information models of AIS subject areas; at the stage of technical design; design databases (from the stage of analysis of the information system subject area to the implementation of a physical database model); apply database design methods and programming interaction with the database; implement and document AIS based on the database. **Skills:** skills of working with relational databases in SQL; work on database design: analyzing the subject area of an information system, compiling an infological model and a datalogical (conceptual) database schema, determining integrity restrictions and data access rights, using data protection tools; using the "essence of communication" (ER-method, method "entity-relation") for database design.
13	Professional competencies	Application software packages	5 term	**Know:** the concept of an application software package; the stages of development of application software packages; the history and stages of the development of printing in Kazakhstan; the concept of office application software packages; the concept of desktop publishing systems; the concept and purpose of technical means of publishing systems; the basics of working with the Adobe Page Maker publishing system. **To be able to:** classify software products depending on their purpose; classify application software packages into types; create texts with publications in AdobePageMaker; work with objects in AdobePageMaker; format texts in AdobePageMaker. **Skills:** skills of creating publications using Microsoft Word software with layout and layout capabilities; creating documents in Microsoft Office Publisher; techniques and methods of creating booklets and layout layouts of work in Microsoft Office Publisher; work in publishing systems.
		Integrated application software packages	5 term	**Know:** interfaces of integrated office application development environments; application software development tools. **To be able to:** to form methods for debugging programs and processing execution errors; basic technologies for obtaining data from external sources. **Владеть навыками**: development, testing and documentation of application software; programming access to external data.
14	Professional competencies	Software information systems	6 term	**Know:** the process of development and support of software products; theoretical foundations of version control systems; automatic testing environments; existing approaches to software verification.

				To be able to: modernize the information system based on a detailed study of its subject activities; organize control of the source code generated during software development; draw up software specifications; choose verification methods. **Skills:** modern tools (CASE-tools) for designing automated systems; practical skills in developing the architecture of a software product; skills in finding the causes of inconsistencies between artifacts and processes formed during software development; skills in describing the results of software verification.
		Design and development of IS software	6 term	**Know:** software design principles are concrete embodiments of these principles when programming on the Java platform, the most widely used in software development at the present time and related software development tools. **To be able to:** design and develop software on the Java platform in various application areas using modern development tools and tools. **Skills:** the skills of developing IP software and applying the acquired knowledge in practice.
15	Professional competencies	Architecture of computer systems	6 term	**Know:** the concept of computer architecture, principles of organization of multiprocessor and multi-machine computing systems, directions of development of computers with traditional, parallel and non-traditional architecture, reasons for building data transmission networks, protocols and layered models of protocol description and implementation. **To be able to:** formulate technical requirements taking into account the functions performed by computing systems and justify a rational architecture, determine the tools for the performance of computing systems, configure the computer to work in a local network and the Internet. **Skills:** skills of architecture selection and integration of modern computers, systems and networks; system administrator.
		Architecture of information systems	6 term	**Know:** fundamentals of the ARIS methodology; features of the ERP (Enterprise Resource Planning) standard as the basis of modern ISPs; principles of implementation of ISPs based on computer communication technologies; modern models of distributed computing and principles of implementation of the unified information space of the enterprise. **To be able to:** independently develop structural and functional models of business processes in the IDEF0 methodology; independently model the deployment of business processes over time in the IDEF3 standard. **Skills:** skills of multilevel modeling of business processes for designing the architecture of an information system designed for their management

				and automation; skills of working in CASE-modeling tools of business processes
16	Professional competencies	Information security and information protection	6 term	**Know:** means and methods of intrusion prevention and detection; technical channels of information leakage; possibilities of technical means of information interception; methods and means of information protection from leakage through technical channels and monitoring the effectiveness of information protection; organization of information protection from leakage through technical channels at informatization facilities. **To be able to:** use regulatory documents on countering technical intelligence; evaluate the quality of the finished software. **Skills:** methods and means of technical protection of information; methods of calculation and instrumental control of indicators of technical protection of information.
		Information protection	6 term	**Know:** the main requirements of the regulatory and legal framework of information security for the protection of information from unauthorized access, software tools of hidden information impact, information leakage through technical channels; information security objectives, the main trends and directions of the formation and functioning of a comprehensive information security system. **To be able to:** apply methods for determining the causes, types, sources and channels of leakage, distortion of information. **Skills:** skills in applying methods and forms of information protection.
17	Professional competencies	Database systems	6 term	**Know:** principles of designing a database structure that meets the requirements of AIS functionality, modern technologies for developing database applications. **To be able to:** to use modern tools and programming technologies, to develop the functionality of an automated information system, to develop software components for working with databases, to develop the user interface of an automated information system. **Skills:** skills of working with various DBMS and their administration, methods of designing the database structure, ADO technology.NET and Entity Framework for accessing the database of various DBMS.
		Database concept	6 term	**Know:** database design methods based on the normalization process and entity–relationship diagrams, database design methods based on the normalization process and entity–relationship diagrams. **To be able to:** define the domain, design a relational database, define integrity constraints.

				Skills: skills of working with modern DBMS, developing data models, developing database applications.
18	Professional competencies	Modern information systems and telemedicine	6 term	**Know:** application of modern information technologies in medicine, medical science and healthcare; general structure, software and hardware for obtaining, entering, storing, searching, processing and analyzing biomedical information and its protection; types and classification of modern information systems and technologies. Be able to implement and use modern information and telemedicine systems. **Skills:** skills of using modern information and telemedicine systems for processing medical and biological information.
		Special purpose information systems	6 term	**Know:** the main approaches to the design of special-purpose information systems; problems of choosing a special-purpose IP in accordance with the objectives of the organization; problems of standardization and unification. **To be able to:** apply system and application software to solve practical problems. **Skills:** the skills of setting up and using special-purpose information systems in practical application and developing individual information products to solve the functional tasks of the organization.
19	Professional competencies	Modeling of information systems	7 term	**Know:** structure, composition and properties of information systems, methods of system analysis and modeling of information systems. **To be able to:** use the tools of information description of objects and processes in accordance with the training profile, apply analysis and modeling methods to solve applied problems, build models of systems of various classes using Visual UML and Bpwin tools. **Skills:** skills of collecting the necessary information, systematization and generalization, application of the acquired knowledge in modeling information systems.
		Fundamentals of computer modeling	7 term	**Know:** typical classes of models and methods of modeling complex systems; principles of the system approach in system modeling; types of system modeling; typical mathematical schemes of system modeling: the sequence of development and computer implementation of system models. **To be able to:** apply knowledge and skills to build models of information systems using standard mathematical schemes, use system models to conduct simulation experiments with variations of different source data. **Skills:** methods and technologies of building models of systems, as well as their implementation with the help of information technologies.

20	Professional competencies	Programming in PHP environment	7 term	**Know:** purpose, functions, classification of PHP programming, principles of operation of Internet services; principles of organization and operation of technologies for processing web information and the Internet. **To be able to:** create static and dynamic pages, create a conceptual proposal in WEB pages using technologies to create a website and publishit on the Internet. **Skills:** programming skills and client-server technologies.
		Programming in Python 3	7 term	**Know:** paradigms, architectural features, semantics and syntax of the Python programming language, purpose, structure and properties of the basic data structures and constructions of the Python language, modules and packages for solving various applied and scientific problems. **To be able to:** develop mathematical methods and algorithms for solving various problems, use integrated development environments for the development and debugging of programs. **Skills:** skills in reading, writing, debugging and testing programs in a high-level programming language in an integrated development environment.
21	Professional competencies	Web programming and the basics of Web design	7 term	**Know:**основы web-дизайна; технологию создания гипертекстовых документов; приемы создания и оптимизации графических элементов сайта; клиентские технологии web-программирования; технологии создания web-приложений; средства управления HTML – документами. **To be able to:** to create software applications based on modern WEB technologies; to apply hypertext markup languages and CSS to the creation of web documents; to develop navigation; to layout a website taking into account ergonomics (web-usability); to develop dynamic elements; to create interactive web applications. **Skills:** skills in the field of mastering technologies, principles of organization and functioning of the Internet, as well as designing applications for use in the Internet environment.
		Internet technologies	7 term	**Know:** basics of web design, graphic programs; common web browsers, HTML, CSS, JavaScript, technologies for creating and editing Internet advertising objects (banners, buttons, flash objects). **To be able to:** to analyze technical, communication, software methods for solving problems of organizing work with users using the Internet. **Skills:** to analyze technical, communication, software methods for solving problems of organizing work with users using the Internet.
22	Professional competencies	Computer graphics	7 term	**Know:** the basic concepts of three-dimensional graphics; the main features of the 3D Studio MAX program.

				To be able to: create a stationary three-dimensional scene in accordance with the rules of artistic and technical design, taking into account color and texture solutions; create a simple animated three-dimensional scene using the 3D Studio MAX program. **Skills:** skills of creating 3D graphics in 3D Studio MAX, Autodesk 3ds Max and Autodesk Maya 3d, graphic and multimedia design development.
		Graphic tools in EIS	7 term	**Know:** modern graphic systems, understand their capabilities and belonging to existing subject areas, terminology, basic concepts, tools and algorithms for the representation, storage and processing of various types of graphic information. **To be able to:** apply graphics systems to solve various tasks, choose the tools of modern graphics tools and computer technologies to solve economic and other problems. **Skills:** the skills of using modern PP packages and software tools used to work with raster, vector and 3D graphics.
23	Professional competencies	Mathematical methods of information processing	7 term	**Know:** basic methods of mathematical information processing. **To be able to:** to search and collect information necessary to solve a specific problem; to determine the type of mathematical model for solving practical problems; to use mathematical modeling methods in solving practical problems; to use basic methods of statistical processing of experimental data. **Skills:** mathematical information processing skills.
		Methods of processing experimental data	7 term	**Know:** conceptual provisions in the field of data processing. **To be able to:** apply mathematical approaches in the development of experimental processing software. **Skills:** skills related to the use of modern computer tools for modeling, processing and analysis of observational data.

24	Professional competencies	3D modeling	7 term	**Know:** basic concepts of modeling theory, classification of models and areas of their use, modeling tasks; basic modeling tools used in the process of designing systems at different stages of project detail; methods of modeling and analysis of systems; principles of model construction. **To be able to:** perform an analysis of the system or process under study; reasonably choose a modeling method; build an adequate model of the system or process using modern computer tools; interpret and analyze the simulation results. **Skills:** the main criteria for evaluating the obtained modeling results; work experience and the use of scientific and technical information in the course of modeling.
		Computer technologies of three-dimensional graphics and animation	7 term	**Know:** modern trends in the development of graphics; principles o constructing graphic images on raster and vector information output devices about working in 3ds MAX, in Maromedia Flash MX. **To be able to:** independently create graphics, animation, simulate space an objects in it (movement and statics); present models in algorithmic form; **Skills:** skills of using interactive computer graphics in professional activities skills of working with modern packages of three-dimensional graphics an animation.
25	Professional competencies	Administration of information systems	7 term	**Know:** basic information about the formation and functioning of management services; issues of ensuring information security and the functioning of information administration systems; functions and responsibilities of the network administrator's managerial decision-making in matters of preventing and neutralizing threats to the functioning of information systems. **To be able to:** use programming languages and systems to automate information processes for collecting information necessary for processing and making managerial decisions; work with general-purpose software, search for information using search rules (query construction) in databases, computer networks of normative reference information; apply instrumental software and mathematical models in the decision-making process, formulation and formalization of tasks of expert decision support, analysis and interpretation of the results obtained. **Skills:** management skills and methods of information processes and management decision-making technologies for the functioning of

				management information systems according to the requirements for software at various levels of administrative management, skills in the practical use of modern software and computer technology and peripheral devices.
		Automated information processing and management systems	7 term	**Know:** the concept of automated information systems; characteristics of information systems, types of information systems, purpose of information systems; structure of AIS, processes and stages of the AIS life cycle; principles and stages of information system design; requirements for basic resources for the implementation of an information system project. **To be able to:** select the necessary hardware and software tools suitable for the specific needs of the information system; analyze, model and design information systems of various architectures. **Skills:** skills in the field of selection, implementation and operation of automated information processing and management systems; introduction of modern automation software products and advanced technologies; development of automated information processing and managementsystems.
26	Professional competencies	IT project management	8 term	**Know:** basic terminology related to project management; principles of development of project concepts and goals; principles of project risk management; principles of project time and cost management; methods of project implementation control; features of IT project management. **To be able to:** plan the project at all phases of its life cycle; calculate the project schedule using calendar network planning tools; manage interactions in the project; ensure effective change management; use software products for project management purposes. **Skills:** skills of project planning, project analysis, monitoring the progress of projects.
		Modern principles of project IT team management	8 term	**Know:** the role of the project in the organization in the formation of competencies necessary for the effective implementation of the project management process and project management techniques; **To be able to:** organize the development of software products by IT project teams, plan and comply with the deadlines for the development of software systems in conditions of limited resources. **Skills:** skills in organizing feedback during software product development, modern methods and tools for managing collective software development.
27	Professional competencies	Database administration on the	8 term	**Know:** tasks and principles of database administration in the MS SQL Server platform, structured SQL query language.

		MS SQL Server platform		**To be able to:** use tools that support database administration in the MS SQL Server platform. **Skills:** skills of database development and administration in a modern DBMS environment using the SQL language.
		Theory of automatic control	8 term	**Know:** automatic devices as a means of controlling operating modes, protection and regulation of electrical engineering and electric power facilities; physical phenomena in automatic devices and the basics of the theory of automatic devices; experimental research tasks; theory and experimental technique in the design, testing and production of automatic devices. **To be able to:** apply the theory and technique of experiment in the design, testing and production of automatic device systems. **Skills:** skills of experimental research, theory and experimental technique.

Table 2. Sequence of mastering disciplines of social and professional interaction

Course	**Providing disciplines**	**Competencies**	**Expected result**
2	History of Kazakhstan	Competence of general education	**Know:** to demonstrate knowledge and understanding of the main stages of the development of the history of Kazakhstan; **To be able to:** correlate the phenomena and events of the historical past with the general paradigm of the world-historical development of human society through critical analysis; be able to objectively and comprehensively comprehend the immanent features of the modern Kazakh model of development; **Skills:** possess the skills of analytical and axiological analysis in the study of historical processes and phenomena of modern Kazakhstan; systematize and give a critical assessment of historical phenomena and processes of the history of Kazakhstan
1,2	Kazakh (Russian) language	Competence of general education	**Know:** theoretical foundations of the course (language, its functions, forms of speech, text, its features, speech styles, functional and semantic types of speech); features of dialogic and monological speech; types of scientific information and specifics of its implementation in a scientific text; elements of structural and semantic analysis and semantic analysis of a scientific text, components of a speech situation, intentions the speaker. **To be able to:** to make the right choice and use of language and speech means to solve certain problems of communication and cognition on the basis of knowledge of a sufficient volume of vocabulary, a system of grammatical knowledge, pragmatic means of expressing intentions; to compose everyday, socio-cultural, official and business texts in accordance with generally accepted norms, functional orientation, using an adequate lexical-grammatical and pragmatic material of a certain certification level; to convey the factual content of texts, formulate their conceptual information, describe the deductive knowledge (pragmatic

			focus) of both the entire text and its individual structural elements; interpret the information of the text, explain in the scope of certification requirements the stylistic and genre specifics of texts of socio-cultural, socio-political, official-business and professional spheres of communication; participate in communication in various situations of different spheres of communication in order to realize their own intentions and needs (domestic, educational, social, cultural), stating them ethically correctly, meaningfully fully, lexically-grammatically and pragmatically adequate to the situation; discuss ethical, cultural, socially significant problems in discussions, express their point of view, argumentatively defend it, critically evaluate the opinion of the interlocutors; build speech behavior programs in situations of personal, social and professional communication in accordance with the norms of language, culture, specifics of the sphere of communication, certification requirements; request and report information in accordance with the communication situation, evaluate the actions and actions of participants, use information as a tool to influence the interlocutor in situations of cognition and communication in accordance with certification requirements. **Skills:** skills of producing oral and written speech in accordance with the communicative purpose and professional sphere of communication; language skills in various situations of everyday, socio-cultural, professional communication; skills of searching, processing information in Russian; types of speech activity.
1,2	Foreign language	Competence of general education	**Know:** lexical minimum and language material of topics and subtopics in this discipline (social and household and socio-cultural spheres of communication). **To be able to:** understand by ear not only individual phrases and frequently used words, but also more voluminous statements on topics directly related to him, understand the main content of short simple communications on the radio, at the airport, at the train station. understand when reading the content of short, simple texts, advertisements, brochures, menus, bus and train schedules, a short, simple personal letter, an electronic message. communicate in simple typical situations that require the exchange of information within the framework of familiar topics and activities, be able to talk about family, living conditions, educational classes. write a simple personal letter, a note, an autobiography. **Skills:** understanding of foreign-language dialogical and monological speech within the framework of general cultural and professional topics; a foreign language at a level that allows for the main types of speech activity; various methods of oral and written communication; skills of adequate response in situations of everyday, academic and professional communication; listening, reading, writing skills.
1	Information and communication technologies	Competence of general education	**Know:** what economic and political factors contributed to the development of information and communication technologies; - features of various operating systems, architecture. **To be able to:** identify the main trends in the field of information and communication technologies; use information resources to search and store information; work with spreadsheets, consolidate data, build graphs; apply methods and means of information protection; design and create simple websites; process vector and raster images; create multimedia presentations; use various platforms for communication; calculate and evaluate performance indicators of supercomputers; use various forms of e-learning to expand professional knowledge; use various cloud services.

			Skills: skills in developing the database structure; designing and creating presentations; receiving data from the server; creating video files; working with Smart applications; working with services on the e-government website.
2	Sociology	Competence of general education	**Know:** patterns and stages of the historical process, the main historical facts, dates, events and names of world and domestic historical figures; the main events and processes of national history in the context of world history. **To be able to:** critically perceive, analyze and evaluate historical information, factors and mechanisms of historical changes; analyze civil and ideological positions in society, form and improve their views and beliefs, transfer philosophical worldview to the field of material and practical activities; use various philosophical methods to analyze trends in the development of modern society, philosophical and legal analysis **Skills:** skills of a holistic approach to the analysis of society's problems; methods of philosophical, historical and cultural studies, techniques and methods of analyzing society's problems; cause-and-effect relationships in the development of Kazakh society; the place of a person in the historical process and the political organization of society; skills of respectful and careful attitude to the historical heritage
2	Political Science	Competence of general education	**Know:** the main stages of the development of political knowledge in the history of civilization; schools and trends of modern political science; the political life of society; the political system and its institutions; the essence of political processes in the country and the world. **To be able to:** analyze the features of political systems and the functioning of political institutions; critically evaluate the theoretical approaches of political science; identify the interrelationships and patterns of the political process; compare political systems, institutions and actors in the cross-country and subnational context, based on the knowledge gained and mastered methods. **Skills:** skills of working with primary sources on the topics of the course; analysis of regulatory legal acts and other documents; search, processing and analysis of information; solving problems related to the assessment of the political course; working in groups, project activities, business games; public speaking; academic writing.
1	Cultural studies	Competence of general education	**Know:** the main theories of culture, the basic concepts of cultural studies; the main directions of the methodology of modern cultural analysis; the history of the formation of world culture and civilization, theoretical features of basic cultural concepts, various interpretations of culture and civilization in world and domestic literature; current problems of the development of modern culture; the idea of culture as a socio-historical phenomenon; patterns of development of world cultures, and also about the typology of the classification of cultures; basic knowledge about the history of the most important cultures of mankind; about the ways of acquiring, storing and transmitting the basic values of culture - about the diversity and self-worth of various cultures, forms and types of culture, patterns of their functioning and development, the main cultural and historical regions - the history of Kazakh culture, its place in the system of world culture and civilization

			To be able to: to identify the features of this culture, the dominant values in it; to explain the specifics of intercultural communication; to be able to conduct independent professional activity in a dynamically changing multicultural society; to be able to navigate the cultural environment of modern society; to be able to explain the phenomenon of culture, its role in human life; to be able to navigate cultural issues, independently understand the influence of cultural factors on behavior individuals; **Skills:** practical skills of preservation and enhancement of national and world cultural heritage; practical skills of practical use of knowledge and skills in taking into account the specifics of cultural behavior of various individuals and collectives in the modern conditions of the formation of civil society in the Republic of Kazakhstan.
1	Psychology	Competence of general education	**Know:** the meaning and place of psychology in the system of sciences; the main directions of personality development in modern psychology; personal values and meanings in professional self-determination; the relationship and mutual influence of the psyche and body; techniques and techniques of effective communication. **To be able to:** interpret basic psychological theories, concepts; use methods and mechanisms of emotion regulation in everyday life; identify patterns of behavior in a conflict situation and conduct self-diagnosis. **Skills:** definitions of individual psychological characteristics of personality, value-semantic representations in professional self-determination of personality; recognition of psychological impact and effective communication.
1,2,3,4	Physical training	Competence of general education	**Know:** the role of physical culture in the development and training of a specialist; fundamentals of the state policy of the Republic of Kazakhstan in the field of physical culture and sports; - theoretical and methodological foundations of physical culture; the main achievements of the Republic of Kazakhstan in the field of physical culture; hygienic and organizational foundations of physical culture and sports. **To be able to:** использовать в жизни практические умения и навыки, обеспечивающие сохранение и укрепление здоровья, развитие и совершенствование психофизических способностей и качеств; использовать физкультурно-спортивную и оздоровительную деятельность для достижения жизненных и профессиональных целей; - применять правила безопасного проведения занятий физическими упражнениями и видам спорта. **Skills:** skills of organizing mass sports competitions; exercises on professional and pedagogical physical training, general physical training, special physical training, as well as to put into practice special games; a system of practical skills that ensure the preservation and strengthening of health, development and improvement of psychomotor abilities and qualities.
4	Philosophy	Competence of general education	**Know:** the main philosophical concepts and categories, the laws of the development of nature, society and thinking; the essence of philosophical categories, the terminology of philosophy and the structure of philosophical knowledge, the functions of philosophy, methods of philosophical research; the place and role of philosophy in public life; **To be able to:** to use the fundamentals of philosophical knowledge to form a worldview position; to analyze worldview, socially and personally significant philosophical problems; to orient oneself in the system of philosophical knowledge as a holistic view of the foundations of the universe and the prospects

			for the development of planetary society; to understand the characteristic features of the modern stage of philosophy development **Skills:** skills of philosophical analysis of various types of worldview; skills of philosophical thinking to develop a systematic, holistic view of the problems of society; skills of analyzing texts with philosophical content
2	Fundamentals of economic and legal knowledge	Competence of general education	**Know:** methods of scientific research in economics, various theories about entrepreneurship, financial literacy and market economy, types of entrepreneurial activity, the field of entrepreneurship, to learn various quantitative and qualitative methods for creating a future business, entrepreneurial calculations, analytical calculations and forecasts, the main provisions of the Constitution and current legislation of the Republic of Kazakhstan, the system of public administration and the circle their powers, the mechanism of interaction of the material and procedural law, the essence of corruption and the causes of its origin, the current legislation in the field of anti-corruption. **To be able to:** analyze and substantiate the reality of business plans, market segmentation, competently and professionally assess the market situation for the organization of your business, creatively approach various business tasks, possess practical skills of independent economic work in the field of entrepreneurship, calculate personal budget, have a clear source of information on the right direction and economic indicators, analyze events and actions from the point of view of the field of legal regulation and be able to refer to the necessary normative acts, navigate the current legislation, using the law to protect their rights and interests, and use spiritual and moral mechanisms to prevent corruption. **Skills:** acquire practical skills in constructing graphs and diagrams illustrating various economic models, independently conducting economic work in the field of entrepreneurship, quickly and correctly orientate yourself with factual output information and calculated economic indicators, determine the level of financial security, have skills in identifying economic problems in analyzing specific situations and solving them taking into account the effects of economic patterns at micro and macro levels, conducting legal discussions, Following the application of the norm in the modern period,the analysis of the situation of the conflict of moral choice.
2	Basis of scientific and ecological thinking	Competence of general education	**Know:** forms and methods of pre-scientific, scientific and non-scientific cognition, modern approaches to socio-humanitarian knowledge and their commensurability; new epistemological models, the nature of transformations of the concept of rationality; fundamentals of ecology and safe human life in the environment, environmental factors and their impact on living organisms, methods for identification, elimination of the influence of harmful factors on humans and the environment, and providing comfortable conditions for human life and activity; **To be able to:** requiring in-depth professional knowledge; modify existing ones and develop new methods based on specific research; choose methods of protection from hazards in relation to the field of their professional activities and choose ways to ensure comfortable living conditions; **Skills:** the skills of conducting independent research and scientific and pedagogical activities that require extensive education in the appropriate direction; the ability to apply methodological and methodological

			knowledge in conducting scientific research; skills to ensure the safety of life in professional activities, living conditions and in emergency situations
3	Algorithms, data structures and programming	Basic competencies	**Know:** varieties of data structures used at various levels of data representation determined by the stages of program design; basic algorithms for processing data structures: replenishment, deletion, modification, search, sorting (ordering); language tools for describing various data structures. **To be able to:** to carry out the structuring of the information space of a given subject area; based on the analysis of the task (program) being developed, to choose the most rational and economical data structures that ensure the effective implementation of the task (program); to develop effective data processing algorithms and program them in well-known programming languages. **Skills:** a methodology for designing programs with complex data organization, starting with the development of a domain model and ending with the description of algorithms and data structures by means of a programming language.
1	Mathematics I	Basic competencies	**Know:** basic mathematical definitions, theorems, etc. theoretical information of the course "Mathematics I", as well as types of problems solved by mathematical methods. **To be able to:** to form applied practical problems by mathematical methods, as well as to apply well-known methods to solve formulated problems.

			Skills: skills independently or in order to meet the modern requirements of the profession to improve their qualifications in the field of mathematical knowledge.
2	Mathematics II	Basic competencies	**Know:** properties of functions of several variables: (limitation, presence of the largest and smallest values, complex functions, partial multiplications and derivatives, full multiplications and differentials; basic methods of integration of double and triple integrals (substitution of variables, calculation in polar coordinates); types of differential equations and methods of their solution; methods for determining power series of functions. and Fourier decomposition into series; apply basic formulas to calculate the probability of random variables. **To be able to:** apply methods for solving differential and integral calculus of functions of several variables in applied problems; apply methods for solving differential equations in solving applied problems; obtain approximate values of solutions by decomposing into a power series and a Fourier series with a given accuracy; determine optimal methods for solving practical problems. **Skills:** skills of solving engineering problems using mathematical methods.
1	Physics	Basic competencies	**Know:** the essence of the basic concepts, laws, theories of classical and modern physics in their internal interrelation and integrity, the concept of physical laws, the limits of their applicability, allowing effective use in specific situations; laws and models of mechanics, molecular physics, electricity and magnetism, thermodynamics and statistical physics; fundamental phenomena in the field of physics. **To be able to:** to solve generalized typical problems from various fields of physics as the basis for solving professional problems; to assess the degree of reliability of the results of experimental and theoretical research methods; to use the achievements of fundamental science for the successful study of general theoretical and special technical disciplines, the development of mathematical thinking and logic. **Skills:** skills of assessing the degree of reliability of the results obtained using experimental or theoretical research methods; conducting a physical experiment.
3	Professional Kazakh (Russian) language	Basic competencies	**Know:** professional vocabulary and terminology; specifics of oral communication in the professional sphere; linguistic features of oral and written communication; features of business communication and business etiquette. **To be able to:** use the Russian language in interpersonal communication and professional activity; carry out business communication and conduct business conversations on professional topics; write and transmit the necessary information; explain your point of view and critically evaluate the propositions put forward; create your own statements, essays, etc. apply business etiquette norms in speech. **Skills:** skills of expressing their thoughts and opinions in interpersonal and business communication in Russian; professional terms and concepts; analysis of professional text; information competence: the ability to work with a book, textbook, reference literature, dictionaries, to find the necessary information.
4	Professionally-oriented foreign language	Basic competencies	**Know:** lexical material on the topics of this discipline; regulatory requirements for registration (official letter, essay, etc.). to improve pronunciation skills; to develop productive and receptive lexical and grammatical skills; to improve the skills of dialogical speech of a general nature related to situations of everyday and professional communication; to develop listening skills (with a full understanding of what

			was heard); to develop and improve writing skills; to improve the skills of introductory, studying, viewing and searching reading. **To be able to:** to automate the technical skills of reading to oneself; to develop the ability to transmit scientific information and literature of a socio-political nature; to develop the skills of monologue (prepared) speech – the deployment of a thesis; to master the reversed reading aloud of a prepared message; to teach referencing skills. **Skills:** complexity in solving practical, educational, educational and developmental goals (with practical goals acting as the leading ones); communicative orientation of the learning process.

Table 3. List of modules in the specialty 6B06102-"Information systems"

	Name of the module	Name of disciplines	Block	Semester	The volume of credits for the discipline	Form of control	Total credits by module
M.1	THE MODULE OF HISTORICAL AND PHILOSOPHICAL KNOWLEDGE	History of Kazakhstan	GD/RC	2	5	GE	10
		Philosophy		4	5	E	
M.2	SOCIO-POLITICAL KNOWLEDGE MODULE	Sociology	GD/RC	2	2	E	8
		Political Science			2	E	
		Cultural studies		1	2	E	
		Psychology			2	E	
M.3	INSTRUMENTAL AND COMMUNICATION MODULE	Foreign language	GD/RC	1.2	10	E	31
		Kazakh (Rus) language	GD/RC	1.2	10	E	
		Professional Kazakh (Russian) language	BD/RC	3	3	E	
		Professionally-oriented foreign language	BD/RC	4	3	E	
		Information and communication technologies	GD/RC	1	5	E	
M.4	HEALTH PROMOTION MODULE	Physical Culture	GD/RC	1-4	8	DC	8
M.5	FUNDAMENTALS OF ECONOMICS AND ECOLOGY	Fundamentals of economic and legal knowledge	GD/RC	2	3	E	5
		Fundamentals of scientific and environmental knowledge	GD/RC	2	2	E	
M.6	FUNDAMENTALS OF PHYSICS AND MATHEMATICS FOR ELECTRONICS AND CIRCUIT ENGINEERING	Physics	BD/HC	1	4	E	27
		Electronics/ Fundamentals of Digital Electronics and Microprocessor Technology	BD/CC	5	5	E	
		Circuit Engineering/ Digital Circuit Engineering	BD/CC	5	5	E	
		Mathematical methods of information processing/ Methods of processing experimental data	PD/CC	7	4	E	

		Educational practice	BD/HC	2	1	E	
		Mathematics I	BD/HC	1	5	E	
		Mathematics II	BD/HC	2	3	E	
M.7	ALGORITHMS AND COMPUTER NETWORKS	Algorithms, data structure and programming	BD/HC	3	5	E	21
		World Information Systems/ World Information Resources	BD/CC	3	5	E	
		Operating systems	BD/CC	3	5	E	
		Computer networks/ Information Technologies and Telecommunications	BD/CC	4	6	E	
M.8	THE INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE	Internet of Things / Peripheral Computing	PD/CC	8	5	E	15
		Artificial Intelligence Technology	PD/ HC	6	5	E	
		IT project management/ Modern principles of project IT team management	PD/CC	8	5	E	
M.9	PROGRAM MODELING AND DESIGN	Computer-aided design systems/ Design of information management systems	BD/CC	5	5	E	24
		Programming Technologies/Web Programming	BD/CC	5	5	E	
		Modeling of information systems/ Fundamentalsof computer modeling	BD/CC	7	5	E	
		Application Software Packages/ Integrated Application Software Packages	PD/CC	5	5	E	
		3D modeling/ Computer technologies of three-dimensional graphics and animation	BD/CC	7	4	E	
M.10	PROGRAMMING LANGUAGES	Production practice I	BD/HC	4	2	DC	22
		Data Mining/ Data Science	BD/CC	4	6	E	
		Programming in PHP/ Programming in Python	BD/CC	7	5	E	
		Information systems software/ Design anddevelopment of IS software	BD/CC	6	6	E	
		Web programming and basics of Web design/Internet Technologies	BD/CC	7	3	E	
M.11	INFORMATION SECURITY AND	Industrial practice II	BD/HC	6	2	DC	13

	COMPUTER GRAPHICS	Information security and Information protection / Information Protection	BD/CC	6	6	E	
		Computer graphics/ Graphic tools in EIS	BD/CC	7	5	E	
M.12	ARCHITECTURE AND ADMINISTRATION OF INFORMATION SYSTEMS	Intelligent information systems and technologies/ New Information Technologies	PD/CC	3	5	E	14
		Administration of information systems/Automated information processing and management systems	PD/CC	7	4	E	
		Architecture of computer systems/ Architecture of information systems	BD/CC	6	5	E	
M.13	INFORMATION SYSTEMS AND DATABASES	Database System/Database Concept	BD/CC	6	6	E	34
		Databases in IP	PD/HC	5	5	E	
		Fundamentals of information systems	PD/HC	3	5	E	
		Industrial practice III	PD/HC	8	10	DC	
		Pre-graduate practice	PD/HC	8	2	DC	
		Database programming/Organization and security of databases	BD/CC	4	6	E	
M.14	Final certification	Final certification	ATT	8	8	FC	8