**Ministry of Education and Science of the Republic of Kazakhstan**

**Non-profit Joint Stock Company «Almaty University of Power Engineering and Telecommunications named Gumarbek Daukeyev»**

**Institute of management systems and information technologies**

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| **"Agreed"** | **"Approved"** |
| President of the Association | AUEC Rector |
| of Innovative Companies SEZ "PIT" | \_\_\_\_\_\_\_\_\_\_\_\_\_\_ S. Sagintayeva |
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| «\_\_\_»\_\_\_\_\_\_\_\_\_\_\_\_\_\_2020 г. | «\_\_\_»\_\_\_\_\_\_\_\_\_\_\_\_\_\_2020 г. |

**MODULAR EDUCATIONAL PROGRAM**

**DIRECTION 6B06102 - INFORMATION SYSTEMS**

**HIGHER EDUCATION**

**Area of education (according to the classifier dated 10/13/2018):** 6B06 - Information and communication technology

**Direction of study (according to the classifier dated 10/13/2018):** 6В061 - Information and communication technology

**Duration of study - 4 years**

**Awarded academic degree:** *Bachelor of Engineering and Technology*

**Qualification level in accordance with the National Qualifications Framework:** Level 6.

**Almaty 2020**

**Training trajectories (specialty):**

IT management

Multimedia and virtual reality systems

Intelligent Information Systems

Information Systems and Telecommunications

The EP is developed on the basis of: the National Qualifications Framework, Approved by the protocol of March 16, 2016 by the Republican tripartite commission on social partnership and regulation of social and labor relations; Sectoral qualifications framework “Information and communication technologies”, Approved by the protocol of the meeting of the Sectoral Commission in the field of information, informatization, communications and telecommunications dated December 20, 2016 No. 1; State compulsory standard of higher education, Approved by the Decree of the Government of the Republic of Kazakhstan dated 08.23.2012 No. 1080 (amended by the decree of the Government of the Republic of Kazakhstan. Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604. Registered in the Ministry of Justice of the Republic of Kazakhstan from November 1, 2018 No. 17669.); Professional standards or standard projects.

The educational program was developed at the IT Engineering Department.

Head of the educational program Tusupova B.B.

In the development of the educational program participated: Amanbaev A.A., Ph.D., associate professor.

The EP was reviewed and approved at a meeting of the IT Engineering Department on 04/03/2020, protocol No. 8.

Head of IT Engineering Department \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Doszhanova A.A.

The EP was reviewed and approved at a meeting of the educational and methodical commission of the Institute of Control Systems and Information Technologies (protocol No. 8 from 05/03/2020).

Director of ICSIT \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Kartbayev T.S.

The EP was reviewed and approved by the Scientific and Methodological Council of AUEC (protocol No. 3 dated 20/10/2020).

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**List of symbols and abbreviations**

|  |  |
| --- | --- |
| HE | - Higher education |
| STSE | - State Compulsory Standard of Education |
| EQF | - European Qualifications Framework |
| NCO | - National classifier of occupations |
| RK | - Republic of Kazakhstan |
| NQF | - National Qualifications Framework |
| NQS | - National Qualifications System |
| GEM | - General educational module |
| EP | - Educational program |
| GED | - General educational disciplines |
| CC | - Compulsory component |
| UC | - University component |
| BD | - Basic disciplines |
| PD | - Profile disciplines |
| IEP | - Individual educational path |
| SQF | - Sectoral Qualifications Framework |
| PS | - Professional standard |
| PGE | - Postgraduate education |
| ON | - Competencies |
| LO | - Learning outcome |
| CW | - Course work |
| CGW | - Calculation and graphic work |
| RWS | - Research work of students |
| CED | - Catalog of elective disciplines |

**Educational program passport**

|  |  |  |
| --- | --- | --- |
| **№** | **Field name** | **Notes** |
| 1 | Registration number | 6B06100033 |
| 2 | Code and classification of the field of education | 6B06 Information and communication technology |
| 3 | Code and classification of training areas | 6B061 Information and communication technology |
| 4 | Group of educational programs | В057 - Information Technology |
| 5 | Name of educational program | 6В06102 - Information System |
| 6 | Type of EP | Current EP |
| 7 | Purpose of EP | The purpose of the educational program: providing comprehensive and high-quality training of qualified, competitive specialists in various fields of information systems application and developing students' personal qualities, as well as the formation of universal cultural (general scientific, social, personal, instrumental) and professional competencies. |
| 8 | ISCE level | ISCE 6 Baccalaureate or its equivalent |
| 9 | NQF level | 6 |
| 10 | SQF level | 6 |
| 11 | Distinctive features of EP | No |
| Partner university (JEP) | No |
| Partner university (AEP) | No |
| 12 | The list of competencies | ON-1. To apply knowledge of the humanities, environmental, social and legal, economic sciences, physics and higher mathematics in all fields of activity.  ON-2. To develop data structures and algorithms for solving problems, to perform their software implementation, to support information systems and networks. ON-3. To be able to develop, apply mathematical and/or simulation models and methods in the design of various processes in information systems. ON- 4. To design and manage databases of information systems. To know the basics of computer systems and networks administration.  ON-5. To be able to design the architecture of an information system. To explain the choice of system, instumnental and application software.  ON-6. To design, develop expert, intelligent, robotic systems. To select the best solutions at their design.  ON-7. To create an ergonomic design of information systems. To know modern tools and development environments for mobile, network applications.  ON-8. To design algorithms and methods for information security and system reliability. To be able to make managerial and technical decisions. (appendix 1) |
| 13 | Learning outcomes |
| 14 | Form of learning | Full-time, distance |
| 15 | Language of learning | Russian, Kazakh, English |
| 16 | Credits | 240 |
| 17 | Awarded Academic Degree | Bachelor in the field of information and communication technologies on the educational program “6B06102 - Information Systems” |
| 18 | Availability of an appendix to the license for the training | License № 0137445  Date of issue 08/04/2010 |
| 19 | Availability of accreditation of EP | Yes |
| Name of accreditation body | IAAR Non-profit organization "Independent agency for accreditation and rating" |
| Accreditation Duration | 05.04.2019-04.04.2024 |
| 20 | Information about disciplines | Information about disciplines of UC/OC GED, BD, PD (Appendix 1) |
| 21 | Professional activity | industry, science, education, culture, healthcare, agriculture, public administration. |
| 22 | Types of professional activity | design and engineering; production and technological; organizational and managerical; operational |
| 23 | Modular Curriculum | Given in appendix 2 |

**1. The structure of the educational program of higher education**

Bachelor's degree - the level of higher education aimed at training personnel with the award of a "bachelor" degree on the relevant educational program with the obligatory mastering of at least 240 academic credits. The content of the educational program of higher education consists of three cycles of disciplines - general education disciplines (hereinafter - GED), basic disciplines (hereinafter - BD) and profile disciplines (hereinafter - PD).

The GED cycle includes disciplines of the compulsory component (hereinafter - CC), the university component (hereinafter - UC) and (or) the optional component (hereinafter - OC). BD and PD cycles include UC and OC disciplines.

The list of GED cycle does not allow a reduction in the volume of disciplines of the compulsory component, the content of which is determined by standard educational programs. The exception is shortened educational programs of higher education with accelerated terms of study on the basis of technical and vocational, post-secondary or higher education.

UC and OC are determined independently by the university and take into account the needs of the labor market, the expectations of employers and the individual interests of the student.

The volume of the GED cycle is not more than 23% of the total educational program of higher education or 56 academic credits. Among them, 51 academic credits are allocated to the disciplines of the compulsory component.

The BD cycle includes the study of academic disciplines and the passage of professional practice and is at least 47% of the total educational program of higher education or at least 112 academic credits.

The PD cycle includes academic disciplines and types of professional practices, the volume of which is at least 25% of the total educational program of higher education or at least 60 academic credits.

The modular curriculum meets the requirements of the state compulsory standard of higher education and the structure of the educational program of higher education, contains all the components of the compulsory part, and has university and optional components. In the modular program, the minimum requirements for the number of credits for theoretical training are -228 and 12 credits for final certification. Terms and types of practices in the educational program are defined as: educational - 1 semester (3 credits), production - 4 semesters (5 credits) and 6 semesters (5 credits), pre-diploma - 8 semesters (8 credits). The optional component is defined in the catalog of elective disciplines.

Appendix 1

to the State Compulsory

Standard of Education

The structure of the educational program of higher education

|  |  |  |  |
| --- | --- | --- | --- |
| No. | The name of the cycles of disciplines and activities | Total labor input | |
| in academic hours | in academic credits |
| 1 | 2 | 3 | 4 |
| 1. | General education disciplines cycle (GED) | 1680 | 56 |
| 1) | Compulsory component | 1530 | 51 |
| The modern history of Kazakhstan | 150 | 5 |
| Philosophy | 150 | 5 |
| Foreign language | 300 | 10 |
| Kazakh (Russian) language | 300 | 10 |
| Information and communication technologies (in English) | 150 | 5 |
| The module of socio-political knowledge (sociology, political science, cultural studies, psychology) | 240 | 8 |
| Physical Culture | 240 | 8 |
| 2) | University component and(or) Optional component | 150 | 5 |
| 2. | Basic disciplines cycle (BD) | 3360 | 112 |
| 1) | University component | 180-1680 | 6-56 |
| 2) | Optional component | Not least than 1680 | Not least than 56 |
| 3. | Profile disciplines cycle (PD) | 1800 | 60 |
| 1) | University component and(or) Optional component | 1800 | 60 |
| 4. | Additional types of education (ATE) |  |  |
| 1) | Optional component |  |  |
| 5. | Final examination (FE) | 360 | 12 |
|  | Preparation and defense of a diploma work and preparation and passing a comprehensive exam | 360 | 12 |
|  | TOTAL | 7200 | 240 |

**2. Catalog of Elective Disciplines**

The catalog of elective disciplines is formed for the entire period of study, but it is not static, and can be changed in accordance with the needs of production, the desire of a group of students (at least one subgroup), academic exchange of teaching staff and the opportunity to listen to a modern professional course, leading specialists, leading universities of the world.

CED is developed and issued as a separate document.

**3. Modular curriculum**

The modular curriculum is presented in Appendix 2. The effectiveness of learning outcomes is achieved by observing a comprehensive approach, when the educational programs and the curriculum and educational disciplines are formed on a modular basis.

The content and volume of each module varies depending on the didactic purposes, profile and level differentiation of students, and the entire educational program is structured into autonomous organizational and methodological modules.

The formation and content of the modules provides the necessary degree of flexibility and freedom for students in selecting a training path and obtaining special professional competencies that increase competitiveness in the labor market.

Modules of the educational program 6В061 -Information systems are either compulsory or variative with the required disciplines of the university component.

**4. Path selection method**

Until the fourth year, the modules have a "horizontal-vertical" scheme. Modules consist of a compulsory and variative component. Learning outcomes after studying the module may vary depending on the selected variative component of the module. The variative part leaves the possibility of changing the learning path up to the 7th semester. From the 7th semester, the student studies modules in a specific direction and the variative component of the modules studied in earlier semesters.

Such a scheme for the formation of an educational program gives a student freedom in choosing the disciplines listed in the catalog of elective disciplines and in a modular curriculum, each student's personal participation in the formation of their individual curriculum, and the involvement of academic consultants to the educational process that assist students in choosing an educational path.

As a result of the implementation of the chosen educational path, the necessary competencies must be obtained. An individual educational path consists of a compulsory one, including a university component, variative, corrective, and organizational parts. The compulsory part includes the basic modules for the study, which correspond to the state compulsory standard of higher education. The university component of the modules is studied obligatory, regardless of the chosen path and forms the basic "General Professional" and "Professional" competencies of the future specialist. The variative part includes a set of modules and their components, which the student selects for study, depending on the areas of study that interests him. The compulsory and variative parts are aimed at determining the content of learning. The corrective part provides assisting students in the selection of disciplines of the variative part of modules and variative modules taking into account their individual characteristics, as well as determining the organizational part. The organizational part includes the following system components: forms, methods, technologies, tools, monitoring the study of selected content. Table 4.1 presents the organizational components of IEP training.

Table 4.1 - Organizational components of IEP training

|  |  |  |
| --- | --- | --- |
| Elements of asynchrony | Providing asynchronous learning | Tools providing asynchrony |
| 1. Individual work of a student 2. The choice of disciplines of the variative component 3. Work on projects 4. The choice of an additional training profile | Institute of Management Systems and Information Technologies | Working curriculum; Timetable of classes; Schedule of consultations of teachers of IWM; curriculum monitoring |
| Advisors, Tutors | Individual curriculum of a student |
| Techers | EMDC, schedule of completion of tasks, bibliography, handout, electronic resource |
| Students | Library, media library, electronic publications, Internet, syllabuses |

Table 4.2 presents the substantive component of IEP training. The content component specifies the variants for the formation of individual educational technology. As a part of the educational program, it is possible to implement academic mobility and receive additional education.

Table 4.2 Substantive component of IEP training

|  |  |  |
| --- | --- | --- |
| IEP variants | Providing asynchronous learning | Tools providing asynchrony |
| Individual competency set | Advisors, students | Individual curriculum of a student |
| Departments | A set of variative disciplines |
| IMSIT | Working curriculum |
| Concretization of the training profile (CGW, TW, research work, project work) | Advisors, students | Individual curriculum of a student |
| Departments | Exemplary topics for TW, CGW topics, RWS topics |
| Individual level of mastering disciplines (high, medium, low) | Advisers, students, teachers | Regulations on the ball-rating assessment system, schedule of tasks completion, experimental research work |
| Professional adaptation to professional activities during the practice | Advisors, students, departments, dean's office | Practice programs, agreements with enterprises on the bases of practices, the formation of individual tasks for practice, elements of dual learning |
| An expanded set of professional competencies (selection of an additional training profile) | Advisors, students | Individual plan of a student |
| IMSIT | Non-linear schedule, the main educational program of an additional learning profile, professional advanced training courses |

The first course is characterized by a significant number of compulsory disciplines and disciplines of the university component included in the modular plan. In the first year, there are no disciplines of the variative component. After studying the disciplines of the first and second semester, students will master 30 credits in the first semester and 30 credits in the second semester. In the first semester, educational practice is provided.

In the second year, the study of the general and basic disciplines cycles continues. The share of the variative part in the second year is significant. In the second year, the formation of a future profession begins; a significant proportion of disciplines is devoted to the theoretical foundations of systems analysis, the basics of information systems, the study of programming languages, etc. The choice of disciplines of the variative component does not affect the choice of the direction of preparation of the educational program, but forms the basic knowledge associated with information systems.

Therefore, after the selection of the disciplines of the third and fourth semester, students will master 30 credits in the third semester and 30 credits in the fourth semester. In the fourth semester, five credits for production practice 1 must be mastered.

In the third year, the study of the disciplines of the basic disciplines cycle continues, but a rather large block of profile disciplines appears, both of the compulsory and the variative component. The proportion of the variative part in the third year is significant. In the third year, there is the beginning of the formation of a future profession in the modules MIS 14-1 IT management, MIS 14-2 Multimedia and virtual reality systems, MIS 14-3 Intelligent information systems, MIS 14-4 Information systems and telecommunications. Disciplines of the university component appear that are inherent to a particular area of ​​training of a future specialist, from these disciplines it is necessary to choose the discipline that lays the foundation for specialization. After selecting the disciplines of the fifth and sixth semester, students will master 30 credits in the fifth semester and 30 credits in the sixth semester. In the sixth semester five credits for production practice 2 must be mastered.

In the fourth year, the study of the basic and profile disciplines cycles of the variative and university component continues. In the seventh semester, the study of the disciplines of a specific area of ​​future specialist training begins (MIS 14-1 IT management, MIS 14-2 Multimedia and virtual reality systems, MIS 14-3 Intelligent information systems, MIS 14-4 Information systems and telecommunications). The study of these modules is compulsory at selecting a training path (specialization). In the eighth semester, the general and basic disciplines of the university component are studied: Economics, entrepreneurship and industry management, Ecology and life safety, Professional Kazakh (Russian) language, Professionally-oriented foreign language, as well as preparation for final certification, which completes the educational process on educational program.

Therefore, after selecting the disciplines of the seventh semester, students will master 30 credits. In the eighth semester, in addition to studying a number of disciplines, there must be mastered pre-diploma practice and final certification, a total - 30 credits.

The volume of mastered credits by modules and training courses is presented in summary table 4.3.

By forming additional modules in the third and fourth courses in the university part of the program, you can train specialists in a wide variety of specializations, keeping up with the times.

The educational program ensures the application of an individual approach to students, ensures the transformation of professional competencies from professional standards and qualification standards into learning outcomes. Student-centered learning is provided - the principle of education, which implies a shift in emphasis in the educational process from teaching (as the main role of teaching staff in the knowledge "translation") to learning (as the active educational activity of the student). The educational program is designed to implement the principles of the democratic nature of educational management, expanding the boundaries of academic freedom and the authority of educational institutions, which will ensure the training of highly motivated personnel in the field of information technology, in particular in the field of information technology systems design.

Table 4.3 - A summary table reflecting the amount of mastered credits by modules of the educational program

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Curriculum | Semester | The number of mastered modules | Number of disciplines | | Number of credits KZ | | | | | Total in hours | ECTS | Amount | |
| CC | OC | Theoretical training | Training practice | Production practice | Final certification | Total | examination | Differential credit |
| 1 | 1 | 6 | 5 | 3 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 5+1 Гос | 2 |
| 2 | 5 | 4 | 3 | 27 | 3 | 0 | 0 | 30 | 900 | 30 | 6 | 1 |
| 2 | 3 | 6 | 3 | 4 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 6 | 1 |
| 4 | 4 | 1 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 5 | 2 |
| 3 | 5 | 6 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 6 | 0 |
| 6 | 4 | 0 | 7 | 25 | 0 | 5 | 0 | 30 | 900 | 30 | 6 | 1 |
| 4 | 7 | 5 | 0 | 6 | 30 | 0 | 0 | 0 | 30 | 900 | 30 | 6 | 0 |
| 8 | 2 | 0 | 5 | 10 | 0 | 8 | 12 | 30 | 900 | 30 | 4+1 Гос+ +ДП | 1 |
| Total | |  | 13 | 40 | 212 | 3 | 13 | 12 | 240 | 7200 | 240 | 44+2Гос+ДП | 8 |

Application 1

Table A1.1 - Information about the studied disciplines and formed competencies

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **№** | **Name of the discipline** | **Discipline Summary (30-50 words)** | **Amount of credits** | **Formed competencies (codes)** |
| **The cycle of general education** | | | | |
| **Required component** | | | | |
| 1 | Modern history of Kazakhstan (in Kazakh language) | As a result of studying the discipline "Modern History of Kazakhstan", students should understand the most important periods and events in the history of Kazakhstan, master the ability to analyze the key problems of Natural History and the ability to navigate in the historical space. | 5 | ON1 |
| 2 | Foreign language 1 | As a result of studying the discipline "Foreign Language", students must master a foreign language at a high professional level, sufficient for professional interaction with foreign colleagues, as well as for searching, studying and analyzing foreign sources of information. | 5 | ON1 |
| 3 | Foreign language 2 | As a result of studying the discipline "Foreign Language", students must master a foreign language at a high professional level, sufficient for professional interaction with foreign colleagues, as well as for searching, studying and analyzing foreign sources of information | 5 | ON1 |
| 4 | Kazakh (Russian) language | As a result of studying the “Kazakh (Russian) language” discipline, students will master the skills of working with authentic texts, master the language system and how to use it, and demonstrate in Russian as a language of interethnic communication written and oral communication skills in various areas of life (social, everyday, | 5 | ON1 |
| 5 | Kazakh (Russian) language | As a result of studying the “Kazakh (Russian) language” discipline, students will master the skills of working with authentic texts, master the language system and how to use it, and demonstrate in Russian as a language of interethnic communication written and oral communication skills in various areas of life (social, everyday, socio-political, educational and vocational). | 5 | ON1 |
| 6 | Information and communication technologies (in English) | In the result of the study of the discipline "Information and communication technologies" students will master information and communication competencies that will facilitate everyday life and provide an opportunity to use modern information technologies in various fields of professional activity, scientific and practical work, for self-educational and other purposes. | 5 | ON1, ON2 |
| 7 | Module social-floor characters (sociology, political science) | As a result of studying the discipline, students will acquire the necessary knowledge about the cultural development of society, about the cultural heritage of their country, as well as they will form an understanding of the laws governing the development of political processes, the place and role of politics in public life, and the features of political relations in the modern world. | 5 | ON1 |
| 8 | Module social-floor characters (cultural studies, psychology) | As a result of studying the discipline, students will receive the skills and abilities to reasonably and reasonably provide information on various stages of development of Kazakhstan's society, social and interpersonal relations, to develop programs for solving conflict situations in society, including in professional society. | 3 | ON1 |
| 9 | Philosophy | As a result of studying the “Philosophy” discipline, students will master general cultural and professional competences, namely, learn to perceive, analyze and understand philosophical, socially and personally significant philosophical problems, learn basic skills of analytical reading of texts using traditional methods and modern information technologies. | 5 | ON1 |
| 10 | Physical Education 1 | As a result of active participation in the passage of this discipline, students learn to be committed to a healthy lifestyle, improve their sporting achievements and will be aimed at the proper level of physical training necessary for an active professional activity. | 1 | ON1 |
| 11 | Physical Education 2 | As a result of active participation in the passage of this discipline, students learn to be committed to a healthy lifestyle, improve their sporting achievements and will be aimed at the proper level of physical training necessary for an active professional activity. | 2 | ON1 |
| 12 | Physical Education 3 | As a result of active participation in the passage of this discipline, students learn to be committed to a healthy lifestyle, improve their sporting achievements and will be aimed at the proper level of physical training necessary for an active professional activity. | 3 | ON1 |
| 13 | Physical Education 4 | As a result of active participation in the passage of this discipline, students learn to be committed to a healthy lifestyle, improve their sporting achievements and will be aimed at the proper level of physical training necessary for an active professional activity. | 2 | ON1 |
|  |  | **Total required component SGE** | **51** |  |
| **University component** | | | | |
| 14 | Module of the university component of the OOD (Fundamentals of Ethics and Anti-Corruption Culture, Environment and Life Safety, Economics, Entrepreneurship, Leadership and Innovation) | As a result of studying this module, students will master the competencies of a comprehensive socio-economic analysis of complex and dynamically developing processes and systems, master the skills of applying the knowledge gained to build an effective system for creating a business, reasonably solve problems, demonstrate knowledge and understanding in the field of economics and production management at Kazakhstani enterprises , the basics of general ecology and the concept of sustainable development, the ability to apply them in the analysis of current environmental problems, as well as master the knowledge of legal, ethical norms for their use in professional activities; will gain comprehensive knowledge about the nature and factors of corruption; develop the legal culture of the individual, contributing to the fight against corruption; will gain knowledge, skills and abilities to combat corruption and critical analysis of corruption phenomena. | 5 | ON1 |
|  |  | **Total university component SGE** | **5** |  |
| **Cycle of basic disciplines** | | | | |
| **University component** | | | | |
| 15 | Mathematics 1 (Maths) | As a result of studying the discipline "Mathematics 1", students will study the fundamental sections of higher mathematics: elements of linear algebra and analytical geometry: determinants, matrices, systems of linear equations, vectors, equations of a line and a plane, curves of second order; differential and integral calculus of functions of one variable: limit of a function, continuity, derivative of a function, antiderivative, a definite integral, and complex numbers. | 5 | ON1 |
| 16 | Physics | As a result of studying the discipline "Physics", students will learn the theoretical foundations of classical mechanics, the elements of the special (private) theory of relativity, the foundations of molecular physics and thermodynamics, electrostatics, direct electric current and electromagnetism, mechanical vibrations and waves. | 5 | ON1 |
| 17 | Mathematics 2 | As a result of studying the discipline "Mathematics 2", students will study the sections of higher mathematics: differential and integral calculus of functions of several variables: partial derivatives, the total differential and its connection with partial derivatives, extremes of functions of several variables, multiple integrals; differential equations: differential equations of the first and higher orders; series theory: numerical series, functional series, Fourier series. | 5 | ON1 |
| 18 | Educational practice. Computer Graphics Basics | As a result of studying the discipline, students will master the methods of computer geometry, raster and vector graphics, will acquire skills in working with graphic libraries and in modern graphic packages and systems, such as Photoshop, CorelDraw, etc. | 3 | ON1 |
| 19 | Professional Kazakh (Russian) language | As a result of studying the discipline, students will master linguistic professional competences that integrate general cultural, intellectual, social and professional qualities specialist; they will master the skills of applying special vocabulary in the professional sphere, reproducing and analyzing the text of general technical and highly specialized topics, producing their own text in the written / oral communication, professional communication and public speaking in the state (Russian) language. | 3 | ON1 |
| 20 | Professionally-oriented foreign language | Discipline is aimed at developing speech skills of oral and written communication in a foreign language, reading and translating texts in the specialty, producing monologic statements in compliance with the rules of speech etiquette. As a result, students will master the skills and knowledge of word-formation models, the contextual meanings of polysemantic words, terms, lexical structures, as well as the grammar and syntax of a technical language. | 3 | ON1 |
| 21 | Basics of Algorithmization and Programming | As a result of studying the discipline "Algorithms, Data Structures and Programming", students will receive competence in the basics of algorithmic tasks, methods of program development, dynamic data structures, software design methods, programming style, debugging methods and testing programs. | 5 | ON2, ON5 |
| 22 | Basics of Information Systems | As a result of studying the discipline “Basics of Information Systems”, students will master the competence in using formalized special knowledge in the field of building models and methods for developing information systems of various classes and assignments using basic models of information processes. | 3 | ON1, ON5, ON6 |
| 23 | Database systems | As a result of studying the discipline "Database Systems" students will learn the competence of the principles of building databases in information systems; data presentation models, in the implementation and use of basic operations on data in information systems, in the basics of designing information systems databases using modern DBMS, to support information support for solving applied problems. | 5 | ON4, ON5, ON6 |
| 24 | IT infrastructure | As a result of studying the IT-infrastructure discipline, students will master the theoretical concepts of information infrastructure, study the architecture description methodology, acquire practical skills of analyzing the problem and the direction of development of programming technologies, creating and developing a business of an enterprise, analyzing the problem and the direction of developing programming technologies. | 5 | ON2, ON5, ON7 |
| 25 | Internship 1 | As a result of practical training, students will gain practical skills in drawing up, monitoring the work plan, planning the resources required for work, the ability to analytically approach solving tasks, work in a team and independently, evaluate the results of their own work, draw up the results obtained in the form of reports and software documentation. | 5 | ON2, ON4, ON5, ON7 |
| 26 | Internship 2 | As a result of practical training, students will gain practical skills in drawing up, monitoring the work plan, planning the resources required for work, the ability to analytically approach solving tasks, work in a team and independently, evaluate the results of their own work, draw up the results obtained in the form of reports and software documentation. | 5 | ON2, ON3, ON4, ON5, ON6, ON7, ON8 |
|  |  | **Total university component BD** | **52** |  |
| **Component of choice** | | | | |
|  | **Optional discipline 1 (choose 1 of 2)** |  | 5 |  |
| 29 | Theory of Probability and Mathematical Statistics | As a result of studying the discipline "Theory of Probability and Mathematical Statistics," students will master the competences in the field of fundamental knowledge of probability theory and mathematical statistics, will be able to apply the theoretical knowledge to solve practical problems. |  | ON3, ON5, ON6 |
| 30 | Discrete Mathematics in Programming | As a result of studying the discipline “Discrete Mathematics in Programming”, students will master the concepts of set theory and mathematical logic, acquire skills in applying modern computer programs using classical methods for solving applied problems, finding optimal methods for solving practical problems, and also using methods of discrete mathematics in solving professional issues. |  | ON2, ON3 |
|  | **Optional discipline 2 (choose 1 of 2)** |  | 3 |  |
| 31 | Fundamentals of IP-telephony and streaming technologies | As a result of studying the discipline “Fundamentals of IP-telephony and streaming technologies”, students will receive basic knowledge about the principles of implementing IP-telephony networks, streaming and processing technologies; high-quality video communications organizing methods; knowledge and effective use of the capabilities of modern streaming technologies for the creation and distribution of audio-video content, including in real time. |  | ON4 |
| 32 | Multimedia technology | The discipline "Multimedia technology" is intended to consolidate the knowledge and skills of the effective use of various modern multimedia technologies for the collection, design, creation, processing, analysis, layout, testing of standard file formats for text, graphic, audio and video information for solving professional tasks. |  | ON4 |
|  | **Optional discipline 3 (choose 1 of 2)** |  | 5 |  |
| 33 | Expert Systems | As a result of studying the discipline "Expert Systems", they will master the competences of formalizing knowledge representation, analyzing the results of modeling; application of methods and models of expert systems; evaluating the effectiveness and choosing the type of models and methods of knowledge representation when creating expert systems; design and development of expert systems in various fields of knowledge. |  | ON6 |
| 34 | Artificial intelligence systems | As a result of studying the discipline "Systems of Artificial Intelligence", they will master the competences of conducting tactics of identifying expert knowledge; development of formalization of knowledge representation of an expert; methods and models of expert and intelligent systems; basic technologies for creating expert systems; master the competence of designing and developing artificial intelligence systems in various fields of knowledge. |  | ON6 |
|  | **Optional discipline 4 (choose 1 of 2)** |  | 5 |  |
| 35 | Programming technology | As a result of studying the “Technology of programming” discipline, students will gain competence in organizing data structures, developing structural diagrams of algorithms for solving set problems, knowing how to choose a programming language, using it as a means of solving a set task, debugging and testing developed programs, and using methods for compiling high-quality software documentation. |  | ON2, ON7 |
| 36 | C ++ programming | As a result of studying the discipline “Programming in C ++”, students will gain the skills to develop algorithms for solving assigned tasks, block diagrams of algorithms for various data structures using modern C ++ programming packages, using methods of compiling high-quality software documentation. |  | ON2, ON7 |
|  | **Optional discipline 5 (choose 1 of 2)** |  | 6 |  |
| 37 | Object oriented programming | As a result of studying the object-oriented programming discipline, students will receive the competence of the theoretical principles of object-oriented programming, the use of modern methods and tools for developing algorithms and programs, the ability to apply modern object-oriented programming technologies in solving complex applied problems when creating information systems. |  | ON2, ON5, ON6 |
| 38 | Visual programming | As a result of studying the “Visual Programming” discipline, students will acquire skills in designing and developing functional modules of software packages and software documentation in accordance with the standards, choosing technology and modern visual programming tools, designing and debugging information systems with documentation. |  | ON2, ON5, ON6 |
|  | **Optional discipline 6 (choose 1 of 2)** |  | 5 |  |
| 39 | Web programming | As a result of studying the discipline “Web-programming”, they will learn competencies in methods of designing and creating Web applications using modern Web technologies, applying modern software tools for solving applied problems using the global Internet, the technology of designing the structure of a web site as an information system. |  | ON7 |
| 40 | Web Interface Design | As a result of the study of the discipline “Design of Web-interfaces”, they will master the skills of applying language hypertext markup and CSS to creating web documents; using DHTML as HTML document management tools; ability to use this knowledge to create application programs in JavaScript and PHP in various subject areas; and to create web pages. |  | ON7 |
|  | **Optional discipline 7 (choose 1 of 2)** |  | 6 |  |
| 41 | Computer networks | As a result of studying the “Computer Networks” discipline, students will master the competencies in the theoretical foundations of the construction and operation of computer networks; in understanding the nature and development trends of technologies of local and global computer networks; creation of corporate network architecture, network management companies Cisco, Juniper, Huawei, network administration, monitoring and network security system development. |  | ON4 |
| 42 | Network Technology Considerations | As a result of studying the discipline "Fundamentals of Network Technologies", students will master the skills of creating corporate network architecture; network management companies Cisco, Juniper, Huawei; administration, monitoring and network security, working with Cisco equipment; static, dynamic IP addressing settings; destination routing static and dynamic IP addressing; application of VLAN technology in the switch; network address translation. |  | ON4 |
|  | **Optional discipline 8 (choose 1 of 2)** |  | 5 |  |
| 43 | Java programming | As a result of studying the “Java Programming” discipline, students will master the competencies of working with elements of Java applications; determine the result of the use of operators; data type conversions when performing assignment operations, concatenating strings, calculating arithmetic expressions, and calling a method; competent writing code programs; exception handling; practical application of the basic concepts of object-oriented programming. |  | ON2, ON7 |
| 44 | Net programming | As a result of studying the “Programming Net” discipline, students will master the skills of building programs in the C # programming language; study its main class libraries; learn how to create your own classes in C #, as well as use library classes for developing applications; use the C # language library and the .NET Framework to build the user interface. |  | ON2, ON7 |
|  | **Optional discipline 9 (choose 1 of 2)** |  | 5 |  |
| 45 | Basics of operations research | As a result of studying the discipline “Basics of operations research”, students will master the competencies of building mathematical models of the system, applying mathematical methods and modern computing and technical means and information technologies to get the desired results, analyzing the results, studying some operation as a whole, and also knowing how to quantify substantiate the optimality of solving the problem of managing an operation. |  | ON3, ON8 |
| 46 | Theory of Decision Making | As a result of studying the discipline “Theory of Decision Making”, students will master the skills of developing and making various kinds of management decisions at the level of an organization, a company, or an enterprise using various economic and mathematical models; will be able to analyze specific management tasks, correctly use management decision-making tools; explain the method of choosing various management decisions, independently develop the right management decisions. |  | ON3, ON8 |
|  | **Optional discipline 10 (choose 1 of 2)** |  | 4 |  |
| 47 | PHP programming | As a result of studying the discipline "Programming on PHP" will learn the principles of technology for the implementation of WEB-projects for any purpose; basics of designing and protecting information systems; information processing systems and models; server programming language PHP. |  | ON2, ON7 |
| 48 | Web technologies | As a result of studying the discipline "Web technologies", students will learn the principles of organization and functioning of Internet technologies. They will master the competences of creating software applications based on modern Web-technologies, using computer programs in research and development related to modern Internet technologies, creating web-sites using client-side and server-side programming tools. |  | ON2, ON7 |
|  | **Optional discipline 11 (choose 1 of 2)** |  | 3 |  |
| 49 | Data protection and security in information systems | As a result of the study of the discipline "Protection and security of data in information systems," they will gain skills in the use of methods and means of protecting information; master the competencies of recognizing threats and channels of information leakage, conducting threat analysis, carrying out the main stages of solving information security problems, applying basic general methodological principles of information security theory in practice. |  | ON8 |
| 50 | Methods and means of information protection | As a result of studying the discipline “Methods and means of information protection”, they will gain skills and competences to use, implement and implement known methods and means of protecting information in systems and networks, the ability to recognize threats and channels of information leakage, use methods and means of protecting information to ensure the security of systems and networks. |  | ON8 |
|  | **Optional discipline 12 (choose 1 of 2)** |  | 5 |  |
| 51 | Computer modelling | As a result of studying the “Computer modeling” discipline, students will master the skills in the field of computer modeling of complex systems, building models of the processes of functioning of complex systems, master the methods of constructing modeling algorithms and implement them using algorithmic languages and modeling software packages. |  | ON2, ON3, ON8 |
| 52 | Information Systems Modeling | As a result of studying the discipline “Modeling Information Systems”, students will master the construction competencies in the field of simulation modeling of information systems, building process models and modeling algorithms for complex systems, as well as their implementation using modern programming languages and application packages to automate the design process and using modeling databases. |  | ON2, ON3, ON8 |
|  | **Optional discipline 13 (choose 1 of 2)** |  | 3 |  |
| 53 | Fundamentals of building intelligent information systems | Formation of knowledge about various Internet technologies, they allow you to efficiently organize your work process in any field, manage various work processes remotely, and perform other work with minimal labor costs. At the end of the course, students will know and be able to find information, process and transmit any type of data in a variety of formats. |  | ON6 |
| 54 | Basics of On-line technologies | Formation of knowledge about various On-line technologies used for long-distance communication in various fields of industrial, public, educational and personal activities. At the end of the course, students will be able to independently configure and use various Internet applications in various fields. |  | ON4 |
|  |  | **Total variable component of BD** | **60** |  |
| **A cycle of majors discipline** | | | | |
| **University component** | | | | |
| 55 | System Programming | As a result of studying the “System Programming” discipline, students will acquire fundamental knowledge about the main theoretical and practical aspects of system programming at the program development level, which will enable them to obtain modern programs with a complex logical structure at the lowest cost. Get the skills to develop system applications. | 5 | ON2, ON8 |
|  |  | **Total university component of MD** | **5** |  |
| **Component of choice** | | | | |
|  | **Optional discipline 1 (choose 1 of 2)** |  | 3 |  |
| 56 | Special operating systems | As a result of studying the discipline “Special Operating Systems”, students will master the skills of installing and configuring network hardware in modern operating systems, ensuring the assignment of access rights, password protection, package management in various operating systems. |  | ON5 |
| 57 | Linux operating system | As a result of studying the “Linux operating system” discipline, students will learn how to configure and work in Linux, work in Linux and in application environments; the use of administration apparatus Linux in professional activities, analysis of the market of software and hardware, information products and services to solve applied problems and the creation of information systems. |  | ON5 |
|  | **Optional discipline 2 (choose 1 of 2)** |  | 5 |  |
| 58 | Robot control systems | As a result of studying the “Robot Control Systems” discipline, students will gain skills in working with the most common robot sensors; understanding of the fundamental algorithms for processing sensors and choosing the optimal solution for their design, as well as master the competence of the basic concepts of robotics, the ability to apply this knowledge when programming robotics devices. |  | ON6 |
| 59 | Arduino and 3D printing technologies | As a result of studying the discipline “Arduino Technologies and 3D Printing”, they will acquire skills in describing the general debugging architecture for embedded systems; studying the provided source codes and online resources to expand knowledge about the capabilities of the Arduino microcontroller; master the competence of designing circuits, connecting them to an Arduino microcontroller, and running Arduino programs to manage electrical circuits. |  | ON6 |
|  | **Optional discipline 3 (choose 1 of 2)** |  | 5 |  |
| 60 | Development of corporate information systems using Oracle | As a result of studying the discipline “Development of corporate information systems using Oracle”, they will master the competencies of creating real relational databases in the Oracle environment; programming in a procedural block-structured PL / SQL language; creating relational distributed databases; work in network databases; Oracle database security and security management. |  | ON2, ON4 |
| 61 | Development of corporate information systems using SQL | As a result of studying the discipline "Development of corporate information systems using SQL", they will master the skills of creating relational databases in the DBMS MS SQL SERVER; creating queries, views, procedures, functions, triggers in the relational language T-SQL; work and administration in the server database MS SQL SERVER; use of methods of protection and security of database servers. |  | ON2, ON4 |
|  | **Optional discipline 4 (choose 1 of 2)** |  | 5 |  |
| 62 | Network Application Development | As a result of studying the discipline "Development of Network Applications", they will learn the principles of developing network applications using various protocols; ways to describe the addresses of sockets, the functions of creating, setting modes, using and deleting sockets; network I / O models; principles of using multicast groups; basics of creating multi-threaded network applications and their basic models; design and implementation of simple client-server applications. |  | ON4, ON7 |
| 63 | Information Systems Interfaces | As a result of studying the discipline "Information Systems Interfaces", students will learn the competences of human-computer interaction and interaction of software applications in information systems, the design of user interfaces and interfaces of interaction of software applications, the ability to evaluate the effectiveness of user and software interfaces. |  | ON2, ON5, ON7 |
|  | **Optional discipline 5 (choose 1 of 2)** |  | 5 |  |
| 64 | Mobile Application Development Technologies | As a result of studying the discipline "Technologies for developing mobile applications," they will study the features of designing applications, developing interfaces for mobile devices; basics of testing, debugging applications; get the skills to design and develop applications of different levels of complexity; installation and configuration of additional tools on the basis of prepared instructions; preparing a computer for developing applications; skills to develop software applications for mobile devices. |  | ON2, ON4, ON7 |
| 65 | Development of applications for mobile devices based on Android | As a result of studying the discipline "Developing applications for mobile devices based on Android," students will learn the principles of developing applications for the Android OS, Intel's tools for optimizing and debugging applications, the basic principles and tools for developing and publishing applications for mobile devices; master the skills to develop software applications for devices with the Android operating system. |  | ON2, ON4, ON7 |
|  | **Optional discipline 6 (choose 1 of 2)** |  | 5 |  |
| 67 | Cloud technologies and administration of high-performance Linux-based systems | As a result of studying the “Cloud technologies and administration of high-performance Linux-based systems” discipline, students will gain the skills of virtualizing a physical server, remote control, network administration, network monitoring, creating and managing a DMZ, and security of a firewall, as well as the competence of performing basic user operations in Linux, performance testing of the supercomputer and installation of the allocated computing resources. |  | ON3, ON5, ON7 |
| 68 | Distributed system technologies and server management | As a result of studying the discipline " Distributed system technologies and server management", students will learn modern approaches to building information distribution systems, data exchange protocols in a distributed information system; master the competencies to select and analyze quality indicators and evaluation criteria for distributed information systems; analysis of the structure of information communications; setting and solving problems of ensuring information exchange in telecommunication systems. |  | ON3, ON5, ON7 |
|  | **Optional discipline 7 (choose 1 of 2)** |  | 5 |  |
| 69 | Information Systems Design | As a result of studying the discipline "Designing Information Systems", students will master the design competencies of all types of information systems, created in various areas of industry and economics, using methods for designing complex systems, evaluating the quality and reliability of a designed system using modern design tools. |  | ON5, ON6, ON7 |
| 70 | Methods and tools for designing information systems | As a result of studying the discipline "Methods and means of designing information systems", they will master the skills of analyzing the subject area and creating applied information systems; registration of design and operational documentation for information systems; analysis of the subject area and the creation of applied information systems. |  | ON5, ON6, ON7 |
|  |  | **Total variable component of MD** | **33** |  |
| **Component of choice** | | | | |
| **Trajectory (specialization) IT management** | | | | |
| 70 | Fundamentals of Management Theory | As a result of studying the discipline "Fundamentals of Management Theory", students will learn the principles of analysis and synthesis of control systems; development of mathematical and computer models of scientific and engineering problems, queuing systems, continuous, etc .; perform modeling of individual typical dynamic links and closed control systems. | 5 | ON2, ON3, ON8 |
| 71 | Data Management in Information Systems | As a result of studying the discipline “Data Management in Information Systems”, they will master the skills of identifying relationships between domain objects, conducting a pre-project study of the design object, system analysis of the subject area, and selecting source data for designing information systems. | 5 | ON4, ON5, ON6, ON7 |
| 72 | IT project management | As a result of studying the discipline "Management of IT-projects", they will master the skills of doing business in high-tech companies, developing and implementing business models, using methods, techniques, tools for creating an Internet company, planning and evaluating business results in the Internet sphere. | 5 | ON3, ON5, ON6 |
|  |  | **Total variable component of MD** | **15** |  |
| **Trajectory (specialization) Multimedia and virtual reality systems** | | | | |
| 73 | 3D modeling systems | As a result of studying the discipline "Systems of 3D-modeling" students will learn the principles of working with modern packages of three-dimensional graphics, creating three-dimensional objects in packages of three-dimensional modeling, analysis of the purpose and functionality of various computer editors of graphic modeling of technical means. | 5 | ON3, ON7 |
| 74 | Interactive Graphic Systems | As a result of studying the discipline "Interactive Graphic Systems", they will master the skills of working with raster, two-dimensional and three-dimensional vector graphics software; organizing dialogue in graphic systems; master the competences of mastering the basic functionality of modern graphic systems. | 5 | ON3, ON7 |
| 75 | Virtual and Augmented Reality Technologies | As a result of studying the discipline "Technologies of Virtual and Augmented Reality", they will master the competences of applying technologies of augmented and virtual reality in different areas of life: in industry, education, medicine, space, sports, entertainment; master the skills of working with hardware and software complexes of augmented and virtual reality; creating interactive applications for mobile devices and products with elements of augmented reality. | 5 | ON3, ON7 |
|  |  | **Total variable component of MD** | **15** |  |
| **Trajectory (specialization) Intelligent information systems** | | | | |
| 76 | Pattern Recognition and Object Identification | As a result of the study of the discipline "Pattern Recognition and Identification of Objects", they will master the skills of constructing mathematical models based on experimental data; computer processing of statistical data; obtaining mathematical models based on an analytical approach; use in the course of research scientific and technical information, Internet resources, databases and catalogs, electronic journals and search resources. | 5 | ON3, ON5 |
| 77 | Intelligent data analysis | As a result of studying the discipline "Intellectual Data Analysis" students will learn the competence to apply modern methods and tools of applied informatics for automation and informatization of solving applied problems of various classes and creating information systems. | 5 | ON3, ON8 |
| 78 | Neural networks | As a result of studying the “Neural Networks” discipline, students will master the skills of posing and solving problems using various neural network models; set tasks and develop algorithms for their solution for the implementation of software implementations of neural networks in order to process static and video images; apply different models of neural networks in solving information processing problems. | 5 | ON3, ON6, ON8 |
|  |  | **Total variable component of MD** | **15** |  |
| **Траектория (специализация) Информационные системы в телекоммуникации** | | | | |
| 79 | Cisco IP Telephony Systems | As a result of studying the discipline "Cisco IP-telephony systems", students will learn the competence of using IP telephony and its features, setting up wireless networks, mastering the principles of upgrading existing systems using advanced technologies and skills to configure Cisco gateways and inter-cluster trunks, create a call routing plan in CiscoCallManager for calls to remote clusters. | 5 | ON4, ON8 |
| 80 | Computer Network Security | As a result of studying the “Computer Network Security” discipline, students will master the skills to perform basic configuration and diagnostics of the state of local computer networks; use of modern software for network diagnostics and monitoring; operate modern network equipment, solve maintenance, network diagnostics tasks, plan strategies for modernizing and expanding local networks. | 5 | ON3, ON4, ON8 |
| 81 | Network Management Systems | As a result of studying the discipline "Systems of centralized network management", students will learn the principles of computer network administration, methods of designing computer networks, principles of working with the main protocols of local networks and the Internet, setting up network interfaces and network operating systems, creating users and groups of users, assigning rights to local networks. and network resources, data security. | 5 | ON4, ON6 |
|  |  | **Total variable component of MD** | **15** |  |

Кафедра отырысында қарастырылды

Рассмотрено на заседании кафедры

Considered at the meeting of the department

Күні/ дата/ date «\_\_\_\_\_» \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_(ж. г. y.)

Кафедра меңгерушісі: / Заведующий кафедрой: / Head of department:

\_\_\_\_Досжанова А.А. \_\_\_\_\_\_\_\_\_\_\_\_\_

(ф.и.о) қолы/подпись/signature)

БББ басшысы / Руководитель ОП / The head of the EP:

\_\_\_\_\_\_Тусупова Б.Б.\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

(ф.и.о) (қолы/подпись/signature)