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«International Information Technology
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EDUCATIONAL PROGRAM

6B06101 «Computer Science»

Code and classification of the field of education: 6B06 – Information and communication technologies

Code and classification of areas of training: 6B061 - Information and communication technologies

Group of educational programs: B057 – Information technologies

Level according to ISCE: 6

Level according to NQF: 6

Level according to SQF: 6

Duration of study: 4 years

Credits: 240

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List of abbreviations and notations

BC	Basic competence
BM	Basic module
HE	Higher education
(ГОСО-SCSE)	State compulsory standard of education
EQF	the European qualifications framework
EFO	the European Foundation for education
KSS	Knowledge, skills, skills
NCO	National classifier of occupations
NQF	National qualifications framework
NQS	National I qualifications system
GGM	General Gumanitary module
GM	General module
EP	Educational program
GPM	General professional module
IQF	Industry qualifications framework
GEC	General education competence
PS	Professional standard
PGE	Post-Graduate education
PC	Professional competence
PM	Professional module
WG	Working group
RK	Republic of Kazakhstan
LR	the learning Result
SM	the Special module
QMS	Quality management system
SEM	Socio-economic module
TTPE	Type of Technical and professional education
TTPEPSE	Type of Technical and professional education and post secondary education
ЮНЕСКО	United Nations Educational, Scientific and Cultural Organization/
UNESCO	
Cedefop	European Centre for the Development of Vocational Training
DACUM	от англ. Developing Curriculum
ECVET	European Credit System for vocational education and training
EQAVET	European Quality Assurance in Vocational Education and Training
ENQA	European Association for Quality Assurance in Higher Education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
FIBAA	International Agency (non-profit Foundation) for accreditation and examination of the quality of higher education (Bonn, Germany)
IQM-HE	Internal Quality Management in Higher Education
TACIS	Technical Assistance for the Commonwealth of Independent States
WSI	World Skills International

1. Description of the educational program

Computer science is a scientific field that studies the laws, methods and methods of obtaining, storing, transmitting and processing information in various fields of human activity using computer technology and telecommunications systems.

Training of a specialist in this experimental program involves the formation of certain professional competencies, including knowledge and skills in the design and evaluation of algorithms and application software interfaces; development and analysis of interacting processes in information environments; development, operation and maintenance of software systems for computers, computer networks and communication tools; identification of new areas of application of computer systems and design of software for them, etc.

Graduate training in the experimental program "Computer science" provides a professional qualification:

- Software development specialist
- Information technology specialist for telecommunications systems
- Specialist in computer design and Web application development
- Specialist in mobile app development and promotion
- Specialist in processing, analyzing and storing large data sets, so-called "BigData" (DataScientist)
- Machine learning specialist

The objects of professional activity are mathematical and software of computers, computer networks and communication tools, mathematical models of processes and systems.

Our approach involves both covering the basic skills of the EP "Computer science", and through the possibility of elective subjects covering the necessary elements of training in the direction of "Computer science".

At the same time, the student is left with the option of taking additional subjects at his discretion as free electives (free electives) - these can be subjects from any specialty.

Meetings conducted by the marketing service of IITU and analysis of surveys conducted among graduates of NIS, physics and mathematics schools showed that about 15 percent of graduates seriously think about professions related to applied computer science.

2. Purpose and objectives of the educational program

The purpose of the educational program is aimed at training of specialists of higher qualification without a category, specialists of higher qualification of the second category, specialists of higher qualification of the first category. To achieve this goal, it is necessary to perform a number of tasks, including the purposeful formation of a contingent of students, specialized theoretical and practical training of students in the learning process focused on the modern needs of the employer

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

Training of a specialist in this specialty involves the formation of certain professional competencies, including knowledge and skills in the design and evaluation of algorithms and application software interfaces; development and analysis of interacting processes in information environments; development, operation and maintenance of software systems for computers, computer networks and communication tools; identification of new areas of application of computer systems and design of software for them.

The following forms of exams are used as an assessment of learning results: computer testing, written exam (answers on sheets), oral exam, project (passing a course project), practical (open questions on a computer, solving problems on a computer, including in ACM format), complex (test/written/oral+others). According to table 1 the following ratio of exam forms is recommended:

Table 1

No	Examination form	Recommended percentage, %
1	Computer testing	20%
2	Written	10%
3	Oral	5%
4	Project	30%
5	Practical	30%
6	Complex	5%

The final certification ends with the defense of the diploma project.

4. Passport of the educational program

4.1 General information

№	Field name	Remark
1	Code and classification of the field of education	6B06-Information and communication technologies
2	Code and classification of training areas	6B061-Information and communication technologies
3	Group of educational programs	057-Information technology
4	Name of the educational program	6B06101 " Computer science»
5	Brief description of the educational program	<p>Computer science is a scientific field that studies the laws, methods and methods of obtaining, storing, transmitting and processing information in various fields of human activity using computer technology and telecommunications systems.</p> <p>Training of a specialist in this experimental program involves the formation of certain professional competencies, including knowledge and skills in the design and evaluation of algorithms and application software interfaces; development and analysis of interacting processes in information environments; development, operation and maintenance of software systems for computers, computer networks and communication tools; identification of new areas of application of computer systems and design of software for them, etc.</p>
6	Objective of the EP	Education of competent it professionals who are able to solve a wide range of application tasks, such as building web services, data analysis and machine learning tasks, managing software projects and their development processes.
7	Level according to ISCE	6
8	Level according to NQF	6
9	Level according to SQF	6
10	List of competencies of the educational program:	<p>GC1: Know: social and ethical values based on public opinion, traditions, customs, social norms and focus on them in their professional activities; traditions and culture of the peoples of Kazakhstan; human and civil rights and freedoms; the basics of the legal system and legislation of Kazakhstan; trends in social development of society; the basics of physical culture and the principles of a healthy lifestyle.</p> <p>GC2: Have an idea: about ethical and spiritual values; about sociological approaches to the individual, the main laws and forms of regulation of social behavior; about the essence of power and political life, political relations and processes, the role of political systems in the life of society and various social groups; about the role of consciousness and self-awareness in the behavior, communication and activities of people, the formation and formation of personality.</p> <p>GC3: Possess: ethical and legal norms of behavior; a system of practical knowledge and skills that ensure the acquisition, development, improvement and activation of psychophysical abilities and qualities, the acquisition, preservation and promotion of health, the ability to work in a team, correctly defend their point of view, offer new</p>

	<p>solutions.</p> <p>GC4: Ability to write and communicate verbally in the state language and the language of international communication; ability to logically correctly, argumentatively and clearly build oral and written speech; readiness to use one of the foreign languages</p> <p>GC5: Ability to use modern information technologies, manage information using business applications; use network computer technologies, databases and application packages in their subject area.</p> <p>BC1: Ability to actually use the state language, the language of international communication and a foreign language in professional activities.</p> <p>BC2: Ability to understand the basics of economic knowledge, scientific ideas about Finance, Economics.</p> <p>BC3: The ability to professionally operate modern equipment, devices, network components, computer systems (in accordance with the program goals), as well as to use safety rules, industrial sanitation, fire safety and labor protection standards.</p> <p>BC4: Ability to have skills in using algorithms and programs for calculating business process parameters.</p> <p>BC5: The ability to use the main provisions and methods for solving management tasks, the ability to perform project documentation in a computer graphics software environment for various types of projects.</p> <p>BC6: The ability to be competent in the choice of mathematical modeling methods for solving specific engineering problems, including the readiness to identify the natural science essence of problems that arise in the course of professional activity, and the ability to attract the appropriate physical and mathematical apparatus for its solution.</p> <p>BC7: Ability to design architectures of information system components, including the human-machine interface of hardware and software complexes, to choose operating systems and methods of information protection.</p> <p>BC8: Ability to develop information and software for an information system based on modern development methods and tools.</p> <p>PC1: Ability to carry out a description of applied processes and information support for solving applied problems;</p> <p>PC2: Ability to manage the lifecycle stages of the methodological and technological infrastructure for big data analysis in an organization;</p> <p>PC3: Ability to participate in the management of information system development projects at the stages of the life cycle;</p> <p>PC4: Ability to use modern programming environments for database design and implementation.</p> <p>PC5: Ability to analyze the market of software and hardware, information products and services for creating and modifying information systems.</p> <p>PC6: Ability to develop, implement and adapt application software.</p>
11	<p>Learning outcomes of the educational program:</p> <p>LO1: Explain the choice of basic standards, principles, and design patterns, methods, tools, and programming languages, including methods and tools for building information security systems. ICT</p> <p>LO2: Apply mathematical models and methods of various processes</p> <p>LO3: Design database, software, and information system architect</p> <p>LO4: Design and develop ergonomic user interfaces</p> <p>LO5: Analyze the market for software and hardware, information products and services for creating and modifying information systems</p> <p>LO6: Demonstrate sociability, initiative and psychological readiness for work, including when working in a team, and make managerial and technical decisions</p> <p>LO7: Use methods for studying large data sets</p> <p>LO8: Installation of information system software and database loading</p> <p>LO8: Apply research methodologies in data science</p>

	LO9: Participation in the management of technical support of an information system during its operation LO10: Conduct a comprehensive analysis and analytical synthesis of research results using modern science and technology, skills of independent data collection, study, analysis and generalization.	
12	Form of training	Intramural
13	Language of instruction	English
14	Volume of credits	240
15	Academic degree awarded	Bachelor in Information and Communication technologies in the educational program "6B06101-Computer science»

4.2. Matrix of correlation of learning outcomes of the educational program with the formed competencies

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
BC1						V				
BC2						V		V		
BC3	V		V	V						
BC4		V	V		V					
BC5			V	V						
BC6		V			V					
BC7	V							V		
BC8	V		V	V	V					
PC1							V	V	V	
PC2	V	V		V			V	V		
PC3					V	V				V
PC4			V		V	V	V		V	V
PC5		V		V		V	V		V	V
PC6										

4.3. Information about disciplines

№	Name of discipline	Short description of the discipline (30-50 words)	Number of credits	Formed competencies (codes)	Prerequisites	Post-requisites
Cycle of General subjects						
University component/Component of choice						
1.	Modern history of Kazakhstan	This course consists of teaching the modern history of the country to understand the role and significance of the events in the historical context.	5	GC1, GC2	-	-
2.	Philosophy	This course consists of teaching philosophy to form a conscious attitude to the environment.	5	GC3	-	-
3.	Foreign language	This course consists of learning a foreign language for the formation of communication skills in a foreign language.	5	GC4	-	
4.	Kazakh (Russian) language	This Russian/Kazakh language course consists of teaching Kazakh / Russian language for	5	GC4	-	-

		the formation of communication skills in the state and Russian languages.				
5.	Information and communication technologies	The course provides an overview in various ICT fields, allowing students to gain basic knowledge on the application of modern ICT in their scientific and practical work, for self-study and other purposes.	5	GC5	-	-
6.	Political science	The course provides students with knowledge about the political sphere of society, the relationship and mutual influence of politics and management	2	GC1, GC3	-	-
7.	Sociology	This course consists of teaching sociology to understand society and social development.	2	GC2	-	-
8.	Psychology	The course introduces various concepts, basic concepts, laws of management psychology	2	GC3	-	-
9.	Culturology	The course forms the necessary knowledge of cultural studies, develops an understanding of the uniqueness of cultures	2	GC2	-	-
10.	Physical culture	The course provides a solution to the main problems of physical education of students, provides for the delivery of control exercises and standards.	2	GC2	-	-
Cycle of basic disciplines University component						
11.	Discrete mathematics	Discrete mathematics is a part of mathematics devoted to the study of discrete objects (here discrete means consisting of separate or unrelated elements). In a more General sense, discrete mathematics is used whenever objects are counted, when relationships between finite (or countable) sets are studied, and when processes involving a finite number of steps are analyzed. The main reason for the growing importance of discrete mathematics is that information is stored and processed by computers in a discrete way	4	BC6	-	Algorithms and data structures
12.	Human-computer interaction (SDP 7)	The course includes: methodology and development of interface design (i.e., based on the requirements and class of users, the design of the best interface within a given framework, optimization for the required properties, such as learning and efficiency of use); methods of implementation of interfaces (for example, software tools, libraries and rational algorithms);	4	PC2		
13.	Object-oriented programming in Java	The course includes: Encapsulation, inheritance, polymorphism. The creation of	5	BC8	Programming	Java Advanced I

		classes. Create useful client applets and stand-alone apps based on real-world requirements that students receive from real clients or employers.			languages and technologies	
14.	Linear algebra	The course includes: matrix Theory, systems of linear equations, vector theory, analytical geometry, limit and differentiation of functions of one variable.	4	BC6	-	
15.	Operating system	The course involves the formulation of the following tasks: familiarization with the basic concepts of operating systems; familiarization with the differences of modern operating systems; training skills in different interfaces of different operating systems; familiarization with the installation and administration of different operating systems; familiarization with the differences in working with local and global networks.	4	BC7, PC6		
16.	Algorithms and data structures	The process of studying the discipline is aimed at the formation of the following competencies: - the ability to search, store, process and analyze information from various sources and databases, to present it in the required format using information, computer and network technologies; - proficiency in reading, understanding and highlighting the main idea of the read source code, documentation.	6	BC4, PC2, PC3, PC6	Дискретная математика	
17.	Computer network	The course promotes the formation of professional competence of the bachelor in the field of architecture of computer networks and telecommunication systems through the formation of a holistic view of the General principles of their construction, operation and understanding, based on an understanding of the structure and nature of network interaction, the ability to design and implement it in solving professional problems, the development of the ability to apply knowledge in practice, the formation of General cultural and professional competencies necessary for the implementation of professional activities	3	BC5, PC6		
18.	Research methodology	The course is devoted to the study of activities aimed at developing students' ability to independent theoretical and	3	BC5	-	

		practical judgments and conclusions, skills of objective evaluation of scientific information, freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for the diploma project (work).				
19.	Java Advanced 1	Development of fast, dynamic and functionally developed Java web applications using JSF, Web Services, AJAX. The course provides an overview of the structure and implementation of enterprise Web applications. An example of actually used architecture is given.	5	BC4, PC2, PC3, PC6	Object-oriented programming in Java	
20.	Mathematical analysis 2	The course explains the basic concepts of a certain integral and its properties; use various mathematical methods to evaluate integrals, apply certain integrals to solve applied problems; develop methods of numerical integration; define the concepts of infinite series, approximation of functions and the concept of convergence; apply infinite series in approximate calculations.	4	BC9		
21.	Professional Kazakh (Russian) language	The course is devoted to the activation and deepening of knowledge, skills and knowledge of the scientific style of Russian language, the formation of professional language competence.	3	BC1	-	
22.	Professional English	The course is devoted to the analysis of professional topics: "Computers and work", "Work in ICT", "Types of computer systems", "Basics of working with a computer", "Operating systems and graphical interface", "word Processing", "Cyberspace: security and crime", etc.	3	BC1	-	
23.	Mathematical analysis 1	The aim of the course is to introduce students to the important branches of calculus and its applications in computer science. During the educational process, students should learn and be able to apply mathematical methods and tools to solve various applied problems. Moreover, they study fundamental methods of studying infinitesimal variables by means of analysis, which is based on the theory of differential and integral calculations.	4	BC9	-	Mathematical Analysis 2
24.	Mathematical analysis 2	The course explains the basic concepts of a certain integral and its properties; use various mathematical methods to evaluate integrals, apply certain	5	BC9	Mathematical analysis 1	

		integrals to solve applied problems; develop methods of numerical integration; define the concepts of infinite series, approximation of functions and the concept of convergence; apply infinite series in approximate calculations.				
25.	Linear algebra	Theory of matrix, systems of linear equations, vector theory, analytical geometry, limit and differentiation of functions of one variable.	4	BC6	-	
26.	Numerical methods of analysis and algebra	Fundamentals of error theory, Systems of linear algebraic equations, Nonlinear equations and systems of nonlinear equations, Interpolation and best approximations, Differentiation and integration of functions, Ordinary differential equations, Equations of mathematical physics.	4	BC4, BC6	Discrete Mathematics	
Cycle of basic disciplines Component of choice						
27.	Databases 1	The course explains what a database system is, and then proceeds to most of the training material for the study of relational database systems - databases developed in accordance with the relational (or tabular) model. Then, from data abstraction, the course moves on to transaction management with additional materials to improve query performance. Finally, there are current trends in database system design, which also determine the latest developments in the broader history of data storage technologies.	5	BC5, PC4	Programming languages and technologies	Programming in PL/SQL
28.	Programming languages and technologies	The discipline "programming Languages and technologies" is aimed at forming the Foundation of the future specialist understanding the basics of programming and allows you to instill strong skills in the use of software designs used in all high-level languages; to form the initial concepts in the application of integrated environments for rapid development of programs to solve a wide range of tasks; to form practical skills in the application of the wide possibilities of the programming environment to create a user interface using standard components.	5	PC5	-	Object-oriented programming
29.	Data Science and Machine Learning I	The purpose of the discipline is to teach students the preliminary analysis of data to identify	5	PC6	Programming	Data Science and

		<p>hidden patterns in the socio-economic data, followed by forecasting the identified patterns.</p> <p>The objectives of the discipline are:</p> <ul style="list-style-type: none"> – familiarity with modern methods of exploration data analysis, methods and models of forecasting stationary and non-stationary series, multivariate models of forecasting both time series and spatial data; – give the basis of quantitative methods for assessing the adequacy and accuracy of the constructed models; – to teach the use of computer technology in the analysis and forecasting of socio-economic indicators (construction of linear and nonlinear forecasting models based on regression analysis, evaluation of their parameters, the calculation of all necessary statistics for the analysis of models). 			languages and technologies	Machine Learning 2
30.	Development of compilers 1	<p>The objectives of the discipline "Development of compilers 1" are the formation of students' theoretical knowledge and practical skills on the basics of creating compilers for arbitrary programming languages.</p> <p>This course focuses on the principles of compiler development. The main objective of this course is to introduce students to the basic ideas and methods used in the creation of modern compilers, as well as to give practical skills in writing simple compilers.</p>	5	PC4		
31.	SAS Programming 1	<p>The course examines the problems of data analysis and methods of solving them on the software platform SAS. The focus is on statistical methods of data analysis. The basics of programming in the SAS Base language are considered. Questions of creation of programs and macro programs are touched upon. Non-statistical methods of data analysis and their implementation on the SAS platform are reviewed.</p>	4	PC7		
32.	Data Mining 1	<p>The aim of the course is to study modern approaches, models,</p>	5	PC7	Databases 1	Data Mining 2

		<p>algorithms of data analysis and solving problems of recognition, classification, finding dependencies.</p> <p>Objectives of the discipline: the study of the nature and role of information analysis; introduction of bachelors with the basic tools and methods of data analysis in the study of complex systems; familiarity with the basic technologies of data analysis; formation of skills in the field of decision support in the organization with the use of modern methods and means of data analysis.</p>				
33.	The Data Science of Health Informatics 1	The purpose of the discipline is to form students' knowledge about the nature of medical information, information processes in medicine and health care and modern medical information technologies: to study the principles and skills of storage, search, processing and analysis of medical and biomedical information using data analysis methods.	5	PC7, PC4		The Data Science of Health Informatics 2
34.	English for STEAM	The course is designed to help students develop their English language skills for their current and future academic studies. The increasing level of grammatical accuracy and the development of skills of listening, reading, letters and speaking format IELTS.	3		-	
35.	Cloud Computing		5			
36.	Big data analysis 2	The course is designed to study the technology of storage, processing and analysis of big data, to study the methods of building information systems based on non-relational databases and distributed storage systems.	4	PC7, PC4	Big data analysis 1	
37.	DataMining 2	"The purpose of mastering the discipline "Data mining 2" is to form an idea of the types of tasks arising in the field of data mining and methods of their solution, which will help students to identify, formalize and successfully solve practical problems of data analysis arising in the course of their professional activities.	4	PC7, PC4	Data Mining 1	

		<p>During the study of the discipline the students are given the following tasks:</p> <ul style="list-style-type: none"> - study of data Mining methods and models; - getting an idea of algorithms for constructing decision trees; - study of classification and regression algorithms; - the study of algorithms for finding Association rules; - study of clustering methods." 				
38.	The Data Science of Health Informatics 2	<p>The aim of the discipline is to master modern methods of applied statistics on the example of specialized statistical packages. Special attention is paid to the content interpretation of the statistical methods used in order to effectively use the theoretical material for solving practical problems arising in medicine and health care and clustering methods."</p>	4	PC7, PC4	The Data Science of Health Informatics 1	
39.	Data Science and Machine Learning 2	<p>"The purpose of the discipline is to familiarize with the basic concepts of machine learning, the basic algorithms of machine learning, the features of their application.</p> <p>As part of this goal, the objectives of the discipline are as follows:</p> <ul style="list-style-type: none"> - study of modern formulation of machine learning problems, various stages of its solution; - study and comparative analysis of various machine learning models: linear models, decision trees, neural networks; - familiarization with online machine learning tasks and machine learning tasks without a teacher." 	4	PC7, PC4	Data Science and Machine Learning 1	
40.	Metaprogramming		5		Java Advanced 1	
41.	Project Management	<p>The purpose of development of the discipline "project Management" is the formation of students' comprehensive theoretical and applied</p>	4	PC2, PC3, PC4, PC5, PC6	Programming languages	

		knowledge on project management and creating a methodological framework for the formation of professional competencies in the field of project management; mastering the knowledge of the organization of the project team for the implementation of specific projects; the study of the types of efficiency of investment projects, methods of analysis and evaluation of their commercial effectiveness and study of the features of project effectiveness, taking into account risk factors and uncertainty.			and technologies	
42.	Programming in PL/SQL	The course includes -familiarity with the basic technologies of building modern databases and databases; -familiarity with the technologies of distributed and parallel databases; -acquisition of skills with databases and data warehouses; -familiarity with OLAP-technologies; -acquisition of skills to create applications in the architecture of "client-server"; -acquisition of skills of using procedural language PL/SQL to create applications that manipulate data on the server side of the database.	4	BC4, PC2, PC3, PC4	Databases 1	Data Mining 2
43.	Data Science and Machine Learning 1	The course includes data structure in Python; methods of primary data processing and cleaning; basics of data analysis in Python.	5	BC4, PC2, PC3, PC6		Data Science and Machine Learning 2
44.	Mathematical statistics for programmers	The course is devoted to the statistics of any events, as well as the relationship between mathematics and modeling, operating systems in the interdisciplinary training program, covering the section modern statistical methods and economic theory.	5	BC6, PC5	Discrete mathematics	
45.	Big data analysis	The objectives of the discipline consist in the formation of General professional competencies that allow to solve the problems of professional activity related to the analysis of big data, using the methods of system analysis and using the program R-Studio.	5	BC6, PC5, PC6	Mathematical statistics for programmers	
46.	Functional programming in Scala	This course provides introductory, basic information about Scala. The course includes writing code in a functional style; writing code for the web application client; creating code for asynchronous web servers; creating distributed systems	5	BC5, PC2, PC3, PC4	Programming languages and technologies	Functional programming in Scala 2

47.	Functional programming in Scala 2	The course is designed to deepen students' knowledge in the field of programming and develop their skills of development in the Scala language. Mastering the discipline involves deepening knowledge about the concepts underlying the design patterns of software systems, deepening knowledge of writing code in the functional language Scala, the formation of knowledge necessary for a more in-depth study of the language Scala.	5	PC7	Functional programming in Scala	
48.	Development of compilers 2	The objectives of the discipline "Development of compilers 2" are the formation of students more in-depth knowledge and practical skills to create compilers for arbitrary programming languages.	5	PC7	Development of compilers 1	
49.	SAS Programming 2	The aim of the discipline is to master modern methods of applied statistics on the example of a specialized statistical package "STATISTICA V. 6.0.". Particular attention is paid to the content interpretation of the statistical methods used for the effective use of theoretical material for solving practical problems arising in medicine, Economics, psychology and other fields of human activity. During the course, students learn how to work with the SAS package, use the SAS Studio interface, program in the SAS statistical package.	4	PC8	SAS Programming 1	
50.	Algorithm design and analysis	The aim of the course is to bring to students an approach to algorithms in the form of a design process, which begins with the problems encountered across the range of computing applications, uses a good understanding of the methods of designing algorithms and the end result of which is the development of effective solutions to such problems.	6	PC2, PC3, PC4, PC5	Programming languages and technologies	
51.	Mobile application development on IOS	The course includes creating backend, frontend programming on IOS, creating the program interface and loading the program in the AppStore	5	PC2, PC3, PC4	Programming languages and technologies	
52.	Development of mobile applications on Android	The course includes creating backend, frontend programming on Android, creating the program interface and loading the program in the PlayMarket	5	PC2, PC3, PC4	Programming languages	

					and techn ologi es	
Cycle of major disciplines						
University component/Component of choice						
53.	Programming the Internet of Things (IOT)	The course includes "Internet of things (Internet of things)" aimed at the study of applied electronics, phased software development and design. The program of the course includes work on inventive projects in which students act as engineers of the "Internet of things" for the "smart home". In the process of developing the project, students collectively discuss ideas for solving the set inventive task, design, program the mobile application and apply it in practice.	5	PC2, PC3, PC4, PC6	Progr ammi ng langu ages and techn ologi es	
54.	MicrosoftProgramming 1: Разработка приложений на ASP.NET	The course includes the development of windows applications using the database on ADO.NET and LINQ	4	PC2, PC3, PC4, PC6	Progr ammi ng langu ages and techn ologi es	MicrosoftP rogrammin g 2: Разработк а приложен ий на ASP.NET
55.	MicrosoftProgramming 2: Разработка приложений на ASP.NET	The course includes development of web services and web applications, XML, MVC, WebForms in the platform ASP.NET	5	PC1, PC3, PC4, PC6	Micro softPr ogra mming 1: Разра ботка прил ожен ий на ASP. NET	
56.	Parallel Computer Architecture and Programming	The use of parallel programming for the organization of high-performance computing leads to a number of specific problems, moreover, the architecture of a parallel computing system involves different methods and means of solving them, and practical language implementations provide the programmer with specific tools for writing effective programs. The discipline "Architectures of computing systems and problems of parallel programming" is designed to study the tools and methods of creating applications for different architectures of the aircraft. The main attention in the study of the discipline is paid to the practical skills of writing parallel programs in terms of	4		Progr ammi ng langu ages and techn ologi es	

		specific libraries and/or language implementations for the sun with both General and distributed memory (including multicore and cluster architectures).				
57.	Big data analysis 3	The discipline "big data Analysis 3" provides a set of professional basic knowledge that contribute to the development of professional skills of the graduate. "Analysis of big data 3" allows the training of students to expand knowledge in the use of databases in different areas of activity, based on the use of a systematic approach to the analysis of information, to get acquainted with the basic concepts in the field of analytical processing of big data, provides the ability to analyze and solve problems in practice and research activities in the context of the development of science and changing social practices, forms the ability to acquire new knowledge. As a result of studying the discipline students receive knowledge forming a system of concepts of modern information technology.	5	PC4	Big data analysis 2	
58.	DataMining 3	"The course introduces students with a technique of creation of system of support of decision-making, OLAP-systems, methodology of multidimensional analysis, Data Mining technology. Methods, tools, and applications of multivariate analysis and Data Mining are discussed in detail. The differences between Data Mining and classical statistical methods of analysis and OLAP-systems are discussed, the types of patterns identified by Data Mining (Association, classification, sequence, clustering, forecasting) are considered. The scope of Data Mining application is described. Data Mining methods are considered in detail: neural networks, decision trees, methods of limited search, genetic algorithms, evolutionary programming, cluster models, combined methods. The basic concepts of data warehouses and the place of Data Mining in their architecture are presented. Introduces the concepts of OLTP, OLAP, ROLAP, MOLAP. The process of data analysis using Data Mining	5	PC7	Data Mining 2	

		technology is discussed. The stages of this process are discussed in detail. The market of analytical software is analyzed, products from the leading producers of Data Mining are described, their possibilities are discussed. "				
59.	The Data Science of Health Informatics 3	In this course, students study the application of computer vision and deep learning methods to solve practical health problems such as improving image quality, restoration of damaged images, recognition of individual elements, recognition of pathological processes. are the concepts of OLTP, OLAP, ROLAP, MOLAP. The process of data analysis using Data Mining technology is discussed. The stages of this process are discussed in detail. The market of analytical software is analyzed, products from the leading producers of Data Mining are described, their possibilities are discussed. "	5	PC4	The Data Science of Health Informatics 2	
60.	Data Science and Machine Learning 3	"This discipline is designed to acquaint students with some elements of modern data analysis. They get an idea of the main classes of machine learning problems and learn more about the algorithms for solving classification and clustering problems. The classification algorithms under study include nearest neighbor algorithms, svms, Bayesian methods, decision trees, and rule lists. To solve clustering problems, we consider both algorithms for a fixed number of clusters (K-Means, EM) and methods for automatically determining the number of clusters (agglomerative and divisive clustering). The second part of the course is devoted to the study of the use of deep learning networks for solving modern problems of classification and recognition of signals and images, text analysis. "	5	PC7, PC4	Data Science and Machine Learning 2	
61.	Deep Learning in Computer Vision	The aim of mastering the discipline "Deep learning in computer vision" is to deepen students' knowledge in the field of image recognition, video and image processing, 3D reconstruction and digital photography using deep learning algorithms. These algorithms are	5	PC7, PC4	Data Science and Machine Learning 2	

		used in the design of Autonomous devices (robots), as well as used in intelligent image processing tasks. The course contains the following sections: basics of image processing (noise reduction, tonal correction, edge selection), heuristic methods of analysis (segmentation and segment analysis), image classification (main features), object selection (cascade methods, methods based on parts), image search by content (compression of descriptors, approximate methods of comparing descriptors), face recognition, neural network models (deep learning) to solve all these problems.				
62.	Processing of texts written in natural languages (Natural Language Processing)	<p>"The course introduces students to the basic concepts, methods, tools and applications of the discipline "natural language Processing" (Natural Language Processing), which studies the problems of interaction between computers and natural languages, improving the quality of machine analysis and synthesis of messages in natural language.</p> <p>The leading role in the language system is given to semantics, including its interaction with other language levels: syntax and pragmatics.</p> <p>Formalization of semantics of natural languages is represented by two directions: logical and algebraic. The logical approach is based on effective interpretation of fragments of natural language by appropriate formal languages with a precise semantics (the language of predicate logic, intensional logic, temporal logic, logic styles, dynamic logic and others), drawing on the ideas of G. Frege, R. Montague, P. Streona etc. on the relations between syntactic, semantic and pragmatic structures. The algebraic approach is based on the use of models and methods of linear algebra (vector text model). The use of semantic methods for formal languages on the example of the Chomsky hierarchy of computable enumerable languages, denotation semantics and semantic programming is also discussed."</p>	5	PC7, PC4	Data Mining 2	

63.	C# programming for unity games	The course includes the creation of 2D and 3D games for mobile and desktop applications using the Unity game engine	4	PC2, PC3, PC4, PC6	Micro softPr ogra mmin g 2: Разра ботка прил ожен ий на ASP. NET	
64.	WEB technology	The course includes the technology of designing the structure of the web-site as an information system; the technology of creating a web-site by means of programming on the client and server side; the technology of placement, support and maintenance of the web-site on the server.	4	PC2, PC3, PC4, PC6	Progr ammi ng langu ages and techn ologi es	WEB technology Advanced
65.	WEB technology Advanced	The course includes methods of designing a web site as a static information system; methods of designing a web site as a dynamic information system; the theory of using graphics on web pages; methods of processing and editing digital images; client side software used to create web pages; server side software used to create web pages; software for creating databases; software for creating a virtual server; basic principles of configuration of a real web server; software used to host and maintain web-pages; methods of optimization of the web-site for promotion on the Internet.	5	PC2, PC3, PC4, PC6	WEB techn ology	
66.	Educational practice		3			
67.	Manufacturing practice	Practice includes the study of organizational structure and complex technical funds information-analytical center (IAC) organizations. Identification of the main tasks to be solved by the IAC. The study of information support of the selected task (a set of tasks or subsystems). The study of mathematical support of the selected problem (a set of tasks or subsystems). The study of the software of the selected task (a set of tasks or subsystems). Study of organizational and legal support of the selected task (a set of tasks or subsystems). systematization and analysis of the actual materials necessary for writing a course work, a scientific report and a report on	3	BC5, BC8		

		practical training.				
68.	Externship	The practice includes the consolidation of theoretical knowledge in the academic disciplines of the specialty; mastering practical skills, technology of work in the specialty directly in the workplace using a PC, modern software and modern office equipment; the study and analysis of the real situation in the static and dynamics of CAD in the short and long term in relation to the enterprise – the basis of practical training; evaluation of the achieved commercial results of the introduction of automation in the short and long term, in relation to these specific enterprises; familiarity with technology and technology development of CAD procedures for the adoption and implementation of automation solutions for specific enterprises; the collection of material for the Capstone projects.	5	BC5, BC8		

4.4. List of modules and learning outcomes

Name of the educational program: «Computer science»

Qualification: bachelor in information and communication technologies in the educational program “6B06101-Computer science”

Module code / module Name	Labor intensity of the module in credits	Learning outcome	Criteria for evaluating learning outcomes	Disciplines that form the module Code / Name
GENERAL EDUCATION MODULES				
OOM01 of Sociology and ethics	5	<p>Has an understanding of the principles and laws of historical development of society, the historical periodization of Kazakhstan's history and place the history of Kazakhstan in world history and the history of Eurasia</p> <p>Able to independently comprehensively and critically analyze historical and modern sources, draw conclusions, argue them.</p>	Oral interview, testing, report, boundary control, term papers	Modern history of Kazakhstan
	5	<p>Has an idea of the subject, functions, main sections and directions of philosophy; the place and role of philosophy in the life of society and man; the main stages of development of world and Kazakh philosophical thought.</p> <p>Able to operate with special philosophical terminology and categorical and conceptual apparatus of philosophy;</p> <ul style="list-style-type: none"> - creatively and critically work on original philosophical texts; - logically present their thoughts on the studied philosophical issues; - analyze the features of the Genesis and development of philosophical knowledge; - to form and argumentatively defend their own worldview. 	Oral interview, testing, report, boundary control, term papers	Philosophy
	2	<p>Has an understanding of the subject, functions, main sections and directions of sociology; consists in presenting key approaches in the sociology of organizations both at the level of theoretical concepts and models, and at the level of empirical research; in introducing students to the basic methods and techniques of research organizations</p> <p>Able – be able to navigate various sociological approaches to the</p>	Oral interview, testing, report, boundary control, term papers	Sociology

	<p>analysis of organizations and literature on each approach; - get skills in critical analysis of these approaches (understand their advantages and limitations); - get basic analytical skills of sociological research of organizations; - have an understanding of the key research methods of organizations and their limitations.</p>		
2	<p>Has an idea of the subject, functions, main sections, must understand the basic concepts of politics and political science, the formation of the main political theories and concepts, to learn the contribution that various thinkers have made to the conceptual understanding of the most important problems of politics and society, the state and government Able to know the basics of scientific policy analysis at both theoretical and applied levels, the possibilities of political analysis and forecasting methods for making optimal management decisions. Apply theoretical knowledge in real political practice at the level of analysis, expertise, consulting, management;</p>	<p>Oral interview, testing, report, boundary control, term papers</p>	<p>Political science</p>
2	<p>Has an understanding of the subject, functions, main sections and directions of psychology; the place and role of psychology in society and human life; Formation of fundamental knowledge, skills and competencies required in professional activities; formation of environmental, physical, ethical, legal and thinking culture; language training; formation of universal and socio-personal values;</p>	<p>Oral interview, testing, report, boundary control, term papers</p>	<p>Psychology</p>
2	<p>It has an idea of the subject of logically completed elements of the content of the discipline, provides a basis for determining the course topics to be submitted for verification. Structuring the content of this discipline is also a prerequisite for the functioning of the rating system. In addition, such structuring helps the student to form a General idea of the development of world culture and systematize their knowledge. Able to give students an idea of the main problems of cultural theory; identify objective patterns of world and national cultural processes;</p>	<p>Oral interview, testing, report, boundary control, term papers</p>	<p>Culturology</p>

		to find out the Genesis, functioning and development of culture as a specifically human way of life, which reveals itself historically as a process of cultural inheritance; consider the cultural aspects of various areas of public life; identify the features of cultural life in different regions of the world, historical epochs, cultural and historical types;			
	10	Able to characterize-basic reading rules; word-formation models; contextual meanings of polysemous words; terms and lexical constructions of the sublanguage corresponding to the profile of the studied specialty; the most frequent specific grammatical phenomena. Understand statements in a foreign language features of the compositional and semantic organization of a scientific text; basic techniques for extracting the main information of the microtext.	Oral interview, testing, report, boundary control, term papers	Foreign language	
	10	Identify the language forms of expression of various types of information in a scientific text for solving problems of educational and professional communication; principles of writing texts of the main educational and scientific, scientific and professional genres.	Oral interview, testing, report, boundary control, term papers	Kazakh (Russian) language	
	2	Identify the language forms of expression of various types of information in a scientific text for solving problems of educational and professional communication; principles of writing texts of the main educational and scientific, scientific and professional genres.	Oral interview, testing, report, boundary control, term papers	Professional Kazakh language	
	4	Able to characterize-basic reading rules; word-formation models; contextual meanings of polysemous words; terms and lexical constructions of the sublanguage corresponding to the profile of the studied specialty; the most frequent specific grammatical phenomena. Understand statements in a foreign language features of the compositional and semantic organization of a scientific text; basic techniques for extracting the main information of the microtext.	Oral interview, testing, report, boundary control, term papers	Professionally-oriented foreign language	
OOM02 Language training					
OOM03 Module of information technologies in science and production and	5	Know: – main directions of ICT development; – basics of using information resources for searching and storing	Oral interview, testing, report, boundary control, term papers	ICT (Информационно-коммуникационные)	

economic theory		information; – architecture and components of computer systems; – the main goals and objectives of information security. Can work in any operating system and with databases; apply methods and tools for protecting information; work with spreadsheets, perform data consolidation, and build charts. Have the following skills: – processing of vector and bitmap images; – create multimedia presentations; – data visualization; – use of various forms of e-learning to expand professional knowledge; – working with e-technology cloud services.	control, term papers	технологии)	
		3	Have an idea of the principles and laws of economic relations.	Oral interview, testing, milestone report, milestone control, calculation and graphic works	Fundamentals of economic theory
		2	Have the ability to make independent theoretical and practical judgments and conclusions. Be able to objectively evaluate scientific information, freedom of scientific search and the desire to apply scientific knowledge in educational activities, including for the implementation of a diploma project (work).	Oral interview, testing, milestone report, milestone control, calculation and graphic works	Research methodology
OOM04 A module of physical training	8	Knows the main tasks of physical education of students, Can pass control exercises and standards.	Test	Physical Culture	
BASIC MODULE					
БМ01 Physics and mathematics module	6+5	Able to describe the basic concepts of linear algebra and analytical geometry; the basic fundamental concepts of mathematical analysis; the theory of limits; the theory of continuous functions of one variable; the differential calculus of a function of one real variable.	Oral interview, testing, report, boundary control, calculation and graphic works	Mathematical analysis 1, 2	
	4	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	Oral interview, testing, report, boundary	Algebra and geometry	

		applied problems; obtain approximate values of solutions using power series and Fourier series expansion with a given accuracy; determine the optimal methods for solving practical problems.	control, calculation and graphic works	
6		Know: probabilistic and statistical methods in science; basic concepts of mathematical statistics; basic methods for constructing estimates; methods for constructing confidence intervals; methods for building and testing statistical hypotheses.	Oral interview, testing, report, boundary control, calculation and graphic works	Discrete mathematics
6		Knows and uses in modeling the Basics of error theory, systems of linear algebraic equations, Nonlinear equations and systems of nonlinear equations, Interpolation and best approximations, Differentiation and integration of functions, Ordinary differential equations, Equations of mathematical physics.	Oral interview, testing, report, boundary control, calculation and graphic works	Computational mathematics
6		Knows the relationship between mathematics and computer science, operating systems in an interdisciplinary training program that covers the section modern statistical methods and economic theory.	Oral interview, testing, report, boundary control, calculation and graphic works	Mathematical statistics for programmers
4		Knows and understands kinematics; dynamics; circular motion and gravity; energy; momentum; simple harmonic vibrations; torque and rotational motion; electric charge and electric force; DC Circuits; thermodynamics and mechanical waves, field and potential; electrical circuits; induction of magnetism and electromagnetism; geometric and physical optics; and quantum, atomic and nuclear physics and sound.	Oral interview, testing, report, boundary control, calculation and graphic works	Physics
5		Knows and uses in modeling Nonlinear equations and systems of nonlinear equations, Interpolation and best approximations, Differentiation and integration of functions, Ordinary differential equations, Equations of mathematical physics.	Oral interview, testing, report, boundary control, calculation and graphic works	Numerical methods of analysis and algebra
6	БМ02 Computer science module	Know: organize the necessary data structures depending on the requirements of the task;	Oral interview, testing, report, boundary control, calculation and graphic works	Introduction to programming

		<p>Be able to: develop block diagrams of various algorithms;</p> <p>Have skills: develop programs in C ++ using the language tools.</p> <p>Be able to develop sorting algorithms such as bubble sorting, merge sorting, quick sorting, etc</p> <p>Have the basics of OOP concepts, theory, methods and technologies of C ++, data structures and algorithms; application of algorithms and modern trends in technologies of a large company</p>	<p>control, calculation and graphic works</p> <p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	<p>Object-oriented programming</p>
6		<p>Be able to know: basic algorithms to solve biological processes of different nature;</p> <p>Can use software language tools to solve biological problems and be able to perform data analysis and identify trends.</p> <p>Have skills in: implementing algorithms and data structures, as well as using programming language functions using modern software tools</p>	<p>Oral interview, testing, report, border control, calculation and graphic works</p>	<p>Algorithms and data structures</p>
5		<p>Know: Python programming language for working with genomic data; Unix operating system and commands for working in this environment; scripting languages and methods for writing program codes on them.</p> <p>Has the skills to develop programs for analysis of genes and genomes, using other additional packages such as Biopython, R, Bioconductor and Galaxy.</p>	<p>Oral interview, testing, report, border control, calculation and graphic works</p>	<p>Python programming</p>
5		<p>Designs the structure of a web site as an information system.</p> <p>Knows the technology of creating a web site using client-side and server-side programming tools; the technology of hosting, supporting and maintaining a web site on the server.</p>	<p>Oral interview, testing, report, border control, calculation and graphic works</p>	<p>Web-technology</p>
5		<p>Knows methods of designing a web site as a static information system; methods of designing a web site as a dynamic information system; theory of using graphics on web pages; methods of processing and editing digital images; client-side software used to create web pages; server-side software used to create web pages; software for creating databases; software for creating a virtual server; basic principles of configuration of a</p>	<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	<p>Advanced WEB technologies</p>

		real web server; software tools used for hosting and maintaining web pages; methods for optimizing a web site for promotion on the Internet.		
3	<p>Knows the theoretical foundations and methods of computer 3D modeling used in mechanical engineering.</p> <p>He has the skills to solve problems of designing cars and machines using application programs for modeling and calculating mechanisms and nodes that allow solving applied problems.</p>	<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	3D models for virtual reality	
5	<p>Knows the basic technologies for building modern databases and DBMS; distributed and parallel DBMS technology;</p> <p>Has skills in working with databases and data warehouses; with OLAP technologies; creating applications in the client-server architecture»;</p> <p>Uses the PL/SQL procedural language to create applications that manipulate data on the DB server side.</p>	<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	Programming in PL/SQL	
5	<p>Knows the architecture of computer networks and telecommunications systems through the formation of a holistic view of the General principles of their construction, functioning and understanding, based on understanding the structure and essence of network interaction, the ability to design and implement it in solving professional tasks.</p> <p>Knows the basic concepts of operating systems and the differences between modern operating systems.</p>	<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	Computer networks and information security	
5	<p>It works in various interfaces of various operating systems; with installation and administration of various operating systems.</p> <p>Develops windows applications using a database on ADO.NET and LINQ</p>	<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	Operating system	Application development on ASP.NET

	4	<p>Knows algorithms in the form of a design process that begins with problems encountered across the entire range of computing applications.</p> <p>Uses a good understanding of algorithm design methods and the end result is the development of effective solutions to such problems.</p> <p>Manages projects and creates a methodological basis for the formation of professional competencies in the field of project management.</p> <p>Has knowledge of organizing the work of the project team to implement specific projects.</p> <p>He knows the types of efficiency of investment projects, methods of analysis and evaluation of their commercial effectiveness, and studies the features of evaluating the effectiveness of projects taking into account risk factors and uncertainty.</p> <p>Know: basic methods of numerical research of biological processes of various nature. Be able to: interpret the results of numerical analysis of biological data, identify trends, make forecasts; Own: implementations of numerical methods using modern software tools.</p>	<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	Algorithm design and analysis
	4		<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	Project management
	6		<p>Oral interview, testing, report, boundary control, calculation and graphic works</p>	Database theory
PROFESSIONAL MODULES				
TIM01 Module of elective courses	5	Have professional skills	Oral interview, testing, report, boundary control, calculation and graphic works	Discipline of choice №1 from the КЭД
	5			Discipline of choice №2 from the КЭД
	5			Discipline of choice №3 from the КЭД
	5			Discipline of choice №4 from the КЭД
	5			Discipline of choice №5 from the КЭД
TIM02 Data Analysis module	4	Have an idea: about comparative analysis in genomics of ideological and methodological criteria for understanding the	Oral interview, testing, report,	Data analysis and visualization in

		structural subsections of the new science-structural genomics, proteomics and transcriptomics.	boundary control, calculation and graphic works	Power BI
	6	He is proficient in the basic concepts and methods of economic systems research. Knows the state and main directions of development of mathematical models of economic systems at various levels. Has the skills necessary for independent work on the design and implementation of economic analysis models and modeling algorithms; system thinking.		Operation research
	4	Know the basics of machine learning theory, including discriminant, cluster and regression analysis, and master the skills of practical solutions to data mining problems.		Data science and machine learning
ПМ03 Practice module	2	Knows the organizational structure and complex of technical means of the information and analytical center (IAC) of the organization.	Report	Educational practice Manufacturing practice
	8	Can identify the main tasks solved by the IAC.		
	5	Knows the mathematical support for the selected task (set of tasks or subsystem) and software for the selected task (set of tasks or subsystem), organizational and legal support for the selected task (set of tasks or subsystem). systematization and analysis of actual materials required for writing a course paper, scientific report, and internship report.		
				Externship

5. Curriculum of the educational program

№	Module code	Code of discipline	Name of the discipline (Rus)	Name of the discipline (KAZ)	Name of the discipline (ang)	Total loans	Semester	Form of control	The total number of academic hours	Number of classroom hours				Number of hours SIS		Prerequisites
										Total classroom hours	lectures	laboratory	practical	Total hours TERMS	Including TSIS	
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1 ООД																
1.1 ОК																
1 General education subjects (ООД) - 56 credits																
1.1 Required component - 51 credits																
ООД 1	ООМ 01	SIK 1101	Современная история Казахстана	Қазақстанның қазіргі тарихы	Modern history of Kazakhstan	5	1	ГЭК	150	45	15	30	105	15	15	-
ООД 2	ООМ 01	FIL 3102	Философия	Философия	Philosophy	5	4	Экз	150	45	15	30	105	15	15	-
ООД 3	ООМ 02	Yа 1103	Иностранный язык	Шеттілі	Foreign language	1	1,2	Экз	300	90		90	210	30	30	-
ООД 4	ООМ 02	K(R) Ya 1104	Казахский (русский) язык	Қазақ (орыс) тілі	Kazakh (Russian) language	1	1,2	Экз	300	90		90	210	30	30	-
ООД 5	ООМ 03	IKT 1105	Информационно-коммуникационные технологии	Ақпараттық-коммуникациялық технологиялар	Information and communication technology	5	1	Экз	150	45	15	30	105	15	15	-
ООД 6	ООМ 01	Pol 1106	Политология	Саясаттану	Political science	2	2	Экз	60	30	15	15	30	10	10	-
ООД 7	ООМ 01	Soc 1107	Социология	Әлеуметтану	Sociology	2	2	Экз	60	30	15	15	30	10	10	-
ООД 8	ООМ 01	Psy 2108	Психология (интернета)	Психология	Psychology	2	6	Экз	60	30	15	15	30	10	10	-

ООД 9	ООМ 01	Kul 2109	Культурология	Мәдениеттану	Culturology	2	6	Экз	60	30	15	15	30	10	-
ООД 10	ООМ 04	Fiz 1110, Fiz 2111	Физическая культура	Дене шынықтыру	Physical Culture	8	1,2,3,4	зачет	240	0				40	-
			Total:			5	1		530	555	10	30	42	975	185
			University components - 5 credits												
ООД 11	ООМ 03	ОЕТ 2112	Основы экономической теории	Экономикалық теория негіздері	Fundamental socioeconomic theory	3	4	Экз	90	30	15		15	60	15
ООД 12	ООМ 03	MI 4113	Методология исследования	Зерттеу әдістемесі	Research methodology	2	7	отчет	60	30			30	30	10
			Total:			5			150	45	15	0	30	105	15
2 БД			2 Basic disciplines (BD) - 112 credits												
2.1 ОК			2.1 University component - 56 credits												
БД 1	БМ01	MA 1203	Математический анализ	Математикалық талдау	Mathematical analysis	6	2	письм	180	60	30		30	120	15
БД 2	БМ01	AG 1207	Алгебра и геометрия	Алгебра және геометрия	Algebra and geometry	4	1	письм	120	45	15		30	75	15
БД 3	БМ01	Fiz1204	Физика	Физика	Physics	4	2	Экз	120	45	15		30	75	15
БД 4	БМ01	MA2 2209	Математический анализ 2	Математикалық талдау 2	Mathematical analysis 2	5	3	письм	150	45	15		30	105	15
БД 5	БМ02	VVP 1208	Введение в программирование	Бағдарламауғақ іріспе	Introduction programming	6	1	Экз	180	60	15	30	15	120	15
БД 6	ПМ03	UP 1202	Учебная практика	Оқу практикасы	Educational practice	2	2	отчет	60	30			30	30	10
БД 7	БМ02	OOP 2206	Объектно-ориентированное программирование	Объекті-бағдарланған программалау	Object-oriented programming	6	4	Экз	180	60	15	30	15	120	15
БД 8	БМ02	ASD 2210	Алгоритмы и структуры данных	Алгоритмдер және деректер құрылымы	Algorithms and data structures	6	3	Экз	180	60	15	30	15	120	15
БД 9	БМ01	DM2201	Дискретная математика	Дискретті математика	Discrete Mathematics	6	3	письм	180	60	30		30	120	15
БД 10	БМ02	WT 1205	WEB технологии	WEB	WEB	5	3	письм	150	45	15	30		105	15

			технологиялар	technology												
БД 11	БМ02	TBD 3211	Теория базы данных	Деректеркорытеориясы	6	5	письм	180	60	15	30	15	120	15	15	-
			Total:		5	6		1680	585	180	150	255	1095	160		
2.2 КВ-БД		2.2 Elective component - 56 credits														
БД 12	БМ01	VM 3214	Вычислительная математика	Есептеуматематикасы	6	5	письм	180	60	15	30	15	120	15	15	AG 1207
БД 13	БМ01	MSdP 2217	Математическая статистика для программистов	Программистергеарналған математикалық статистика	6	4	письм	180	60	30		30	120	15	15	AiG 1202
БД 14	ООМ 02	POYа2223	Профессионально-ориентированный иностранный язык	Кәсіби-бағытталған шет тілі	4	5	Экз	120	45			45	75	15	15	-
БД 15	ООМ 02	PKYа3222	Профессиональный казахский язык	Кәсіби қазақ тілі	2	5	Экз	60	30			30	30	10		-
БД 16	ПМ0 2	Ю 3218	Исследование операции	Операциялық зерттеу	6	7	письм	180	60	15	30	15	120	15	15	AG 1207
БД 17	ПМ0 1	DV 2212	Дисциплина по выбору №1 из КЭД	Таңдау бойынша апан ЭПК №1	5	3	Экз	150	45	15	30		105	15	15	БМ0 1, БМ0 2
БД 18	БМ02	3DVR 4213	3D-модели для виртуальной реальности	Виртуалды шындыққа арналған 3D модельдері	3	7	Экз	90	30		30		60	15		-
БД 19	БМ02	PPLSQL 4215	Программирование на PL/SQL	PL/SQL тілінде бағдарламалау	5	7	Экз	150	45	15	30		105	15	15	TBD 3211
БД 20	БМ02	PWT 3216	Продвинутые WEB технологии	Жоғары деңгейлі WEB технологиялары	5	5	письм	120	45	15	30		75	15	15	WT 1205

БД 21	БМ02	КСИБ 3219	Компьютерные сети и информационная безопасность	Компьютерлік желі және қауіпсіздік	Computer networks and information security	5	6	Экз	150	45	15	30	105	15	-
БД 22	ПМ0 2	NDMO 3220	Наука о данных и машинное обучение	Деректергілім ыжәнемашинал ықоқыту	Data Science and Machine Learning	4	6	письм	120	45	15	15	75	15	ПнР 3309
БД 23	БМ02	OS 2221	Операционные системы	Операциялық жүйелер	Operating system	5	4	Экз	150	45	15	30	105	15	-
3 ПД			Total:			5	6		1650	630	195	300	1020	180	
3.1 ОК			3. Profile disciplines (PD) - 60 credits												
3.1 ОК			3.1 University component-32 credits												
ПД 1	ПМ0 1	DV 4301	Дисциплина по выбору №3 из КЭД	Таңдаубойынш апән ЭПК №3	Discipline of choice №3 of CED	5	7	письм	150	45	15	30	105	15	БМ0 1 БМ0 2
ПД 2	БМ02	RPASP 3303	Разработка приложений на ASP.NET	ASP.NET платформасынд ақосымшалар жа сау	Application development in ASP.NET	5	6	Экз	150	45	15	30	105	15	VVP 1208
ПД 3	БМ02	ДАА 3304	Дизайн и анализ алгоритмов	Алгоритмді жоб алау және талдау	Algorithm design and analysis	4	7	Экз	120	45	15	30	75	15	VVP 1208
ПД 4	ПМ0 2	AVDRPVI 4302	Анализ и визуализация данных в Power BI	Power BI деректерді талда у және визуализа циялау	Data analysis and visualization in Power BI	4	8	Проект	120	45		45	75	15	-
ПД 5	БМ02	UP 4305	Управление проектами	Жобаларды басқ ару	Project Management	4	7	Экз	120	45	15	30	75	15	-
ПД 6	ПМ0 1	DV 4306	Дисциплина по выбору №4 из КЭД	Таңдаубойынш апән ЭПК №4	Discipline of choice №4 of CED	5	8	Экз	150	45	15	30	105	15	БМ0 1 БМ0 2
ПД 7	БМ01	СhMAA 3307	Численные методы анализа и алгебры	Анализ бен алгебраның санд ыкәдістери	Numerical methods of analysis and algebra	5	6	Письм	150	45	15	15	105	15	VM 3214

		Total:		3		2											
3.2 Elective component- 28 credits																	
КВ-ПД	Курс	Дисциплина по выбору №2 из КЭД	Тандаубойынш апен ЭПК №2	Discipline of choice №2 of CED	5	5	письм	150	45	15	30	105	15	БМО 1	БМО 2		
ПД 8	ПМ0 1	DV 3313	Тандаубойынш апен ЭПК №2	Discipline of choice №2 of CED	5	5	письм	150	45	15	30	105	15	БМО 1	БМО 2		
ПД 9	ПМ0 3	PP 2310	Производственная практика	Өндірістік практика	4	4	отчет	120	0			120	15	-	-		
ПД 10	БМО2	PP 3309	Программирование на Python	Pythonбағдарла малу	5	5	письм	150	45	15	30	105	15	-	-		
ПД 11	ПМ0 1	DV 4308	Дисциплина по выбору №5 из КЭД	Тандаубойынш апен ЭПК №5	5	8	письм	150	45	15	30	105	15	БМО 1	БМО 2		
ПД 12	ПМ0 3	PP 3311	Производственная практика	Өндірістік практика	4	6	отчет	120	0			120	15	-	-		
ПД 13	ПМ0 3	PP 4312	Преддипломная практика	Диплом алдындағы тәжірибе	5	8	отчет	150	0			150	15	-	-		
			Overall:		2	8											
			Number of exams		4	6											
			Total theoretical training														
			Sum of credits:			228		6840	2640	720	660	1260	4200	780			
			5. Final certification														
			Написание и защита дипломной работы (проекта)	Дипломдық жұмыстың (жобаның) жазылуы және қорғау	1	8		360					360				
			TOTAL		240												

6. Additional educational programs (Minor)

Name of the additional educational program (Minor) with an indication of the list of disciplines that form the Minor	The total number of loans/ number of credit hours in the discipline	Semesters of study	Documents on the results of the development of additional educational programs (Minor)
DataScience:	13		
- Programming in Python	5	5	Transcript
- Data science and machine learning	4	6	Transcript
- Data analysis and visualization in Power BI	4	8	Transcript
The Internet of things:	15		
- Programming in Java	5	3	Transcript
- Programming in PL/SQL	5	7	Transcript
- Programming the Internet of Things (IOT)	5	5	Transcript