ХАЛЫҚАРАЛЫҚ УНИВЕРСИТЕТІ
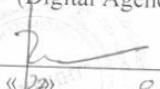INTERNATIONAL UNIVERSITY
МЕЖДУНАРОДНЫЙ УНИВЕРСИТЕТ

AGREED
by Director REDPRINT LLP
(Digital Agency NIDGE)

_____ Ryskeldi M.M.
«___» ___03___ 2024

APPROVED
by Chairman of the Board - Rector
«International Information Technology
University» JSC
_____ Khikmetov A.K.
«___» ___03___ 2024

EDUCATIONAL PROGRAM

6B06112 «Data 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

Almaty, 2024

Content

List of designations and abbreviations

CD	Cycle of core disciplines
CC	Core competency
BM	Basic module
UC	University component
HE	Higher education
NMS	National Mandatory Standards of Higher and Post-Graduate Education
ATT	Additional types of training
EQF	European qualifications framework
EFE	European foundation for education
KSA	Knowledge, Skills and Abilities
FA	Final attestation
OC	Optional component
ISCED	International Standard Classification of Education
NQF	National qualifications framework
NQS	National qualifications system
GHM	General humanitarian module
RC	Required component
GEM	General education module
GED	Cycle of general education disciplines
AP	Academic program
GPM	General professional module
SQF	Sectoral qualifications framework
GEC	General education competence
PD	Cycle of profiling disciplines
PI	Professional internship
PS	Professional standard
PE	Postgraduate education
PC	Professional competence
PM	Professional module
LO	Learning outcome
QMS	Quality Management System

1. Description of the educational program

The need for the emergence of such a profession was dictated by the fact that when we deal with Ultra Big Data, the data arrays turn out to be too large to be processed by standard means of mathematical statistics. Every day, thousands of petabytes (1015 bytes = 1024 terabytes) of information pass through the servers of companies around the world. In addition to such volumes of data, the problem is complicated by their heterogeneity and high update speed.

A data scientist, like a real scientist, not only collects and analyzes data, but also studies it in different contexts and from different angles, questioning any assumptions. The most important quality of a data scientist is the ability to see logical connections in the system of collected information and, based on quantitative analysis, develop effective business solutions. In today's competitive and rapidly changing world, in the ever-growing flow of information, a Data Scientist is indispensable for management in terms of making the right business decisions. Individually, a statistician, systems analyst or business analyst cannot solve problems with such volumes of data. This requires a person with an interdisciplinary education, competent in mathematics and statistics, economics and business, computer science and computer technology.

The main task of a Data Scientist is the ability to extract the necessary information from a wide variety of sources, using information flows in real time; identify hidden patterns in data sets and statistically analyze them to make smart business decisions. The workplace of such a specialist is not 1 computer or even 1 server, but a cluster of servers.

Our approach involves both covering the basic skills of the MCM specialty, and through the possibility of elective subjects, covering the necessary elements of training in the field of "Data science".

At the same time, the student is left with the opportunity to take additional subjects at his discretion as free electives (minors) - these can be subjects from any specialty.

Meetings held by the marketing service of IITU and an analysis of surveys among graduates of NIS and physics and mathematics schools showed that about 20 percent of graduates are seriously thinking about the profession of "data analyst."

2. Purpose and objectives of the educational program

The goal of the "Data Science" educational program is to prepare highly qualified analysts and specialists in the field of Data Science who have an understanding of the problems of applied mathematics and economics, in particular the problems of the financial sector, and who are able to creatively apply their knowledge and skills to successfully solve them.

The objectives of the Data Science educational program are:

• Students receive good mathematical training.

• Formation of competencies in various areas of programming and modern applied mathematics and computer science, such as data analysis and machine learning, design and software development.

• Obtaining skills in professional work with big data and building analytical models for the financial sector of the economy.

• Training to work in an English-speaking environment, adaptation to the international education system.

3. Passport of the educational program

3.1 General Information

№	Field name	Note
1	Code and classification of the field of education	6B06 – Information and communication technologies
2	Code and classification of study areas	6B061 – Information and communication technologies
3	Educational programs group	057 – Information technology
4	Name of educational program	6B06112 «Data Science»
5	Purpose of the educational program	Training highly qualified analysts and specialists in the field of Data Science who have an understanding of the problems of applied mathematics and economics, in particular the problems of the financial sector, and who are able to creatively apply their knowledge and skills to their successful solution.
6	Type of Educational Program	Current (Innovative)
Qualification characteristics of the EP graduate		
7	Field of professional activity of an EP graduate	The sphere of professional activity of graduates is institutions and business entities of all forms of ownership, government bodies regulating the economy, and research institutions.
8	Objects of professional activity of EP graduates	Enterprises and organizations of various forms of ownership that use large amounts of data in digital form, requiring their structuring and analysis to solve production and management problems; Scientific institutes and organizations developing, implementing and operating intelligent systems for predicting new results and making recommendations to optimize various processes and production
9	Subject of professional activity	Mathematical, information, software, linguistic, technical, organizational, and legal support: • big data processing software, • intelligent strategic assessment systems, including technologies for design, development, implementation, maintenance and operation.
10	Types of professional activities of EP graduates	Types of professional activities of the graduate: - production and technological; - experimental research; - educational; - organizational and managerial.
11	Functions of professional activity of an EP graduate	Functions of a graduate's professional activity: - design; - programming;

F-72, Educational program

		- administration; - support; - testing.
12	Level according to ISCE	6
13	Level according to NQF	6
14	Level according to SQF	6
15	Number of credits	240
16	Academic degree awarded	Bachelor in Information and Communication Technologies in the educational program «6B06112 – Data Science»
17	List of generalized competencies of the EP: GEC1: Know: social and ethical values based on public opinion, traditions, customs, social norms and focus on them in your professional activities; traditions and culture of the peoples of Kazakhstan; human and civil rights and freedoms; fundamentals of the legal system and legislation of Kazakhstan; trends in social development of society; basics of physical culture and principles of a healthy lifestyle. GEC2: Have an idea of: ethical and spiritual values; about sociological approaches to personality, basic patterns 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 development of personality. GEC3: Own: ethical and legal standards 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 one's point of view, and propose new solutions. GEC4: Ability for written and oral communication in the state language and the language of interethnic communication; the ability to logically construct oral and written speech in a logical, reasoned and clear manner; readiness to use one of the foreign languages GEC5: Ability to use modern information technologies, manage information using business applications; use network computer technologies, databases and application packages in your subject area GEC6: Ability to model financial and economic processes to solve specific problems and forecast financial and economic data using modern information technologies, computer technologies, databases and application packages in their subject area CC1: The ability to actually use the state language, the language of interethnic communication and a foreign language in professional activities. CC2: The ability to understand the basics of economic knowledge, scientific ideas about finance and economics. CC3: Ability to professionally operate modern equipment, instruments, network components, computer systems (in accordance with the goals of the program), as well as use safety rules, industrial sanitation, fire safety and labor protection standards. CC4: Ability to have the skills to use algorithms and programs to calculate business process parameters. CC5: The ability to use basic concepts and methods to solve problems, the ability to carry out design documentation in a computer graphics software environment for various types of projects. CC6: The ability to be competent in choosing mathematical modeling methods to solve specific problems, including the willingness to identify the natural scientific essence of problems arising in the process of professional activity, and the ability to use the appropriate physical and mathematical apparatus to solve it.

	CC7: Ability to develop information and software for an information system based on modern methods and development tools. CC8: Ability to find limits, uncover uncertainties; differentiate and integrate basic elementary functions; explore functions using differential calculus methods; apply methods of differential and integral calculus when solving applied problems. be able to classify differential equations and apply the necessary methods to solve these equations; solve linear differential equations of the nth order and systems of linear equations with constant coefficients; find rest points of the autonomous system; PC1: Ability to create mathematical models using methods of modern information technologies; PC2: Ability to analyze received information; PC3: Ability to develop new algorithms; PC4: Ability to develop optimization methods and control algorithms; PC5: Ability to process large amounts of information; PC6: Ability to conduct multidimensional analysis, the ability to extract the necessary information from a wide variety of sources, using information flows in real time; PC7: The ability to see a logical connection in the system of collected information; mastery of advanced analytical tools. PC8: Ability to apply acquired knowledge in the selected additional educational program.
18	List of generalized learning outcomes for EP: LO1: Give reasons for the choice of basic standards, principles and design patterns, methods, tools and programming languages, including choosing methods and means for building information security systems of modern ICTs. LO2: Apply mathematical models and methods of various processes LO3: Create mathematical models using methods of modern information technologies. LO4: Demonstrate communication skills, initiative and psychological preparedness for work, including when working in a team and making managerial and technical decisions. LO5: Extract relevant information from a variety of sources, including real-time information flows. LO6: Analyze the information received. LO7: Have excellent programming skills. LO8: Be able to develop new algorithms. LO9: Process large amounts of information. LO10: Conduct multivariate analysis. LO11: Recognize logical connections in a system of collected information. LO12: Be able to use advanced analytical tools. LO13: Able to apply acquired knowledge in the chosen additional educational program. LO14: Demonstrate the ability to conduct interdisciplinary scientific research using basic knowledge from the fields of economics and law, ecology and life safety. Ability to apply entrepreneurial skills to problems calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.
19	Form of study Full-time
20	Languages of instruction English
21	EP's strategic partners REDPRINT LLP (Digital Agency NIDGE)
22	Developer(s) and authors of the educational program: JSC "International Information Technology University", Department of MCM: - Rysbaiuly B. - Ydyrys A.Zh. - Nurtas M. - Alpar S.D.

Table of relationships between competencies, learning outcomes, assessment methods and criteria

Dublin descriptors	Competencies of an EP graduate	Competencies expressed in expected learning outcomes	Evaluation criteria	Name of assessment method
General educational competencies				
Knowledge and understanding	GEC1 GEC2 GEC3 GEC6	LO10 LO11	Knows the basic concepts in the field of study	Summary
			Reproduces and explains basic concepts in the area under study	Report, message
			Knows the basic concepts in the field of study	Test
Putting knowledge and understanding into practice	GEC5	LO1	Uses knowledge in the area under study in practice	Project
			Solve complex problems based on acquired knowledge	Multi-level tasks and assignments
Communication skills	GEC4	LO6	Able to construct oral speech in a reasoned and clear manner	Round table, discussion, controversy, dispute, debate
			Able to construct oral speech logically and clearly	Interview
			Able to construct written speech logically and clearly	Essay
Core competencies				
Knowledge and understanding	CC2 CC6 CC8	PO2	Knows the basic concepts of the area under study	Test
		PO3	Knows the basic concepts of the area under study	Case study
		PO5	Knows the basic concepts of the area under study	Test
		PO6	Knows how to apply mathematical methods to solve various problems	Workbook
		PO8	Knows the basic concepts of the area under study	Case study
		PO10	Knows the basic concepts of the area under study	Control work
		PO11	Knows how to apply mathematical methods to solve various problems	Workbook
		PO12	Knows the basic concepts of the area under study	Case study
		PO14	Knows basic concepts from the fields of economics and law, ecology and life safety	Creative task
Putting knowledge and understanding into practice	CC3 CC4 CC5 CC7	LO1	Applies acquired knowledge to solve practical problems	Project
		LO2	Solve complex problems based on acquired knowledge	Multi-level tasks and assignments
		LO3	Applies acquired knowledge to solve	Project

			practical problems	
		LO6	Applies acquired knowledge to solve practical problems	Calculation and graphic work
		LO7	Applies acquired knowledge	Laboratory work
		LO8	Applies acquired knowledge to solve practical problems	Case-study
		LO9	Applies acquired knowledge to solve practical problems	Project
		LO10	Applies acquired knowledge to solve practical problems	Project
		LO11	Applies acquired knowledge to solve practical problems	Project
		LO12	Solve complex problems based on acquired knowledge	Multi-level tasks and assignments
Communication skills	CC1	LO1	Able to present his ideas in a compelling manner	Colloquium
		LO4	Able to communicate clearly in writing	Summary
Professional competencies				
Putting knowledge and understanding into practice	PC1 PC3 PC4 PC5	LO1	Applies acquired knowledge to solve practical problems	Project
		LO3	Applies acquired knowledge to solve practical problems	Project
		LO5	Applies acquired knowledge to solve practical problems	Project
		LO6	Applies acquired knowledge to solve practical problems	Calculation and graphic work
		LO7	Applies acquired knowledge	Laboratory work
		LO8	Applies acquired knowledge to solve practical problems	Case-study
		LO9	Applies acquired knowledge to solve practical problems	Project
		LO10	Applies acquired knowledge to solve practical problems	Project
		LO11	Applies acquired knowledge to solve practical problems	Project
		LO12	Solve complex problems based on acquired knowledge	Multi-level tasks and assignments
Ability to make judgments, evaluate ideas, and formulate conclusions	PC2 PC6 PC7	LO2	Able to present his ideas in a compelling manner	Laboratory work
		LO5	Able to retrieve necessary information	Colloquium
		LO6	Able to present his ideas in a compelling manner	Laboratory work

F-72, Educational program

		LO9	Able to present his ideas in a compelling manner	Laboratory work
		LO10	Able to present his ideas in a compelling manner	Laboratory work
		LO11	Умеет извлекать нужную информацию	Colloquium
		LO12	Able to present his ideas in a compelling manner	Laboratory work
Self-learning	PC8	LO13	Able to apply acquired knowledge in the chosen additional educational program	Project

3.2 Matrix for correlating the learning outcomes of the educational program with the competencies being developed

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14
CC1	V			V										
CC2		V			V	V				V				V
CC3	V		V				V					V		
CC4						V		V	V	V				
CC5	V	V	V								V			
CC6		V	V					V			V	V		
CC7			V				V					V		
CC8		V				V				V	V			
PC1	V		V						V			V		
PC2						V			V	V	V			
PC3								V			V			
PC4					V	V					V	V		
PC5							V		V	V				
PC6					V					V				
PC7		V									V	V		
PC8													V	

Organization of inclusive education

The educational program 6B06123 - "Data science" provides for the provision of educational services for persons with limited vision and speech and limited capabilities of the musculoskeletal system in accordance with medical indications. The organization of the educational process for persons with disabilities is regulated by the academic policy of the university. For students with special educational needs (SEN), if necessary, an individual curriculum can be developed with an individual schedule for attending classes. Maintenance of educational programs for persons with disabilities is implemented using e-learning and distance learning technologies (hereinafter referred to as DET). To ensure access to education for students with special education needs, the university uses a form of remote access for students to the resources of the educational portal through the website and personal accounts in www.platonus.iitu.edu.kz, MsTeams.

In order to adapt students with special education needs, the following is carried out:
- training to work in the information system on the website www.platonus.iitu.edu.kz, MsTeams;
- training in working with the library's electronic catalogue.

3.3. Information about the modules of the educational program

Module code and module name	Module volume (work intensity)	Learning outcomes	Criteria for assessing learning outcomes	Disciplines forming the module Code and Name
		GENERAL EDUCATION MODULES		
GEM01 Sociology and Ethics	5	Has an understanding of the principles and patterns of the historical development of society, the historical periodization of the history of Kazakhstan, the place of the history of Kazakhstan in world history and the history of Eurasia. Able to independently and critically analyze historical and modern sources, draw conclusions, and give reasons for them.	Oral survey, testing, report, midterm control, semester work	History of Kazakhstan
	5	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 the development of world and Kazakh philosophical thought. Able to operate with special philosophical terminology and the categorical-conceptual apparatus of philosophy; - work creatively and critically on original philosophical texts; - logically express your thoughts on the philosophical issues being studied; - analyze the features of the genesis and development of philosophical knowledge; - formulate and defend your own worldview with arguments.	Oral survey, testing, report, midterm control, semester work	Philosophy
	4	Political Science and Sociology consists of two parts: the first part provides comprehensive coverage of all key elements, the study of sources and political relations, types of political systems, democratic and authoritarian systems, political mechanisms, political competition and power, political capital and values, the survival of political ideas, nationalism , analysis of domestic and foreign policy, political growth, public policy in the world political system; In the second part, students will study scientific social knowledge that will help them gain experience in forming patterns of social relations. In addition, they will learn to respect the good values of both Kazakhstan and the rest of the	Oral survey, testing, report, midterm control, semester work	Political Science and Sociology

		world, skills of social communications, interpersonal relationships, respect for the different cultures of Kazakhstan and the world community.		
	4	Culturology and psychology consists of two parts: the first part - knowledge in the field of cultural studies can serve as the basis for the study of the entire complex of social and human sciences. At the same time, it can serve as a supplement to general courses in history and philosophy. Methods and technologies of teaching used in the process of implementing the program: role-playing games and educational discussions of various formats; case study (analysis of specific situations); project method; the second part presents issues of psychology in a broad educational and social context. The knowledge, skills and abilities acquired and developed as a result of mastering the course content give students the opportunity to apply them in practice in various spheres of life: personal, family, professional, business, social, in working with people - representatives of different social groups and age categories .	Oral survey, testing, report, midterm control, semester work	Cultural studies and psychology
GEM02 Language training	10	Able to characterize – the basic rules of reading; word formation models; contextual meanings of polysemous words; terms and lexical structures of the sublanguage corresponding to the profile of the specialty being studied; 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 isolating the main information of microtext.	Oral survey, testing, report, midterm control, semester work	Foreign language
	10	Identify linguistic forms of expression of various types of information in a scientific text to solve problems of educational and professional communication; principles of compiling texts of the main educational, scientific, scientific and professional genres.	Oral survey, testing, report, midterm control, semester work	Kazakh (Russian) language
	2	The course is designed to help students develop their English language skills for their current and future academic studies. Improve grammatical accuracy and develop listening, reading, writing and speaking skills in IELTS format.	Устный опрос, тестирование, доклад, рубежный контроль, семестровые работы	English language for STEM
	2	Identify linguistic forms of expression of various types of information in a scientific text to solve problems of educational and professional	Oral survey, testing, report, midterm	Business correspondence in the

		communication; principles of compiling texts of the main educational, scientific, scientific and professional genres.	control, semester work	state language
	4	Able to characterize – the basic rules of reading; word formation models; contextual meanings of polysemous words; terms and lexical structures of the sublanguage corresponding to the profile of the specialty being studied; 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 isolating the main information of microtext.	Oral survey, testing, report, midterm control, semester work	Professionally oriented foreign language
GEM03 Information Technology Module	5	Know: – main directions of ICT development; – basics of using information resources for searching and storing information; – architecture and components of computer systems; – main goals and objectives of information security. Can work in any operating system and with databases; apply methods and means of protecting information; work with spreadsheets, consolidate data, build charts. Have skills: – processing of vector and raster images; – creating multimedia presentations; – data visualization; – application of various forms of e-learning to expand professional knowledge; – work with cloud services of E-technologies.	Oral survey, testing, report, milestone control, calculation and graphic work	Information and Communication technologies
GEM04 Physical training module	8	Knows the main tasks of physical education of students, Can pass control exercises and standards.	Physical education test	Physical Culture
GEM05 Research and Entrepreneurship Module	5	Have an idea of the principles and patterns of economic relations.	Oral survey, testing, report, milestone control, calculation and graphic work	Economic theory
	5	Have the ability to make independent theoretical and practical judgments and conclusions. Be able to objectively evaluate scientific information, freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for completing a diploma project	Oral survey, testing, report, midterm control, semester work	Research methodology

		(work).		
	5	Have an understanding of the principles of law and anti-corruption culture	Oral survey, testing, report, midterm control, semester work	Fundamentals of law and anti-corruption culture
	5	Have an idea of the principles and laws of ecology and life safety	Oral survey, testing, report, midterm control, semester work	Fundamentals safety of life activity and ecology
	5	Have an idea of financial literacy	Oral survey, testing, report, midterm control, semester work	Basics of financial literacy
	5	Have an idea of IT competence and entrepreneurial skills	Oral survey, testing, report, midterm control, semester work	Startups and entrepreneurship
BASIC MODULES				
BM01 Physics and mathematics module	6, 5	Able to apply methods for solving differential and integral calculus of functions of several variables in applied problems; apply methods for solving differential equations in solving applied problems; obtain approximate values of solutions using expansion in power series and Fourier series with a given accuracy; determine the optimal methods for solving practical problems.	Oral survey, testing, report, midterm control, calculation and graphic work	Mathematical analysis 1, 2
	4	The goals of the course are to familiarize students with important sections of linear algebra and analytical geometry. During the educational process, students should become familiar with and be able to apply algebraic and geometric methods and tools to solve various applied problems with such important concepts as matrices, determinants, matrix rank, vectors, lines, planes, linear and Euclidean space, linear transformations and quadratic forms.	Oral survey, testing, report, midterm control, semester work	Algebra and Geometry
	6	Study of discrete objects, solution of combinatorial problems, study of types of mappings and binary relations, reduction of propositional algebra formulas to normal forms, application of logical algebra to the theory of switching circuits. The ability to analyze and synthesize, as well as mathematical maturity.	Oral survey, testing, report, midterm control, calculation and graphic work	Discrete mathematics and mathematical logic

	3	The course focuses on probability, as well as the relationship between mathematics and modeling, operating systems in an interdisciplinary curriculum covering the branch of mathematical analysis.	Oral survey, testing, report, midterm control, calculation and graphic work	Probability theory
	5	Know: basic concepts of the theory of differential equations, types and standard forms of writing basic differential equations, methods for solving basic differential equations. Be able to: apply differential equations to model physical processes, use the tools of differential equations to process, analyze and systematize information on the topic of research and use mathematical literature if necessary.	Oral survey, testing, report, midterm control, calculation and graphic work	Differential equations
	4	Knows and understands kinematics; dynamics; circular motion and gravity; energy; pulse; 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 survey, testing, report, midterm control, calculation and graphic work	Physics
BM02 Mathematical modeling module	5	The course includes: 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.	Oral survey, testing, report, midterm control, calculation and graphic work	Computational mathematics
	6	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 survey, testing, report, midterm control, calculation and graphic work	Numerical analysis
BM03 Computer simulation module	6	Know: organize the necessary data structures depending on the requirements of the task; Be able to: develop block diagrams of various algorithms; Have the skills to develop programs in C++ using language tools.	Oral survey, testing, report, midterm control, calculation and graphic work	Fundamentals of Programming
	7	Be able to develop sorting algorithms such as bubble sort, merge sort, quick sort, etc. Have a basic understanding of OOP concepts, C++ theory, methods and technologies, data structures and algorithms; application of algorithms and modern trends in technologies of a large company	Oral survey, testing, report, midterm control, calculation and graphic work	Object-oriented programming

	6	Able to know: basic algorithms for solving biological processes of various natures; Able to use software language tools to solve biological problems and be able to perform data analysis and identify trends. Have the skills to: implement algorithms and data structures, as well as use programming language functions using modern software tools.	Oral survey, testing, report, midterm control, calculation and graphic work	Algorithms and data structures
	4	Know: Python programming language for working with genomic data; Unix operating system and commands for working in this environment; scripting languages and methods of writing program codes in them. Has skills in developing programs for analysis of genes and genomes, use of other additional packages such as Biopython, R, Bioconductor and Galaxy.	Oral survey, testing, report, midterm control, calculation and graphic work	Python programming
	5, 5	Know the basics of machine learning theory, including discriminant, cluster and regression analysis, mastering the skills of practical solution of data mining problems.	Oral survey, testing, report, midterm control, calculation and graphic work	Machine learning 1, 2
	5	Know: basic methods for numerical research of biological processes of various natures. Be able to: interpret the results of numerical analysis of biological data, identify trends, make forecasts; Own: implementation of numerical methods using modern software.	Oral survey, testing, report, midterm control, calculation and graphic work	Database theory
	6	Knows how to apply technologies for designing the structure of a website as an information system	Oral survey, testing, report, midterm control, calculation and graphic work	WEB technology
	5	Knows how to apply programming skills to build predictive models, data visualization and work with neural networks.	Oral survey, testing, report, midterm control, calculation and graphic work	Python for data analysis
PROFESSIONAL MODULES				
PM01 Module of elective disciplines	5	Able to have professional skills	Oral questioning, testing, report, midterm control	Elective discipline No. 2 from CED
	6			Elective discipline No. 3 from CED

PM02 Data analysis module	3	Have an idea: about a comparative analysis in genomics, ideological and methodological criteria for understanding the structural subdivisions of the new science - structural genomics, proteomics and transcriptomics.	Oral survey, testing, report, midterm control, calculation and graphic work	Data analysis and visualization in Power BI
	5	Knows the basic concepts and methods of studying economic systems. 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 of models and modeling algorithms; systems thinking.		Operation research
	5	Knows modern statistical methods and economic theory.		Statistics for data analysis
	6	Knows elements of algebra, statistics, elements of mathematical analysis (for example, gradient descent), elements of numerical method and analysis, optimization problems, elements of vector space.		Advanced Mathematics for Machine Learning
	5	Knows the mathematical apparatus and tools for processing, analyzing and systematizing information on the research topic.		Optimal management
	6	Solves practical problems of data processing, mathematical modeling, computer science.		Neural Networks
	5	Proficient in identifying patterns, identifying anomalies, testing hypotheses, and testing assumptions using summary statistics and graphical representations.		Exploratory data analysis
PM03 Practice module	2	Knows the organizational structure and complex of technical means of the information and analytical center (IAC) of the organization.	Report	Teaching practice
	4, 4			Industrial practice
	5	Able to identify the main problems solved by the IAC. Knows the mathematical support of the selected task (set of tasks or subsystem) and the software of the selected task (set of tasks or subsystem), organizational and legal support of the selected task (set of tasks or subsystem). systematization and analysis of factual materials necessary for writing a course work, scientific report and internship report.		Pregraduation practice
PM04 Module of Minor disciplines	5, 5, 5	Able to apply acquired knowledge in the chosen additional educational program.	Oral questioning, testing, report, midterm control	Minor 1, 2, 3

3.4. Information about the disciplines of the educational program

№	Code and Name of discipline	Brief description of the discipline (30-50 words)	Labor intensity of discipline in credits	Formed learning outcomes (codes)	Prerequisites	Postrequisites
		Cycle of general education disciplines (GED) **Required component (RC)**				
1.	History of Kazakhstan	Данный курс состоит из обучения истории страны для понимания роли и значения происходящих событий в историческом контексте.	5	GEC1	-	-
2.	Philosophy	Данный курс состоит из обучения философии для формирования осознанного отношения к окружающей среде.	5	GEC3	-	-
3.	Foreign language	Данный курс состоит из обучения иностранному языку для формирования коммуникативных навыков на иностранном языке.	10	GEC4	-	
4.	Kazakh (Russian) language	Данный курс состоит из обучения казахскому/русскому языку для формирования коммуникативных навыков на государственном, русском языках.	10	GEC4		
5.	Information and communication technologies	Курс содержит обзор в различных областях ИКТ, позволяющий студентам получить базовые знания по применению современных ИКТ в своей научной и практической работе, для самостоятельного изучения и других целей.	5	GEC5, CC3		
6.	Sociology - Political Science	Курс дает знания студентам о политической сфере общества, представление о соотношении и взаимовлиянии политики и управления, а также социологии для понимания общества и общественного развития.	4	GEC1 GEC2 GEC3		
7.	Cultural studies - Psychology	Курс формирует необходимые знания о культурологии, вырабатывает понимание своеобразия культур народов, а также курс знакомит с различными концепциями, основными понятиями, закономерностями психологии.	4	GEC2 GEC3		
8.	Physical education	The course provides solutions to the main tasks of physical education of students, provides for passing control exercises and standards.	8	GEC1 GEC3		
		Cycle of general education disciplines (GED) **University Component (UC) and/or Optional Component (OC)**				
9.	Elective discipline 1 (GED)		5			
	Economic theory	The course contains an overview of the principles and patterns of economic relations.		GEC6 CC2		
	Startups and entrepreneurship	The course is designed to help students develop IT competencies, entrepreneurial skills, teamwork, Business skills and Softskills.		GEC3		
	Fundamentals of law and anti-corruption culture	As part of the course, students will become familiar with concepts such as anti-corruption consciousness and anti-corruption culture, and acquire knowledge about corruption as a phenomenon of modern reality and its historical roots. The discipline forms the acquisition of skills in working with legislation in the field of anti-corruption, and develops a civic position towards this phenomenon.		GEC1 GEC3		
	Fundamentals safety of life activity and	This is a higher school discipline that studies ways of safe human interaction with the environment		GEC3		

	ecology	(industrial, domestic, urban, natural), sustainable functioning of economic objects (organizations) in emergency situations, issues of protection from negative factors, prevention and mitigation of the consequences of natural and man-made emergency situations the nature and use of modern weapons.				
	Basics of financial literacy	The course "Basics of Financial Literacy" is aimed at gaining knowledge and skills in the field of personal finance management. As part of the course, students will learn to use in practice all kinds of tools in the field of finance, save and increase savings, plan a budget competently, gain practical skills in calculating and paying taxes and correctly filling out tax reporting, learn to analyze financial information and navigate financial products to choose an adequate investment strategies.		CC3		
	Research methodology	The course is devoted to the study of activities aimed at developing in students the ability to make independent theoretical and practical judgments and conclusions, the ability to objectively evaluate scientific information, freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for completing a diploma project (work).		GEC3 BC5	-	-
Cycle of core disciplines **University component**						
10.	Mathematical analysis 1	The purpose of the course is to introduce students to important branches of calculus and its applications in computer science. During the educational process, students must become familiar with and be able to apply mathematical methods and tools to solve various applied problems. Moreover, they will learn fundamental methods for studying infinitesimal variables using analysis, which is based on the theory of differential and integral calculations.	6	CC6 CC8	-	Mathematical analysis 2
11.	Mathematical analysis 2	The course explains the basic concepts of the definite 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, approximations of functions and the concept of convergence; use infinite series in approximate calculations.	5	CC6 CC8	Mathematical analysis 1	
12.	Algebra and geometry	The goals of the course are to familiarize students with important sections of linear algebra and analytical geometry. During the educational process, students should become familiar with and be able to apply algebraic and geometric methods and tools to solve various applied problems with such important concepts as matrices, determinants, matrix rank, vectors, lines, planes, linear and Euclidean space, linear transformations and quadratic forms .	4	CC6	-	Operation research
13.	Differential equations	The course classifies differential equations and applies the necessary techniques to solve these equations; teaches you to solve linear differential equations of the nth order and systems of linear equations with constant coefficients; find rest points of the autonomous system; solve boundary value problems for a linear homogeneous equation with constant coefficients; and use the mathematical apparatus to master the theoretical foundations and practical use of physical methods.	5	CC6 CC8	Mathematical analysis 1	ED from CED
14.	Object-oriented programming	This course will provide skills in developing console or window applications using the Java programming	7	BC7	Introductio	Algorithms

		language using object-oriented programming concepts. Course topics include the OOP paradigm, Java programming, file handling, exceptions, structures, collections, object-oriented programming concepts.			n to Progr ammi ng	and data struct ures
15.	Computational mathematics	The course includes: 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.	5	CC4 CC6	Differ ential equati ons	Nume rical analy sis
16.	Physics	The course covers topics such as: Kinematics; dynamics; circular motion and gravity; energy; pulse; 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.	4	CC6	-	-
17.	Numerical analysis	The following sections are studied in the course: Basic problems of mathematical physics. Difference schemes for equations of parabolic type. Difference schemes for equations of hyperbolic type. Difference schemes for elliptic type equations. Variational and variational-difference methods. Iterative and variational methods for solving nonlinear problems of mathematical physics. Monte Carlo methods.	6	CC6 PC1	Comp utatio nal mathe matic s	ED from CED
18.	Algorithms and data structures	The course is designed to study algorithms and development programs for solving various problems. For this purpose, the program structure, principles of constructing algorithms and programs, methods of solution, algorithmization, programming, debugging and implementation of programs using a programming language are considered.	6	CC4	Objec t- orient ed progr ammi ng	ED from CED
19.	Introduction to Programming	The course is designed to develop professional and general educational competencies of future specialists in the field of computer security through familiarization with the general principles of constructing and using programming languages, as well as developing skills in designing and implementing algorithms for solving practical problems in a program language, using assembly languages on modern computers.	6	CC7	-	Objec t- orient ed progr ammi ng
20.	Teaching practice	Practice includes detailing the finishing blocks of a generalized scheme, identifying the necessary classes and methods, defining sets of logically interconnected data (data flows), introducing various additional tools to ensure visibility and improve the level of service of the designed program, developing a generalized algorithm diagram, developing and debugging the program, implementing the designed model.	2	CC4 CC6	-	-
21.	WEB technology	The course includes technology for designing the structure of a website as an information system; technology for creating a website using programming tools on the client and server sides; technology for hosting, supporting and maintaining a website on a server.	6	CC7		
22.	Business correspondence in the state language	Record keeping in the state language is a very important subject for students, because This discipline teaches the preparation and execution of documents in the state language, develops practical	2	CC1		

F-72, Educational program

		skills and the ability to independently compose and translate documents into Kazakh.				
Cycle of core disciplines **Optional component**					
23.	Advanced Mathematics for Machine Learning	The course contains elements of algebra, statistics, elements of mathematical analysis (for example, gradient descent), elements of numerical method and analysis, introduction to optimization problems, elements of vector space.	5	CC6 CC8	Statis tics for data analy sis	ED from CED
24.	English for STEM	The course is designed to help students develop their English language skills for their current and future academic studies. Improve grammatical accuracy and develop listening, reading, writing and speaking skills in IELTS format.	2	GEC4 CC1		
25.	Professionally oriented foreign language	The course is devoted to the analysis of professional topics: "Computers and work", "Working in ICT", "Types of computer systems", "Computer fundamentals", "Operating systems and graphical interface", "Word processing", "Cyberspace: security and crime " etc.	4	CC1		
26.	Probability theory	The course focuses on probability, as well as the relationship between mathematics and modeling, operating systems in an interdisciplinary curriculum covering the branch of mathematical analysis.	3	CC6 PC5	-	Statis tics for data analy sis
27.	Statistics for data analysis	The course focuses on the statistics of any event, as well as the relationship between mathematics and modeling, operating systems within the framework of an interdisciplinary training program covering the section of modern statistical methods and economic theory.	5	CC6 PC5 PC7	Proba bility theor y	ED from CED
28.	Discrete mathematics and mathematical logic	Discrete mathematics is the branch of mathematics devoted to the study of discrete objects (here, discrete means consisting of separate or unrelated elements). More generally, 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 manner.	6	CC6	-	ED from CED
29.	Data analysis and visualization in Power BI	An analyst is a specialist who studies and models a specific area. Power BI is an analytics system that combines data from various information sources, transforms it, and presents it in a visual form convenient for analysis. BI technologies allow you to process large, unstructured volumes of data for decision making. Power BI is a collection of Microsoft software services that work together to turn a company's disparate data sources into cohesive, interactive reports. In this case, the source can be databases, Excel files, data from cloud sources and the Internet, text files, and so on. This tool helps you monitor the situation and get immediate answers to questions using detailed dashboards available on every device.	3	CC3 PC6 PC7	-	-
30.	Programming in Python	The goal of the course is to develop programming skills in Python. As a result of mastering the discipline, the student must: know the basic constructions and idioms of the Python programming	4	CC7	-	Pytho n for Data Analy

F-72, Educational program

		language and be able to put into practice a simple program to perform the assigned analytical task. Have the skills to formalize and solve practical programming problems				sis
31.	Database theory	The course explains what a database system is and then moves on to most of the teaching material to learn relational database systems—databases designed according to the relational (or tabular) model. The course then moves from data abstraction to transaction management, with additional material on improving query performance. Finally, modern trends in database system design have emerged that also shape recent developments in the broader history of data storage technologies.	5	CC5 CC7	–	Mach ine learni ng 1
32.	Python for Data Analysis	The course shows how to apply your programming skills to build predictive models, data visualization and work with neural networks. The course is practical-oriented and will allow you to immediately start working with data and building models.	5	PC1 PC5 PC6 PC7	Progr ammi ng in Pytho n	Mach ine learni ng 1
33.	Operation research	Goals: mastery of basic concepts and methods of studying economic systems; studying the current state and main directions of development of mathematical models of economic systems at various levels; acquiring the skills necessary for independent work on the design and implementation of economic analysis of models and modeling algorithms; development of a systemic type of thinking.	5	PC3 PC4	Ageb ra and Geom etry	Opti mal mana geme nt
34.	Machine learning 1	The course introduces students to the theoretical foundations and algorithms of machine learning, their possible practical implementations and application in solving real-life problems. As part of this course, students should gain an understanding of the problems solved using the theory under consideration, and the principles of constructing some basic classifiers.	5	PC1 PC4 PC5	Pytho n for Data Analy sis	Mach ine learni ng 2; Neura l netwo rks
Cycle of profiling disciplines **University component**						
35.	Industrial practice	The practice includes the study of the organizational structure and complex of technical means of the information and analytical center (IAC) of the organization. Identification of the main tasks solved by the IAC. Study of information, mathematical, software of the selected task (set of tasks or subsystem).	4	CC5 PC1	-	-
36.	Industrial practice	The practice includes the study of the organizational structure and complex of technical means of the information and analytical center (IAC) of the organization. Identification of the main tasks solved by the IAC. Study of information, mathematical, software of the selected task (set of tasks or subsystem).	4	CC5 PC1	-	-
37.	Pregraduation practice	Practice includes consolidation of theoretical knowledge in academic disciplines of the specialty; mastering practical skills, technology of work in the specialty directly at the workplace using a PC, modern software and modern office equipment; study and analysis of the real situation in the statics and dynamics of CAD in the short and long term in relation to the enterprise - the base for the internship; collecting material for graduation projects.	5	CC5 PC1	-	-
Cycle of profiling disciplines **Optional component**						
38.	Machine learning 2	The purpose of this course is to study the	5	PC1	Mach	-

		fundamentals of machine learning theory, including discriminant, cluster and regression analysis, and master the skills of practical solving data mining problems.		PC4 PC5	ine learni ng 1	
39.	Optimal management	The course provides the ability to use the basic methods of natural science disciplines in professional activities for theoretical and experimental research; ability to use appropriate mathematical apparatus and tools for processing, analyzing and systematizing information on the research topic.	5	CC6 PC1 PC4 PC6	Nume rical analy sis	-
40.	Exploratory data analysis	Exploratory data analysis refers to the critical process of performing initial explorations of data to identify patterns, identify anomalies, test hypotheses, and test assumptions using summary statistics and graphical representations.	5	PC2 PC6 PC7	Pytho n for Data Analy sis	-
41.	Neural Networks	The goals of the course are to prepare students in the application of modern methods for solving difficult to formalize problems that require large computing power. The course is aimed at preparing students to solve practical problems of data processing, mathematical modeling, computer science, obtaining higher professional education, allowing graduates can successfully work in their chosen field of activity using modern computer technologies.	6	PC1 PC2	Mach ine learni ng 2	-
42.	Elective discipline 2		5			
	Deep learning for Applied Mathematics	Deep learning is the dark magic of our day, incredibly powerful and accessible to almost everyone, not just giants like Google, Amazon or Tesla. And when hiring employees in this area, it is important for companies themselves that the person has experience in solving realistic cases. The only prior knowledge required to complete this training program is a basic knowledge of Python syntax. Deep learning is, of course, based on mathematics, particularly in areas such as linear algebra, probability, statistics, and calculus.		PC1 PC6 PC7	Progr ammi ng in Pytho n	
	Methods of nonlinear programming	The course reveals the differences and advantages of nonlinear programming problems over classical problems of mathematical analysis, classifies sections of nonlinear programming; formulates problems and classifies methods for solving nonlinear programming problems.		PC1 PC6 PC7	Progr ammi ng in Pytho n	
43.	Elective discipline 3		6			
	Deep learning of inverse problems	Approximate methods for solving inverse problems are being developed. problems, algorithms are compiled. Predict solutions to given problems using machine learning. Computational experiments are carried out and the output data is analyzed.		PC1 PC6 PC7	Nume rical analy sis	
	Methods for solving inverse ill-posed problems	Methods for constructing a mathematical model of oil transportation by pipeline based on the basic laws of physics (law of conservation of mass) are considered. Initial and boundary conditions are set as close as possible to practice. The inverse problems of transporting oil by pipeline are posed. Based on the basic model of the direct problem, a mathematical model of the inverse problem is developed. Inverse ill-posed problems are considered.		PC1 PC6 PC7	Nume rical analy sis	
44.	Minor 1	Students choose from a list of minors from other EP.	5	PC8		
45.	Minor 2		5	PC8		
46.	Minor 3		5	PC8		

4. Educational program curriculum

№	Module code	Module name in three languages (Kaz/Rus/Eng)	Discipline code	Name of the discipline in three languages (Kaz/Rus/Eng)	Cycle (GED, CD, PD)	Component (RC, OC, UC)	Total number of credits (ECTS)	Total academic hours	Number of classroom hours				Number of hours of SIS		Form of control (Att1, Att2, exam, CW/CP, differential test, defense of DP/DW)	Prerequisites (Discipline code)
									Total classroom hours	lectures	practical (sem.)	laboratory	Total hours SIS	Including TSIS		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
				1 course												
				1 semester												
1	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6001A	Шет тілі / Иностранный язык / Foreign language	GED	RC	5	150	45	0	45	0	105	15	Att1, Att2, exam	-
2	GEM03	Ақпараттық технологиялар модулі / Модуль информационных технологий / Information Technology Module	ICT6001	Ақпараттық-коммуникациялық технологиялар / Информационно-коммуникационные технологии / Information and Communication Technologies	GED	RC	5	150	45	15	0	30	105	15	Att1, Att2, exam	-
3	BM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics and Mathematics module	MAT6001	Алгебра және геометрия / Алгебра и геометрия / Algebra and Geometry	CD	UC	4	120	45	15	30	0	75	15	Att1, Att2, exam	-
4	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6001	Бағдарламалауға кіріспе / Введение в программирование / Introduction to Programming	CD	UC	6	180	60	15	15	30	120	15	Att1, Att2, exam	-
5	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6558	WEB технологиялары / WEB технологии / WEB technology	CD	UC	6	180	60	15	15	30	120	15	Att1, Att2, exam	-
6	BM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics	MAT6509	Дискреттік математика және математикалық логика / Дискретная математика и математическая логика /	CD	UC	6	180	60	30	30	0	120	15	Att1, Att2, exam	-

F-72, Educational program

		and Mathematics module		Discrete Mathematics and Mathematical Logic												
				Total for the 1st semester:			**32**	**960**	**315**	**90**	**135**	**90**	**645**	**90**		
				2 semester												
7	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6002A	Шет тілі / Иностранный язык / Foreign language	GED	RC	5	150	45	0	45	0	105	15	Att1, Att2, exam	-
8	GEM04	Дене шынықтыру модулі / Модуль физической подготовки / Physical training module	PhC6005	Дене шынықтыру / Физическая культура / Physical Culture	GED	RC	4	120	45	0	45	0	75	15	Att1, Att2, exam	-
9	BM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics and Mathematics module	MAT6501	Математикалық талдау 1 / Математический анализ 1 / Mathematical analysis 1	CD	UC	6	180	60	30	30	0	120	15	Att1, Att2, exam	-
10	BM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics and Mathematics module	PHY6001	Физика / Физика / Physics	CD	UC	4	120	45	15	0	30	75	15	Att1, Att2, exam	-
11	PM03	Тәжірибе модулі / Модуль практик / The Practice module	PP6501	Оқыту практика / Учебная практика / Teaching practice	CD	UC	2	60	30	0	30	0	30	0	Dif.test	-
12	PM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics and Mathematics module	MAT6520	Ықтималдық теориясы / Теория вероятности / Probability Theory	CD	OC	3	90	30	15	15	0	60	15	Att1, Att2, exam	-
13	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6516	Python бағдарламалау / Программирование на Python / Programming in Python	CD	OC	4	120	45	15	0	30	75	15	Att1, Att2, exam	-
				Total for the 2nd semester:			**28**	**840**	**300**	**75**	**165**	**60**	**540**	**90**		
				TOTAL FOR THE 1 COURSE:			**60**	**1800**	**615**	**165**	**300**	**150**	**1185**	**180**		
				2 course												
				3 semester												
14	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6001KR	Қазақ (орыс) тілі / Казахский (русский) язык / Kazakh (Russian) language	GED	RC	5	150	45	0	45	0	105	15	Att1, Att2, exam	-
15	GEM01	Әлеуметтану және этики / Социологии и этики / Sociology and Ethics	HK6002	Қазақстан тарихы / История Казахстана / History of Kazakhstan	GED	RC	5	150	45	15	30	0	105	15	Att1, Att2, exam	-
16	GEM04	Дене шынықтыру модулі / Модуль физической подготовки	PhC6006	Дене шынықтыру / Физическая культура / Physical Culture	GED	RC	4	120	45	0	45	0	75	15	Att1, Att2,	-

№																
		/ Physical training module													dif.test	
17	BM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics and Mathematics module	MAT6502	Математикалық талдау 2 / Математический анализ 2 / Mathematical analysis 2	CD	UC	5	150	45	15	30	0	105	15	Att1, Att2, exam	MAT6501
18	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6517	Объектті-бағдарланған программалау / Объектно-ориентированное программирование / Object-oriented programming	CD	UC	7	210	75	15	30	30	135	15	Att1, Att2, exam	SFT6001
19	BM01	Физика - математикалық Модуль / Модуль Физико-математический / The Physics and Mathematics module	MAT6531	Дифференциалдық теңдеулер / Дифференциальные уравнения / Differential Equations	CD	UC	5	150	45	15	30	0	105	15	Att1, Att2, exam	MAT6501
				Total for the 3rd semester:			**31**	**930**	**300**	**60**	**210**	**30**	**630**	**90**		
				4 semester												
20	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6002KR	Қазақ (орыс) тілі / Казахский (русский) язык / Kazakh (Russian) language	GED	RC	5	150	45	0	45	0	105	15	Att1, Att2, exam	-
21	GEM01	Әлеуметтану және этика / Социологии и этики / Sociology and Ethics	SPS6007	Әлеуметтану - Саясаттану / Социология-Политология / Sociology - Political science	GED	RC	4	120	45	15	30	0	60	15	Att1, Att2, exam	-
22	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6501	Алгоритмдер және деректер құрылымы / Алгоритмы и структуры данных / Algorithms and data structures	CD	UC	6	180	60	15	15	30	120	15	Att1, Att2, exam	SFT6517
23	BM02	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT6534	Есептеу математикасы / Вычислительная математика / Computational mathematics	CD	UC	5	150	45	15	15	15	105	15	Att1, Att2, exam	MAT6531
24	PM03	Тәжірибе модулі / Модуль практик / The Practice module	PP6502	Өндірістік практика / Производственная практика / Industrial practice	PD	UC	4	120	0	0	0	0	120	15	report	-
25	PM02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	MAT6507	Деректерді талдауға арналған статистика / Статистика для анализа данных / Statistics for data analysis	CD	OC	5	150	45	15	30	0	105	15	Att1, Att2, exam	MAT6520
				Total for the 4th semester:			**29**	**870**	**255**	**75**	**135**	**45**	**615**	**105**		
				TOTAL FOR THE 2 COURSE:			**60**	**1800**	**555**	**135**	**345**	**75**	**1245**	**195**		
				3 course												

F-72, Educational program

5 semester
26	GE01	Әлеуметтану және этика / Социологии и этики / Sociology and Ethics	SPS6006	Мәдениеттану - психология / Культурология - психология / Cultural studies - Psychology	GED	RC	4	120	45	15	30	0	105	15	Att1, Att2, exam	-
27	GEM05	Зерттеу және кәсіпкерлік модулі / Модуль исследований и предпринимательства / Research and Entrepreneurship Module	RM6502	Зерттеу әдістемесі / Методология исследования / Research metodology	GED	OC	5	150	45	15	30	0	105	15	Att1, Att2, exam	-
			JUR 6507	Тіршілік қауіпсіздігінің және экологияның негіздері / Основы экологии и безопасности жизнедеятельности / Fundamentals safety of life activity and ecology												
			JUR 6470	Заң және сыбайлас жемқорлыққа қарсы мәдениеттің негіздері / Основы права и антикоррупционной культуры / Fundamentals of law and anti-corruption culture												
			MGT6706	Стартаптар және кәсіпкерлік / Стартапы и предпринимательство / Startups and entrepreneurship												
			FIN6720	Қаржылық сауаттылықтың негіздері / Основы финансовой грамотности / Basics of financial literacy												
			ECO6006	Экономикалық теория / Экономическая теория / Economic theory												
28	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6002PA	Кәсіби бағытталған шет тілі / Профессионально-ориентированный иностранный язык / Professionally oriented foreign language	CD	OC	4	120	45	0	45	0	75	15	Att1, Att2, exam	-
29	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6503	Деректерді талдауға арналған Python / Python для анализа данных / Python for Data Analysis	CD	OC	5	150	45	15	0	30	105	15	Att1, Att2, exam	SFT6516
30	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6507	Деректер қоры теориясы / Теория базы данных / Database theory	CD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	SFT6501
31	PM04	Майнор пәндер модулі / Модуль Майнор дисциплин / The module of Minor disciplines	MIN601	Майнор 1 / Майнор 1 / Minor 1	PD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	-
				Total for the 5th semester			28	840	285	90	135	60	555	105		
6 semester

F-72, Educational program

32	GEM01	Әлеуметтану және этика / Социологии и этики / Sociology and Ethics	SPS6001	Философия / Философия / Philosophy	GED	RC	5	150	45	15	30	0	105	15	Att1, Att2, exam	-
33	BM2	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT6506	Сандық талдау / Численный анализ / Numerical analysis	CD	UC	6	180	60	15	15	30	120	15	Att1, Att2, exam	MAT6534
34	PM03	Тәжірибе модулі / Модуль практик / The Practice module	PP6503	Өндірістік практика / Производственная практика / Professional Internship	PD	UC	4	120	0	0	0	0	120	15	report	
35	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6508	Машиналық оқыту 1 / Машинное обучение 1 / Machine Learning 1	CD	OC	5	150	45	15	0	30	105	15	Att1, Att2, exam	SFT6503
36	PC02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	MAT6535	Машиналық оқытуға арналған озық математика / Продвинутая математика для Машинного обучения / Advanced Mathematics for Machine Learning	CD	OC	5	150	45	15	30	0	105	15	Att1, Att2, exam	MAT6507
37	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6004DA	STEM арналған ағылшын тілі / Английский язык для STEM / English for STEM	CD	OC	2	60	30	0	30	0	30	15	Att1, Att2, exam	-
38	PM04	Майнор пәндер модулі / Модуль Майнор дисциплин / The module of Minor disciplines	MIN602	Майнор 2 / Майнор 2 / Minor 2	PD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	MIN601
				Total for the 6th semester:			32	960	270	75	120	75	690	105		
				TOTAL FOR THE 3 COURSE:			60	1800	555	165	255	135	1245	210		
				4 course												
				7 semester												
39	GEM02	Тілдік дайындық / Языковая подготовка / Language training	LAN6007K	Мемлекеттік тілде іс қағаздарын жүргізу / Делопроизводство на государственном языке / Business correspondence in the state language	CD	UC	2	60	30	0	30	0	30	15	Att1, Att2, exam	LAN6002KR
40	PM02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	MAT6538	Операцияларды зерттеу / Исследование операции / Operation research	CD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	MAT6506
41	BM01	Элективті пәндер модулі / Модуль элективных дисциплин / The module of elective disciplines	MAT6546	Қолданбалы математиканы терең оқыту / Глубокое обучение для прикладной математики / Deep learning for Applied Mathematics	PD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	SFT6516
			MAT6536	Сызықты емес бағдарламалау әдістері												

№																
				/ Методы нелинейного программирования / Methods of nonlinear programming												
42	BM03	Компьютерлік модельдеу модулі / Модуль компьютерного моделирования / Computer simulation module	SFT6540	Машиналық оқыту 2 / Машинное обучение 2 / Machine learning 2	PD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	SFT 650 8
43	PM02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	SFT6526	Деректерді барлау талдауы / Исследовательский анализ данных / Exploratory data analysis	PD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	SFT 650 3
44	PM02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	SFT6527	Оптималды басқару / Оптимальное управление / Optimal management	PD	OC	5	150	45	15	30	0	105	15	Att1, Att2, exam	MA T6506
45	PM04	Майнор пәндер модулі / Модуль Майнор дисциплин / The module of Minor disciplines	MIN603	Майнор 3 / Майнор 3 / Minor 3	PD	OC	5	150	45	15	15	15	105	15	Att1, Att2, exam	MIN 602
				Всего за 7 семестр:			**32**	**960**	**300**	**90**	**135**	**75**	**660**	**105**		
				8 semester												
46	PM03	Тәжірибе модулі / Модуль практик / The Practice module	PP6504	Диплом алдындағы практика / Преддипломная практика / Pregraduation practice	PD	UC	5	150	0	0	0	0	150	15	report	
47	PM02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	SFT6506	Power BI деректерді талдау және визуализациялау / Анализ и визуализация данных в Power BI / Data analysis and visualization in Power BI	CD	OC	3	90	30	0	30	0	60	15	Att1, Att2, exam	-
48	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / The module of elective disciplines	MAT6542	Кері есептерді терең оқыту / Глубокое обучение обратных задач / Deep learning of inverse problems	PD	OC	6	180	60	15	15	30	120	15	Att1, Att2, exam	MA T6506
			MAT6532	Кері бұрыс есептерді шешу әдістері / Методы решения обратных некорректных задач / Methods for solving inverse ill-posed problems												
49	PM02	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	SFT6520	Нейрондық желілер / Нейронные сети / Neural Networks	PD	OC	6	180	60	15	15	30	120	15	Att1, Att2, exam	SFT 6540
50				Дипломдық жұмысты, дипломдық жобаны жазу және қорғау немесе кешенді емтиханды дайындау және тапсыру / Написание и защита дипломной работы, дипломного			8	240	0	0	0	0	240	15	DP defense	

		проекта или подготовка и сдача комплексного экзамена / Writing and defending a diploma thesis, diploma project or preparation and passing of a comprehensive exam									
		Total for the 8th semester:		28	840	150	30	60	60	690	75	
		TOTAL FOR THE 4 COURSE:		60	1800	450	120	195	135	1350	180	
		TOTAL:		240	7200	2175	585	1095	495	5025	765	

Summary table of indicators of the amount of credits of the educational program in terms of cycles of disciplines and semesters of study

Cycle of disciplines / Semester	1 sem.	2 sem.	3 sem.	4 sem.	5 sem.	6 sem.	7 sem.	8 sem.	Total of credits ECTS	Note (Structure EP according to higher education NMS)
Cycle of general education disciplines (GED)	**10**	**9**	**14**	**9**	**9**	**5**			**56**	*** 56 cr.**
- including a required component (RC GED)	10	9	14	9	4	5			51	* 51 cr.
- including an optional component (OC GED)					5				5	* 5 cr.
Cycle of core disciplines (CD)	**22**	**19**	**17**	**16**	**14**	**18**	**7**	**3**	**116**	******
- including a university component (UC CD)	16	12	17	11		6	2		64	
- including an optional component (OC CD)	6	7		5	14	12	5	3	52	
Cycle of profiling disciplines (PD)				**4**	**5**	**9**	**25**	**17**	**60**	******
- including a university component (UC PD)				4		4		5	13	
- including an optional component (OC PD)					5	5	25	12	47	
Professional practice (PP)		*2*		*4*		*4*		*5*	*15*	
Additional types of training										
Final attestation (FA)								8	8	*No less than 8 cr.
TOTAL credits for the educational program	**32**	**28**	**31**	**29**	**28**	**32**	**32**	**28**	**240**	**No less than 240 cr.**

** Cycle of core and major disciplines (CD, PD) At least 176 credits

5. Additional educational programs (Minor)

Name of AEP (Minor), indicating the list of disciplines that form Minor	Number of credits for AEP / number of credits for discipline	Semester of training	Document issued based on the results of mastering the AEP (Minor)
Data protection			
SEC6206 Cryptographic methods of information protection	5	5	Transcript
SEC6211 Protecting Database Management Systems	5	6	Transcript
SEC6236 Protecting applications and scripts from modifications	5	7	Transcript
Accounting by ACCA			
ACC6701 Business technology (ACCA)	5	5	Transcript
ACC6702 Financial Accounting	5	6	Transcript
ACC6703 Management Accounting	5	7	Transcript
Management & Leadership			
MGT6701 Management	5	5	Transcript
MGT6707 Psychology of Management	5	6	Transcript
MGT6702 Organizational Behavior and Leadership	5	7	Transcript
IoT Security Technologies			
HRD6202 IoT Technologies	5	5	Transcript
SEC6215 IoT Security	5	6	Transcript
SEC6235 Biometric access control systems	5	7	Transcript

6. Agreement sheet with developers

Code and name of the educational program: 6B06112 «Data Science»

№ п/п	Developers of the educational program (Position, academic degree, full name)	Data	Signature	Note
1	Professor, d.ph.-m.s. Rysbaiuly B.			
2	Assistant-professor, PhD Ydyrys A.Zh.			
3	Associative professor, PhD Nurtas M.			
4	Assistant-professor, Alpar S.D.			