AGREED
Chairman of the
Educational and Methodological
Council of JSC «International Information
Technology University»

Mustafina A.K.

«12» December 2024 Protocol of the EMC № 3

APPROVED
By the Chairman of the Board - Rector
of the JSC «International Information
Technology University»

Issakhov A.A.

«28» February 2025 Protocol of the AC № 10

EDUCATIONAL PROGRAM

6B06112 Data Science

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

Code and classification of training area: 6B061 Information and communication technologies

Group of educational programs: B057 Information technologies

ISCED level: 6

NQR level: 6

ORC level: 6

Academic Degree Awarded: Bachelor in Information and Communication Technologies in the educational program «6B06112 Data Science»

Duration of study: 4 years

Number of credits: 240

AGREED
by Director REDPRINT LLP
(Digital Agency NIDGI)

M.M. Ryskeldi

«__» _____ 2025.

AGREED
Deputy Director for Research of the Institute of Ionosphere

B.A. Iskakov

«__» _____ 2025.

Almaty, 2025

The code and name of the educational program: **6B06112 Data Science**

№	**Developers of the Educational Program (Position, Academic Degree, Scientific Degree, Full Name)**	**Date**	**Signature**	**Note**
1	Head of the Department of Mathematical and Computer Modeling, Associate Professor, PhD Abdikalikova Z.T.			
2	Associate Professor of the Department of Mathematical and Computer Modeling, PhD Ydyrys A.Zh.			
3	Associate Professor of the Department of Mathematical and Computer Modeling, PhD Nurtas M.			
4	Associate Professor of the Department of Mathematical and Computer Modeling, PhD — Alpar S.D.			

Contents

List of abbreviations and acronyms

BD	Cycle of basic disciplines
BC	Basic 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
EC	Elective 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
EP	Educational program
GPM	General professional module
SQF	Sectoral qualifications framework
GEC	General education competency
MD	Cycle of major disciplines
PI	Professional internship
PS	Professional standard
PE	Postgraduate education
PC	Professional competency
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.

2. Aim and objectives of the educational program

The purpose of the EP - 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.

AP objectives:

1. Students receive good mathematical training.
2. 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.
3. Obtaining skills in professional work with big data and building analytical models for the financial sector of the economy.
4. Training to work in an English-speaking environment, adaptation to the international education system.

3. Passport of the academic program

№	Name	Description
1.	Education area code and classification	6B06 Information and communication technologies
2.	Training direction code and classification	6B061 Information and communication technologies
3.	Group of academic programs	B057 Information technology
4.	Name of the educational program	6B06112 Data Science
5.	Aim 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 the educational program	Innovative
7.	Level according to the National Classifications Framework	6
8.	Level according to the Sectoral Qualifications Framework	6
9.	Distinctive features of the program	None
10.	Partner University	None
11.	Academic degree awarded	Bachelor
12.	Duration of study	4 years
13.	Volume of credits	240
14.	Language of education	English
15.	Atlas of new professions	Artificial Neural Network Systems Designer
16.	Regional standard	Not provided
17.	Availability of an attachment to the training license	Available
18.	License number for the training area	KZ81LAM00001263
19.	Availability of program accreditation	Available
20.	Generated learning outcomes	LO1: Possess fundamental knowledge and experience in algorithm development LO2: Possess a high level of qualification in the field of programming LO3: Be able to use advanced analytical tools. LO4: Apply mathematical models and methods of various processes LO5: To demonstrate sociability, initiative and psychological preparedness for work, including when working in a team and making management and technical decisions. LO6: Extract the necessary information from various sources, including information flows in real time. LO7: Perform multidimensional analysis. LO8: Create mathematical models using methods of modern information technologies LO9: Evaluate the credibility and validity of obtained information using critical thinking. LO10: To have competencies in big data processing and designing artificial intelligence systems. LO11: Recognize the logical connection in the system of collected information. LO12: To argue the choice of basic standards, principles and design patterns, methods, tools and programming languages, including choosing methods and tools for building information security systems of modern ICT. LO13: Able to apply the 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. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.

4. Professional Standards (PS), profession cards, labor functions

№	Name of the PS	Profession card	Labor functions
1	Development of systems for processing and storing big data	Year of approval: 2022 CCEA: Information and Communication Profession: Specialist in Machine Learning ORK Level: 6	Design and implementation of systems using machine learning
2	Development of systems for processing and storing big data	Year of approval: 2022 CCEA: Information and Communication Profession: Specialist in Neural Networks ORK Level: 6	Use of neural networks for solving complex data processing tasks Preparing data for use in neural systems
3	Software maintenance	Year of approval: 2022 CCEA: Information and Communication Profession: Software Maintenance Specialist ORK Level: 6	Participation in the modernization of software
4	Database and network librarian	Year of approval: 2024 CCEA: Arts, Entertainment and Recreation Profession: Database and Network Librarian ORK Level: 6	Administration of databases, data backup and recovery

5. List of the EP competencies

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
BC1: The ability to actually use the state language, the language of interethnic communication and a foreign language in professional activities.
BC2: The ability to understand the basics of economic knowledge, scientific ideas about finance and economics.
BC3: 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.
BC4: Ability to have the skills to use algorithms and programs to calculate business process parameters.

BC5: 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.
BC6: 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.
BC7: Ability to develop information and software for an information system based on modern methods and development tools.
BC8: 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.

6. List of learning outcomes of the EP

LO1: Possess fundamental knowledge and experience in algorithm development
LO2: Possess a high level of qualification in the field of programming
LO3: Be able to use advanced analytical tools.
LO4: Apply mathematical models and methods of various processes
LO5: To demonstrate sociability, initiative and psychological preparedness for work, including when working in a team and making management and technical decisions.
LO6: Extract the necessary information from various sources, including information flows in real time.
LO7: Perform multidimensional analysis.
LO8: Create mathematical models using methods of modern information technologies
LO9: Evaluate the credibility and validity of obtained information using critical thinking.
LO10: To have competencies in big data processing and designing artificial intelligence systems.
LO11: Recognize the logical connection in the system of collected information.
LO12: To argue the choice of basic standards, principles and design patterns, methods, tools and programming languages, including choosing methods and tools for building information security systems of modern ICT.
LO13: Able to apply the 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. The ability to apply entrepreneurial qualities to the tasks of calculating the profitability of scientific projects. The ability to build personal and interpersonal relationships in compliance with an anti-corruption culture.

7. Matrix for correlating the learning outcomes of the EP with the formed competencies (V)

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14
BC1	V			V										
BC2		V			V	V				V				V
BC3	V		V				V					V		
BC4						V		V	V	V				
BC5	V	V	V								V			
BC6		V	V					V			V	V		
BC7			V				V					V		
BC8		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	

8. The relationship of LO with labor functions

№	LO	Labor functions
1.	LO1	Data preparation for use in neural systems Design and implementation of systems using machine learning Participation in software modernization
2.	LO2	Data preparation for use in neural systems Design and implementation of systems using machine learning Participation in software modernization
3.	LO3	Data preparation for use in neural systems
4.	LO4	Data preparation for use in neural systems
5.	LO5	Design and implementation of systems using machine learning
6.	LO6	Data preparation for use in neural systems
7.	LO7	Data preparation for use in neural systems Design and implementation of systems using machine learning Database administration, backup and data recovery
8.	LO8	Participation in software modernization
9.	LO9	Data preparation for use in neural systems
10.	LO10	Database administration, backup and data recovery Application of neural networks to solve complex data processing problems Design and implementation of systems using machine learning
11.	LO11	Database administration, backup and data recovery
12.	LO12	Participation in software modernization
13.	LO13	-
14.	LO14	-

9. Table showing interconnection of competencies, learning outcomes, assessment methods and criteria

Competencies of a graduate of the EP	Competences expressed in expected learning outcomes	Evaluation criteria	Name of the estimation method
General educational competencies			
GEC1	LO1	Knows the basic concepts in the field of study	Summary

GEC2 GEC3		Reproduces and explains basic concepts in the area under study	Report, message
		Knows the basic concepts in the field of study	Test
GEC5 GEC6	LO3	Uses knowledge in the area under study in practice	Project
		Solve complex problems based on acquired knowledge	Multi-level tasks and assignments
GEC4	LO5	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
Basic competencies			
BC2 BC4	LO2	Knows the basic concepts of the area under study	Test
	LO3	Knows the basic concepts of the area under study	Case study
	LO6	Knows how to apply mathematical methods to solve various problems	Workbook
	LO8	Knows the basic concepts of the area under study	Case study
	LO10	Knows the basic concepts of the area under study	Control work
	LO11	Knows how to apply mathematical methods to solve various problems	Workbook
	LO12	Knows the basic concepts of the area under study	Case study
	LO14	Knows basic concepts from the fields of economics and law, ecology and life safety	Creative task
BC3 BC5 BC6 BC7 BC8	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 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
BC1	LO5	Able to present his ideas in a compelling manner	Colloquium
	LO14	Able to communicate clearly in writing	Summary
Professional competencies			
PC1 PC3 PC4 PC5	LO1	Applies acquired knowledge to solve practical problems	Project
	LO3	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
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
	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
PC8	LO13	Able to apply acquired knowledge in the chosen additional educational program	Project

10. Information about the modules of the educational program

Module code and name	Volume (labor intensity) of the module	Learning outcomes	Learning outcomes assessment criteria	Disciplines forming the module Code and name
GENERAL EDUCATION MODULES				
OOM6001 Module of social and cultural development	18	Has an understanding of the principles and patterns of historical development of society, the historical periodization of Kazakhstan's history, the place of Kazakhstan's history in world history and the history of Eurasia. Is capable of independently conducting comprehensive and critical analysis of historical and contemporary sources, drawing conclusions and supporting them with arguments.	Oral interview, testing, report, midterm and endterm, semester papers	History of Kazakhstan
		Has an understanding of the subject, functions, main branches, and directions of philosophy; the place and role of philosophy in society and human life; the main stages of development of world and Kazakh philosophical thought. Is able to use specialized philosophical terminology and the conceptual-categorical apparatus of philosophy; - creatively and critically work with original philosophical texts; - logically express their thoughts on studied philosophical issues; - analyze the features of the genesis and development of philosophical knowledge; formulate and argue their own worldview positions.	Oral interview, testing, report, midterm and endterm, semester papers	Philosophy
		Has an understanding of the subject, functions, main branches, and directions of sociology; is familiar with key approaches in the sociology of organizations both at the level of theoretical concepts and models, as well as at the level of empirical research; and is acquainted with basic methods and techniques of organizational research. Is capable of: - navigating various sociological approaches to the analysis of organizations and the literature related to each approach; - acquiring skills in critical analysis of these approaches (understanding their advantages and limitations); - obtaining basic analytical skills in sociological research of organizations; having an understanding of key methods of organizational research and their limitations.	Oral interview, testing, report, midterm and endterm, semester papers	Sociology-Political science
		Has an understanding of the subject, functions, and main branches of political science; should grasp the fundamental concepts of politics and political science, the development of major political theories and concepts, and assimilate the		

		contributions made by various thinkers to the conceptual understanding of key issues in politics, society, the state, and power. Is capable of understanding the basics of scientific political analysis at both theoretical and applied levels, as well as the potential of political analysis and forecasting methods for making optimal managerial decisions. Applies theoretical knowledge in real political practice at the levels of analysis, expertise, consulting, and management.		
		Has an understanding of the subject, functions, main branches, and directions of psychology; the place and role of psychology in the life of society and the individual. Is capable of forming fundamental knowledge, skills, and competencies necessary for professional activity; — fostering ecological, physical, ethical, legal culture, and culture of thinking; — language training; — fostering universal human and socio-personal values.	Oral interview, testing, report, midterm and endterm, semester papers	Cultural studies-Psychology
		Has an understanding of the subject as logically complete elements of the discipline's content, providing a basis for defining the course topics and the material to be assessed. The structuring of this educational content is also a necessary condition for the functioning of the rating system. Furthermore, such structuring helps students form a general understanding of the development of world culture and to systematize their knowledge. Is capable of giving students an understanding of the main problems of cultural theory; identifying objective patterns in global and national cultural processes; clarifying the genesis, functioning, and development of culture as a specifically human way of life, which historically reveals itself as a process of cultural heritage; considering cultural aspects of various spheres of social life; identifying the features of cultural life in different world regions, historical epochs, and cultural-historical types.		
OOM6002 Language and ICT skills development module	25	Is capable of describing – the basic rules of reading; 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. Understands statements in a foreign language, features of the compositional and semantic organization of a scientific text; the main techniques for extracting the key information from a microtext.	Oral interview, testing, report, midterm and endterm, semester papers	Foreign language
		Identify linguistic forms expressing various types of information in scientific texts to solve tasks of academic and professional communication; principles of composing texts in main academic-scientific and scientific-professional genres.	Oral survey, testing, report, midterm control, semester work	Kazakh (Russian) language

		Knows: - The main directions of ICT development; - The basics of using information resources for information search and storage; - The architecture and components of computer systems; - The main goals and tasks of information security. Can: - Work in any operating system and with databases; - Apply methods and tools for information protection; - Work with spreadsheets, consolidate data, and build charts. Has skills in: - Processing vector and raster images; - Creating multimedia presentations; - Data visualization; - Using various forms of e-learning to expand professional knowledge; Working with cloud services and e-technologies.	Oral interview, testing, report, midterm and endterm, calculation and graphic works	Information and Communication Technologies
OOM6003 Module of physical culture	8	Knows the main tasks of physical education of students, Can pass control exercises and standards.	Test	Physical Culture
OOM6004 Module of personal and social development	5	Have an understanding of the principles and patterns of economic relations. To be familiar with basic financial terms such as income, expenditure, assets, liabilities, capital and current expenditures, investments, loans, and savings.	Oral questioning, report, midterm exam	Foundation of economics and financial literacy
		Have the ability for independent theoretical and practical judgments and conclusions. Be able to objectively evaluate scientific information, the freedom of scientific inquiry, and the aspiration to apply scientific knowledge in educational activities, including for completing a diploma project (work).		Research metodology
		Have an understanding of the principles of law and anti-corruption culture.		Fundamentals of law and anti-corruption culture
		Knows the fundamentals of ensuring personal and public safety in emergency situations. Can apply methods of prevention and protection against hazardous and harmful factors in everyday and professional activities.		Fundamentals safety of life activity
		Understands the interrelationship between human activities and the state of the environment. Can apply the principles of sustainable development when making environmentally sound decisions.		Ecology and sustainable development
		Have an understanding of IT competencies and entrepreneurial skills.		Startups and entrepreneurship
		Understands the fundamental principles of inclusive education, the legislative and ethical foundations of inclusion, and can apply strategies to adapt the educational process for learners with special educational needs. Is capable of developing an inclusive environment and collaborating with various stakeholders in the educational process, taking into account the individual characteristics of learners.		Inclusive education

BASIC MODULES				
BM6501 Physics and mathematics module (DS)	33	Has a fundamental knowledge about limits, continuity, derivatives, and integrals. Knows the methods of differential and integral calculus and, is able to apply them to solve theoretical and applied problems, including the analysis of functions of one and several variables. Possesses skills in using integrals and partial derivatives in mathematical modeling tasks.	Oral interview, testing, report, midterm control, calculation and graphic work	Mathematical analysis 1, 2
		Knows: vectors and vector spaces, their main properties, operations (addition, scalar multiplication), and the concept of linear independence. Matrix operations such as addition, multiplication, transposition, inversion, and determinant calculation. Equations of lines and planes in space, their mutual positions, as well as the use of parametric and canonical representations. Able to: solve systems of linear equations using various methods, analyze the existence and number of solutions; write equations of different curves — circles, ellipses, parabolas, hyperbolas — and analyze their geometric properties.	Oral interview, testing, report, midterm control, calculation and graphic work	Algebra and Geometry
		Development of logical and abstract thinking for solving complex mathematical problems. Ability to apply methods of discrete mathematics and logic for modeling, analyzing, and optimizing processes in various fields such as computer science, cryptography, information processing, and artificial intelligence.	Oral interview, testing, report, midterm control, calculation and graphic work	Discrete Mathematics and Mathematical Logic
		Knows: the basic principles, methods, and results of modern probability theory and mathematical statistics. Able to: calculate probabilities of random events and probabilistic characteristics of random variables; process statistical data; build adequate probabilistic and statistical models of real processes and phenomena, conduct their mathematical analysis; evaluate the quality of solutions obtained for applied problems. Proficient in: methods of classical probability theory; skills in mathematical formalization of applied problems, analysis, and interpretation of solutions of mathematical models.	Oral interview, testing, report, midterm control, calculation and graphic work	Probability Theory
		Know: the basic concepts of the theory of differential equations, types and standard forms of notation of main differential equations, methods for solving basic differential equations. Be able to: apply differential equations to model physical processes, use differential equation tools for processing, analyzing, and systematizing information on the research topic, and consult mathematical literature when necessary.	Oral interview, testing, report, midterm control, calculation and graphic work	Differential Equations
		Knows and understands kinematics; dynamics; circular motion and gravity; energy; momentum; simple harmonic oscillations; torque and rotational motion; electric charge and electric force; direct current circuits; thermodynamics and	Oral interview, testing, report, midterm control,	Physics

		mechanical waves; field and potential; electric circuits; magnetic induction and electromagnetism; geometric and physical optics; quantum, atomic, and nuclear physics; and sound.	calculation and graphic work	
BM6503 Mathematical modeling module (DS)	18	Mastery of various methods for solving differential equations, integrals, boundary value problems, and optimization. Development and application of numerical methods for solving mathematical problems, such as methods for solving linear and nonlinear equations, numerical integration and differentiation methods, and methods for finding extrema.	Oral interview, testing, report, midterm control, calculation and graphic work	Computational mathematics
		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.		Numerical analysis
		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; Have: implementation of numerical methods using modern software.		Database theory
		Able to collect and analyze information related to the professional field. Able to work with educational, methodological and regulatory documents. Prepares practice reports in accordance with established requirements.	Report	Teaching practice
BM6502 Computer Modeling Module (DS)	39	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
		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		Object-oriented programming
		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.		Algorithms and data structures
		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. Have 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
		Know the basics of machine learning theory, including discriminant, cluster and regression analysis, mastering the skills of practical solution of data mining problems.		Machine learning 1

		Knows how to apply technologies for designing the structure of a website as an information system		WEB technology
		Knows how to apply programming skills to build predictive models, data visualization and work with neural networks.		Python for data analysis
BM6504 Data Analysis Module (DS)	18	Have an understanding of comparative analysis in genomics according to ideological and methodological criteria for understanding the structural subdivisions of the new science — structural genomics, proteomics, and transcriptomics.	Oral interview, testing, midterm control, calculation and graphic work	Data analysis and visualization in Power BI
		Possess fundamental concepts and methods for researching economic systems. Know the current state and main directions in the development of mathematical models of economic systems at various levels. Have the skills necessary for independent work on designing and implementing economic analysis models and modeling algorithms in practice; systemic thinking.		Operation research
		Knows modern statistical methods and economic theory.		Statistics for data analysis
		Knows elements of algebra, statistics, elements of mathematical analysis (for example, gradient descent), elements of numerical methods and analysis, optimization problems, elements of vector space.		Advanced Mathematics for Machine Learning
BM6505 Professional Language Training Module (DS)	8	Able to characterize — basic rules of reading; 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-semantic organization of scientific texts; basic techniques for extracting the main information of a microtext.	Oral interview, testing, report, midterm control, semester papers	English for STEM
		Identify linguistic forms used to express various types of information in scientific texts to solve tasks related to academic and professional communication; principles of composing texts in key educational-scientific and scientific-professional genres.		Business correspondence in the state language
		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-semantic organization of scientific texts; main techniques for extracting the core information of a microtext.		Professionally oriented foreign language

PROFESSIONAL MODULES				
PM6503 Artificial Intelligence Module (DS)	16	Solves practical problems of data processing, mathematical modeling, computer science.	Oral survey, testing, report, midterm control, calculation and graphic work	Neural Networks
		Know advanced machine learning methods: ensemble models (Bagging, Boosting), gradient boosting (XGBoost, LightGBM), SVM, feature selection methods, model optimization. Understand methods for assessing the quality of models and techniques for combating overfitting (regularization, cross-validation). Be able to apply machine learning algorithms to real data processing problems.		Machine Learning 2
		Know the basic concepts and algorithms of reinforcement learning (Q-learning, DQN, Policy Gradient, etc.). Understand how to formulate problems in the form of a decision-making model (MDP). Be able to implement and apply RL algorithms in practice using Python and specialized libraries (OpenAI Gym, PyTorch, etc.).		Reinforcement Learning and its Applications in AI
PM6502 Nonlinear Programming and Deep Learning (DS) Module	16	Knows the mathematical apparatus and tools for processing, analyzing and systematizing information on the research topic.	Oral survey, testing, report, midterm control, calculation and graphic work	Optimal management
		Proficient in identifying patterns, identifying anomalies, testing hypotheses, and testing assumptions using summary statistics and graphical representations.		Exploratory data analysis
		Be able to use neural networks to solve applied mathematical problems (function approximation, numerical solutions of differential equations, data processing). Have skills in working with deep learning frameworks (PyTorch, TensorFlow, Keras). Be able to analyze, train and test models, evaluate the accuracy and generalization ability of solutions.		Deep Learning for Applied Mathematics
		Know the theoretical foundations of nonlinear programming problems: optimality conditions, convexity, duality. Be able to use solution methods: gradient methods, Newton's method, Lagrange multiplier method, penalty and barrier method, numerical algorithms. Be able to formulate and solve applied optimization problems in mathematics, economics, engineering and AI.		Nonlinear programming methods
		Be able to formulate and solve inverse problems in applied areas (physics, engineering, medicine). Be able to use methods for assessing the stability and convergence of solutions. Be able to apply numerical methods and software to solve ill-posed problems (e.g. MATLAB, Python/NumPy/SciPy).		Methods for solving inverse ill-posed problems
		Know the basics of inverse problems and their features (ill-posedness, instability, underdetermination). Understand how to use deep learning methods to solve inverse problems in various areas (image processing, tomography, signal recovery, etc.). Be able to work with deep learning libraries (PyTorch, TensorFlow).		Deep learning of inverse problems

PM6501 Practical Module	13	Knows the organizational structure and complex technical means of the information and analytical center (IAC) of the organization. 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.	Report	Industrial practice Pregraduation practice
PM6504 Module of Minor disciplines	15	Able to apply acquired knowledge in the chosen additional educational program.	Oral questioning, testing, report, midterm control	Minor 1, 2, 3

11. Information about the disciplines of the educational program

№	Discipline Code and Name	Brief description of the discipline (30-50 words)	Labor intensity of discipline in credits	Learning outcomes formed (codes)	Prerequisites	Postrequisites
Cycle of general education disciplines (GED) Required component (RC)						
1.	History of Kazakhstan	This course consists of teaching the history of the country to understand the role and significance of events in their historical context.	5	LO1 LO2	-	-
2.	Philosophy	This course consists of teaching philosophy to develop a conscious attitude toward the surrounding environment.	5	LO3	-	-
3.	Foreign language	This course consists of teaching a foreign language to develop communicative skills in that language.	10	LO4	-	Professionally oriented foreign language
4.	Kazakh (Russian) language	This course consists of teaching Kazakh/Russian to develop communicative skills in the state and Russian languages.	10	LO4	-	Business correspondence in the state language
5.	Information and Communication Technologies	The course provides an overview of various ICT fields, enabling students to acquire basic knowledge of applying modern ICT in their research and practical work, for self-study, and for other purposes.	5	LO3 LO5	-	-
6.	Sociology-Political science	The course gives students knowledge about the political sphere of society and an understanding of the relationship and mutual influence between politics and governance.	4	LO1 LO2 LO3	-	-
7.	Cultural studies-Psychology	The course introduces different concepts, key terms, and patterns in management psychology and provides essential knowledge of cultural studies, fostering an understanding of the cultural distinctiveness of different peoples.	4	LO2 LO3	-	-
8.	Physical Culture	The course ensures that students address the main objectives of physical education and includes the requirement to complete assessment exercises and fitness standards.	8	LO3	-	-
Cycle of general education disciplines (GED) Elective component (EC)						
9.	Elective discipline 1 (GED)		5			
	Startups and entrepreneurship	This course provides an introduction to what a business is, how it works and how to run it. Students will define ownership and processes used in manufacturing and marketing, finance, personnel, and management in business operations.		LO5 LO13 LO14		

	Fundamentals of law and anti-corruption culture	The course outlines the legal, economic, and social foundations of fighting corruption. Throughout the course, students will gain practical knowledge in identifying the peculiarities of state policies, applying international experiences in combating corruption, mastering skills in conflict resolution, and detecting corruption activities using professional ethics and methods. After successful completion of the course, students will gain the following competencies: 1. Understand the measures of legal responsibility for participation in corruption violations. 2. Determine the conflict of interests in the activities of organizations leading to corruption. 3. Analyze the work of organizations using various research methods.		LO5 LO13 LO14		
	Fundamentals safety of life activity	Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat.		LO5 LO13 LO14		
	Ecology and sustainable development	The course reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.		LO5 LO13 LO14		
	Research metodology	The course is devoted to the study of activities aimed at developing students " ability to independent theoretical and 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).		LO5 LO8 LO11		
	Foundation of economics and financial literacy	This course provides an integrated introduction to economics and legal foundations relevant to entrepreneurial decision-making and everyday personal finance. Students will understand basic economic principles and navigate legal systems affecting individuals and businesses and learn how to manage personal finances. Topics include		LO13 LO14		

		economic behavior, legal research, business budgeting, taxation, investment and case analysis. The course is open to non-economics majors interested in how economic, legal and financial systems shape our lives.				
	Inclusive education	The philosophy, history and methodology of an inclusive approach. Documents governing the development of an inclusive process in higher professional education. Educational needs of students with disabilities and disabilities. Methods and forms of organization of the educational process at a university for students with disabilities. Development of adapted educational programs, curricula and educational paths for students with disabilities and disabilities. Psychological and pedagogical support of students with disabilities and disabilities at the university.		LO13	-	-
Cycle of basic disciplines (BD) University component (UC)						
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	LO4 LO7	-	Mathematical analysis 2
11	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, function approximations and the concept of convergence; apply infinite series in approximate calculations.	5	LO4 LO7	Mathematical analysis 1	Diff.equations
12	Algebra and geometry	Studying the elements of linear algebra and analytic geometry using real life and various science examples.	4	LO1 LO4 LO8 LO11	-	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	5	LO4 LO7	Mathematical analysis 2	Comp. Math

		methods.				
14	Object-oriented programming	This course will provide skills in developing console or window applications using the Java programming language using object-oriented programming concepts. Course topics include the OOP paradigm, Java programming, file handling, exceptions, structures, collections, object-oriented programming concepts.	7	LO7 LO9 LO11	Introduction to Programming	Algorithms and data structures
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	LO3 LO4 LO8 LO9	Differential equations	Numerical analysis
16	Physics	The study of the laws, principles, postulates and equations of mechanics, molecular physics and thermodynamics, electricity and magnetism, the use of the equations of physics to solve specific physical problems, the use of physics methods for research, analysis and laboratory work in order to verify the operation and implementation of the laws of physics in nature and technology.	4	LO1 LO4 LO8 LO11	-	-
17	Numerical analysis	The course covers the following sections: Basic problems of mathematical physics. Difference schemes for parabolic equations. Difference schemes for hyperbolic equations. Difference schemes for elliptic equations. Variational and variational-difference methods. Iterative and variational methods for solving nonlinear problems in mathematical physics. Monte Carlo methods.	6	LO1 LO4 LO7 LO8 LO9 LO10 LO11	Computational mathematics	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	LO1 LO7 LO9 LO10	Object-oriented programming	ED from CED
19	Introduction to Programming	To study the methodological basis of program development and practical programming skills. The main objectives of studying the discipline are the following: * Study of the basics of algorithmization of tasks * Learning the basics of classification of programming languages * Study of data types and classification of C ++operators * Development of programs using subroutines, standard modules, programming style, programming quality indicators, methods of debugging	6	LO2 LO3 LO8	-	Object-oriented programming Programming in Python

		and testing programs, the basics of object-oriented programming.				
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	LO4	-	-
21	WEB technology	This course teaches the basics of web development using HTML, Cascading Style Sheets (CSS), JavaScript, and JQuery. It teaches how to use the PHP programming language, master the basics of the MySQL database, and develop secure server-side client web applications.	5	LO2		
22	Business correspondence in the state language	Business correspondence in the state language is a very important subject for students, because given discipline teaches the preparation, execution of documents in the state language, forms practical skills and ability to independently compose, translate documents into Kazakh language.	2	LO5 LO9		
Cycle of basic disciplines (BD) Elective component (EC)						
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	LO3 LO4 LO5 LO7 LO9	Statistics for data analysis	
24	English for STEM	Business English is aimed at the formation and development of students' skills of listening, speaking, reading and writing in English on business-related topics, and developing such social skill as making presentations. The language training is communicative, interactive, student-centered, outcome-oriented and heavily reliant on the students' self-study work. The latter is organized as TSIS (business correspondence) and SIS (Practice File self-check exercises and business project).	2	LO5 LO9		
25	Professionally oriented foreign language	A course of Professional English focuses on such topics of professional interest as Future trends in IT, Computer as a friend, Computer as a foe, Minimizing the negative impacts, Magnetic storage, Optical storage, Flash memory, the Programming languages, Web design, Graphics and design, etc. It is designed to raise the students' language awareness, improve their speech skills and communication competences in Professional English.	4	LO5 LO9 LO13		

26	Probability theory	The course is devoted to probability, as well as the relationship between mathematics and modeling, operating systems as part of an interdisciplinary training program covering the section of mathematical analysis.	3	LO1 LO2 LO4 LO7 LO8	-	Statistics for data analysis
27	Statistics for data analysis	The course focuses on the statistics of all events, as well as the relationship between mathematics and modeling, operating systems, as part of an interdisciplinary training program covering the section modern statistical methods and economic theory.	5	LO1 LO2 LO4 LO7	Probability theory	
28	Discrete mathematics and mathematical logic	The study of discrete objects, the solution of combinatorial problems, the study of types of mappings and binary relations, the reduction of propositional algebra formulas to normal forms, the application of logic algebra to the theory of switching circuits. The capabilities for analysis and synthesis, and mathematical maturity are developing.	6	LO1 LO4 LO8 LO11	-	
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 them, and presents them in a visual form that is convenient for analysis. BI technologies allow you to process large unstructured amounts of data for decision-making. Power BI is a suite of Microsoft software services that work together to transform the company's unrelated data sources into holistic, 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 your questions using detailed dashboards available on each device.	3	LO6 LO9	-	-
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 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	5	LO1 LO3 LO5 LO4 LO8 LO10 LO11 LO12	Introduction to Programming	Python for Data Analysis
31	Database theory	The course explains what a database system is, and then proceeds to most of the training material for learning relational database systems - databases designed according to a relational (or tabular) model. Then, from data abstraction, the course moves on to transaction management with additional materials to improve query performance. Finally, modern trends in database system design have emerged, which also define the latest developments in the broader history of data storage	5	LO3 LO4 LO5 LO6 LO8 LO9 LO11 LO12	-	Machine learning 1

		technologies.				
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	LO1 - LO4 LO7 LO8	Programming in Python	Machine learning 1
33	Operation research	Goals - mastering the basic concepts and methods of research of economic systems; study of the current state and main directions of development of mathematical models of economic systems at various levels; acquisition of skills necessary for independent work on the design and implementation of economic analysis of models and modeling algorithms in practice; development of a systemic type of thinking.	5	LO1 LO3 LO5 LO6 LO9 LO11	Agebra and Geometry	Optimal management
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	LO2 LO3 LO5 - LO12	Python for Data Analysis	Machine learning 2; Neural networks
Cycle of professional disciplines (PD) University component (UC)						
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	LO4 LO5	-	-
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	LO4 LO8	-	-
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	LO4 LO5 LO6 LO9	-	-

Cycle of professional disciplines (PD) Elective component (EC)						
38	Machine learning 2	The purpose of this course is to study the fundamentals of machine learning theory, including discriminant, cluster and regression analysis, and master the skills of practical solving data mining problems.	5	LO1 - LO4 LO7 LO8 LO10 - LO12	Machine learning 1	-
39	Neural Networks	The course aims to train students in the application of modern methods for solving difficult-to-formalize problems that require high computing power. The course is aimed at preparing students to solve practical problems of data processing, mathematical modeling, computer science, obtaining higher professional education, which allows the graduate to successfully work in their chosen field of activity with the use of modern computer technologies.	6	LO1 LO3 LO4 LO7 – LO12	Machine learning 2	-
40	Reinforcement Learning and its Applications in AI	"Reinforcement Learning and its Applications in AI" explores the principles of RL (Reinforcement Learning), where agents learn strategies through rewards and penalties. The course covers key algorithms, applications in robotics, gaming, finance, and autonomous systems, as well as their role in the development of AI. Practical implementations and real-world cases are included.	5	LO3 LO7 LO8 LO10 LO12	Machine learning 1	
41	Elective Discipline 1		5			
	Optimal management	The course provides the ability to use the main methods of natural science disciplines in professional activities for theoretical and experimental research; the ability to use the appropriate mathematical apparatus and tools for processing, analyzing and systematizing information on the topic of research.		LO1 - LO4 LO7 LO8 LO10 - LO12	Numerical analysis	-
	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.		LO7 LO9 LO11	Python for Data Analysis	-
42	Elective discipline 2		5			
	Deep learning for Applied Mathematics	Multi-layer artificial neural networks are becoming an increasingly common tool in a variety of applications. At the heart of this deep learning revolution are familiar concepts from applied and computational mathematics, especially calculus, approximation theory, optimization, and linear algebra. The course also demonstrates the use of state-of-the-art software to solve a large-scale image classification problem.		LO2 LO3 LO4 LO7 LO9 LO10 LO11	Programming in Python	

	Methods of nonlinear programming	In the numerical solution of optimization problems faced the following difficulties: the large calculation time of a variant of the designed system because of the complexity of mathematical models; uncertainty of optimal decision-making due to the multi-extremality of optimized functions, as well as due to the multi-criteria nature of control system design problems; lack of recommendations on the use of effective search engine optimization methods for solving extreme problems. In the conditions of overcoming these difficulties, it is important to develop and improve software packages that facilitate the choice of nonlinear programming methods that ensure the adaptation of algorithms to the specifics of the problems being solved.		LO2 LO4 LO8 LO9	Programming in Python	
43	Elective discipline 3		6			
	Deep learning of inverse problems	To acquaint students with methods of solving inverse practical problems. Approximate methods for solving inverse problems are developed, and algorithms are compiled. Predict the solution of given problems using machine learning. Computational experiments are performed, and the output data is analyzed.		LO2 LO3 LO4 LO7 LO9 LO11	Numerical analysis	
	Methods for solving inverse ill-posed problems	To acquaint students with the main methods of solving incorrectly set practical problems. Models of heat propagation in a multilayer region are considered. Approximate methods for solving ill-posed problems of artificial structures are developed, and algorithms for solving various types of inverse problems are compiled. Computational experiments are performed, and the output data is analyzed.		LO3 LO4 LO8 LO9	Numerical analysis	
44	Minor 1	Additional educational program (minor) - a set of disciplines and (or) modules and other types of educational work, determined by students for study in order to form additional competencies	5	LO11 LO13		Minor 2
45	Minor 2		5		Minor 1	Minor 3
46	Minor 3		5		Minor 2	

12. Curriculum of the educational program (Platonus)

№	Module Code	Module Name in Three Languages (Kazakh / Russian / English)	Discipline code	Course Name in Three Languages (Kazakh / Russian / English)	Cycle (GED, BD, PD)	Component (RC, EC, UC)	Total Credits (ECTS)	Total Academic Hours	Number of contact hours				Number of hours		Assessment Method (Att. 1, Att. 2, Exam, Coursework/Project, Differentiated Pass/Fail, Thesis/Dissertation Defense)	Prerequisites (Course Code)
									Total contact hours	including:			Total SIS hours	including TSIS		
										Lectures	Practical sessions (seminars)	Laboratory sessions				
1	2	3	4	5	6	7	8	9	10	11	12	13	2	3	4	5
1 course																
1 semester																
1	OOM6002	Тіл және АКТ-дағдыларын дамыту / Развития языковых и ИКТ-навыков / Language and ICT skills development	LAN6001A	Шет тілі / Иностранный язык / Foreign language	GED	RC	5	150	45	0	45	0	105	15	MT, ET, exam	-
2	OOM6002	Тіл және АКТ-дағдыларын дамыту / Развития языковых и ИКТ-навыков / Language and ICT skills development	ICT6001	Ақпараттық-коммуникациялық технологиялар / Информационно-коммуникационные технологии / Information and Communication Technologies	GED	RC	5	150	45	15	0	30	105	15	MT, ET, exam	-
3	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module	MAT6001	Алгебра және геометрия / Алгебра и геометрия / Algebra and Geometry	BD	UC	4	120	45	15	30	0	75	15	MT, ET, exam	-
4	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module	MAT6501	Математикалық талдау 1 / Математический анализ 1 / Mathematical analysis 1	BD	UC	6	180	60	30	30	0	120	15	MT, ET, exam	-
5	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module	PHY6001	Физика / Физика / Physics	BD	UC	4	120	45	15	0	30	75	15	MT, ET, exam	-

6	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования (DS) / Computer modeling module (DS)	SFT6001	Бағдарламалауға кіріспе / Введение в программирование / Introduction to Programming	BD	UC	6	180	60	15	15	30	120	15	MT, ET, exam	-
				Total for 1 semester:			**30**	**900**	**300**	**90**	**120**	**90**	**600**	**90**		
2 semester																
7	OOM6002	Тіл және АКТ-дағдыларын дамыту / Развития языковых и ИКТ-навыков / Language and ICT skills development	LAN6002A	Шет тілі / Иностранный язык / Foreign language	GED	RC	5	150	45	0	45	0	105	15	MT, ET, exam	-
8	OOM6003	Дене шынықтыру модулі / Модуль физической культуры / Physical training module	PhC6005	Дене шынықтыру / Физическая культура / Physical Culture	GED	RC	4	120	45	0	45	0	75	15	MT, ET, diff. offset	-
9	OOM6001	Әлеуметтік-мәдени даму модулі / Модуль социально-культурного развития / Module of social and cultural development	HK6002	Қазақстан тарихы / История Казахстана / History of Kazakhstan	GED	RC	5	150	45	15	30	0	105	15	MT, ET, exam	-
10	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module (DS)	MAT6509	Дискреттік математика және математикалық логика / Дискретная математика и математическая логика / Discrete Mathematics and Mathematical Logic	BD	EC	6	180	60	30	30	0	120	15	MT, ET, exam	-
11	BM6503	Математикалық модельдеу модулі / Модуль математического моделирования (DS)/ Mathematical modeling module	PP6501	Оқыту практика / Учебная практика / Teaching practice	BD	UC	2	60	30	0	30	0	30	0	diff. offset	-
12	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module (DS)	MAT6520	Ықтималдық теориясы / Теория вероятности / Probability Theory	BD	EC	3	90	30	15	15	0	60	15	MT, ET, exam	-
13	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования (DS) / Computer modeling module	SFT6516	Python бағдарламалау / Программирование на Python / Programming in Python	BD	EC	5	150	45	15	0	30	105	15	MT, ET, exam	-
				Total for 2 semester:			**30**	**900**	**300**	**75**	**195**	**30**	**600**	**90**		
				TOTAL FOR 1 COURSE:			**60**	**1800**	**600**	**165**	**315**	**120**	**1200**	**180**		

2 course																
3 semester																
14	OOM6002	Тіл және АКТ-дағдыларын дамыту / Развития языковых и ИКТ-навыков / Language and ICT skills development	LAN6001KR	Қазақ (орыс) тілі / Казахский (русский) язык / Kazakh (Russian) language	GED	RC	5	150	45	0	45	0	105	15	MT, ET, exam	-
15	OOM6001	Әлеуметтік-мәдени даму модулі / Модуль социально-культурного развития / Module of social and cultural development	SPS6007	Әлеуметтану - Саясаттану / Социология-Политология / Sociology - Political science	GED	RC	4	120	45	15	30	0	75	15	MT, ET, exam	-
16	OOM6003	Дене шынықтыру модулі / Модуль физической подготоUСи / Physical training module	PhC6006	Дене шынықтыру / Физическая культура / Physical Culture	GED	RC	4	120	45	0	45	0	75	15	MT,ET, diff. offset	-
17	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования (DS) / Computer modeling module	SFT6558	WEB технологиялары / WEB технологии / WEB technology	BD	UC	5	150	45	15		30	105	15	MT, ET, exam	-
18	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module (DS)	MAT6502	Математикалық талдау 2 / Математический анализ 2 / Mathematical analysis 2	BD	UC	5	150	45	15	30	0	105	15	MT, ET, exam	MAT6501
19	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования (DS) / Computer modeling module	SFT6517	Объектті-бағдарланған программалау / Объектно-ориентированное программирование / Object-oriented programming	BD	UC	7	210	75	15	30	30	135	15	MT, ET, exam	SFT6001
				Total for 3 семестр:			**30**	**900**	**300**	**60**	**180**	**60**	**600**	**90**		
4 semester																
20	OOM6002	Тіл және АКТ-дағдыларын дамыту / Развития языковых и ИКТ-навыков / Language and ICT skills development	LAN6002KR	Қазақ (орыс) тілі / Казахский (русский) язык / Kazakh (Russian) language	GED	RC	5	150	45	0	45	0	105	15	MT, ET, exam	-
21	BM6501	Физика - математикалық Модуль (DS) / Физико-математический модуль (DS) / Physics and Mathematics module (DS)	MAT6531	Дифференциалдық теңдеулер / Дифференциальные уравнения / Differential Equations	BD	UC	5	150	45	15	30	0	105	15	MT, ET, exam	MAT6501

22	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования (DS) / Computer modeling module (DS)	SFT6501	Алгоритмдер және деректер құрылымы / Алгоритмы и структуры данных / Algorithms and data structures	BD	UC	6	180	60	15	15	30	120	15	MT, ET, exam	SFT6517
23	BM6503	Математикалық модельдеу модулі / Модуль математического моделирования (DS)/ Mathematical modeling module	MAT6534	Есептеу математикасы / Вычислительная математика / Computational mathematics	BD	UC	5	150	45	15	15	15	105	15	MT, ET, exam	MAT6531
24	PM6501	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	BM6504	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	MAT6507	Деректерді талдауға арналған статистика / Статистика для анализа данных / Statistics for data analysis	BD	EC	5	150	45	15	30	0	105	15	MT, ET, exam	MAT6520
				Total for 4 semester:			**30**	**900**	**240**	**60**	**135**	**45**	**660**	**90**		
				TOTAL FOR 2 COURSE:			**60**	**1800**	**540**	**120**	**315**	**105**	**1260**	**180**		
3 course																
5 semester																
26	OOM6001	Әлеуметтік-мәдени даму модулі / Модуль социально-культурного развития / Module of social and cultural development	SPS6006	Мәдениеттану - психология / Культурология - психология / Cultural studies - Psychology	GED	RC	4	120	45	15	30	0	75	15	MT, ET, exam	-
27	OOM6004	Жеке және әлеуметтік даму модулі / Модуль личностного и общественного развития / Module of personal and social development	RM6001	Зерттеу әдістемесі / Методология исследования / Research metodology	GED	EC	5	150	45	15	30	0	105	15	MT, ET, exam	-
			JUR 6505	Экология және тұрақты даму / Экология и устойчивое развитие / Ecology and Sustainable Development												
			LAW6007	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												
			JUR6413	Тіршілік қауіпсіздігінің негіздері / Основы безопасности жизнедеятельности / Fundamentals of Life Safety												

			ECO6007	Экономика және қаржылық сауаттылық негіздері / Основы экономики и финансовой грамотности / Fundamentals of Economics and Financial Literacy												
			HUM6400	Инклюзивті білім беру / Инклюзивное образование / Inclusive education												
28	BM6505	Кәсіби тілдік даярлық модулі / Модуль профессиональных языковых подготовRC (DS) / Professional Language Training Module	LAN6002PA	Кәсіби бағытталған шет тілі / Профессионально-ориентированный иностранный язык / Professionally oriented foreign language	BD	EC	4	120	45	0	45	0	75	15	MT, ET, exam	-
29	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования (DS) / Computer modeling module (DS)	SFT6503	Деректерді талдауға арналған Python / Python для анализа данных / Python for Data Analysis	BD	EC	5	150	45	15	0	30	105	15	MT, ET, exam	SFT6516
30	BM6503	Математикалық модельдеу модулі / Модуль математического моделирования (DS)/ Mathematical modeling module	SFT6507	Деректер қоры теориясы / Теория базы данных / Database theory	BD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	SFT6501
31	PM6504	Майнор пәндер модулі / Модуль Майнор дисциплин / The module of Minor disciplines	MIN601	Майнор 1 / Майнор 1 / Minor 1	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	-
				Total for 5 semester:			**28**	**840**	**270**	**75**	**135**	**60**	**570**	**90**		
6 semester																
32	OOM6001	Әлеуметтік-мәдени даму модулі / Модуль социально-культурного развития / Module of social and cultural development	SPS6001	Философия / Философия / Philosophy	GED	RC	5	150	45	15	30	0	105	15	MT, ET, exam	-
33	BM6503	Математикалық модельдеу модулі / Модуль математического моделирования (DS)/ Mathematical modeling module	MAT6506	Сандық талдау / Численный анализ / Numerical analysis	BD	UC	6	180	60	15	15	30	120	15	MT, ET, exam	MAT6534
34	PM6501	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	BM6502	Компьютерлік модельдеу модулі (DS) / Модуль компьютерного моделирования	SFT6508	Машиналық оқыту 1 / Машинное обучение 1 / Machine Learning 1	BD	EC	5	150	45	15	0	30	105	15	MT, ET, exam	SFT6503

		(DS) / Computer modeling module (DS)														
36	BM6504	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	BD	EC	5	150	45	15	30	0	105	15	MT, ET, exam	MAT6507
37	BM6505	Кәсіби тілдік даярлық модулі / Модуль профессиональных языковых подготовRC (DS) / Professional Language Training Module	LAN6004DA	STEM арналған ағылшын тілі / Английский язык для STEM / English for STEM	BD	EC	2	60	30	0	30	0	30	15	MT, ET, exam	-
38	PM6504	Майнор пәндер модулі / Модуль Майнор дисциплин / Module of Minor disciplines	MIN602	Майнор 2 / Майнор 2 / Minor 2	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	MIN601
				Total for 6 semester:			**32**	**960**	**270**	**75**	**120**	**75**	**690**	**105**		
				TOTAL FOR 3 COURSE:			**60**	**1800**	**540**	**150**	**255**	**135**	**1260**	**195**		
4 course																
7 course																
39	BM6505	Кәсіби тілдік даярлық модулі / Модуль профессиональных языковых подготовRC (DS) / Professional Language Training Module	LAN6007K	Мемлекеттік тілде іс қағаздарын жүргізу / Делопроизводство на государственном языке / Business correspondence in the state language	BD	UC	2	60	30	0	30	0	30	15	MT, ET, exam	LAN6002KR
40	BM6504	Деректерді талдау модулі / Модуль Анализа данных / Data Analysis Module	MAT6538	Операцияларды зерттеу / Исследование операции / Operation research	BD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	MAT6506
41	PM6502	Сызықтық емес бағдарламалау және терең оқыту модулі / Модуль нелинейное программирование и глубое обучение / Nonlinear programming and deep learning Module	MAT6546	Қолданбалы математиканы терең оқыту / ГлубRCое обучение для прикладной математики / Deep learning for Applied Mathematics	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	SFT6516
			MAT6536	Сызықты емес бағдарламалау әдістері / Методы нелинейного программирования / Methods of nonlinear programming												
42	PM6503	Жасанды интеллект модулі / Модуль Искусственного интеллекта/ Artificial Intelligence Module	SFT6540	Машиналық оқыту 2 / Машинное обучение 2 / Machine learning 2	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	SFT6508

43	PM6503	Жасанды интеллект модулі / Модуль Искусственного интеллекта/ Artificial Intelligence Module	SFT6598	Нығайтумен оқыту және оның жасанды интеллектегі қолданылуы/ Обучение с подкреплением и его применения в ИИ/ Reinforcement Learning and Its Applications in AI	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	SFT6508
44	PM6502	Сызықтық емес бағдарламалау және терең оқыту модулі / Модуль нелинейное программирование и глубое обучение / Nonlinear programming and deep learning Module	SFT6526	Деректерді барлау талдауы / Исследовательский анализ данных / Exploratory data analysis	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	SFT6503
			SFT6527	Оптималды басқару / Оптимальное управление / Optimal management												MAT6506
45	PM6504	Майнор пәндер модулі / Модуль Майнор дисциплин / Module of Minor disciplines	MIN603	Майнор 3 / Майнор 3 / Minor 3	PD	EC	5	150	45	15	15	15	105	15	MT, ET, exam	MIN602
				Total for 7 semester:			**32**	**960**	**300**	**90**	**120**	**90**	**660**	**105**		
8 semester																
46	PM6501	Тәжірибе модулі / Модуль практик / Practice module	PP6504	Диплом алдындағы практика / Преддипломная практика / Pregraduation practice	PD	UC	5	150	0	0	0	0	150	15	Report	
47	BM6504	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	BD	EC	3	90	30	0	30	0	60	15	MT, ET, exam	-
48	PM6502	Сызықтық емес бағдарламалау және терең оқыту модулі / Модуль нелинейное программирование и глубое обучение / Nonlinear programming and deep learning Module	MAT6542	Кері есептерді терең оқыту / ГлубRCое обучение обратных задач / Deep learning of inverse problems	PD	EC	6	180	60	15	15	30	120	15	MT, ET, exam	MAT6506
			MAT6532	Кері бұрыс есептерді шешу әдістері / Методы решения обратных некорректных задач / Methods for solving inverse ill-posed problems												
49	PM6503	Жасанды интеллект модулі / Модуль Искусственного интеллекта/ Artificial Intelligence Module	SFT6520	Нейрондық желілер / Нейронные сети / Neural Networks	PD	EC	6	180	60	15	15	30	120	15	MT, ET, exam	SFT6540
50				Дипломдық жұмысты, дипломдық жобаны жазу және қорғау немесе кешенді емтиханды дайындау және тапсыру / Написание и защита дипломной работы, дипломного проекта или подготоUCа и сдача комплексного экзамена / Writing and defending a diploma thesis, diploma			8	240	0	0	0	0	240	15	Defense of diploma	

				project or preparation and passing of a comprehensive exam													
				Total for 8 semester:			**28**	**840**	**150**	**30**	**60**	**60**	**690**	**75**		
				TOTAL FOR 4 COURSE:			**60**	**1800**	**450**	**120**	**180**	**150**	**1350**	**180**		
				TOTAL:			**240**	**7200**	**2130**	**555**	**1065**	**510**	**5070**	**735**		

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**	**14**	**13**	**5**	**9**	**5**			**56**	*** 56 cr.**
- including a required component (RC GED)	10	14	13	5	4	5			51	* 51 cr.
- including an optional component (OC GED)					5				5	* 5 cr.
Cycle of core disciplines (CD)	**20**	**16**	**17**	**21**	**14**	**18**	**7**	**3**	**116**	******
- including a university component (UC CD)	20	2	17	16		6	2		63	
- including an optional component (OC CD)		14		5	14	12	5	3	53	
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	**30**	**30**	**30**	**30**	**28**	**32**	**32**	**28**	**240**	**No less than 240 cr.**

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

13. Additional Educational Programs (Minor)

The name of the AEP (Minor), indicating the list of disciplines forming the Minor	Number of credits AEP / number of credits in the discipline	Description, Competencies generated by the AEP, learning outcomes
Data protection		Develops skills in information security, including cryptography, database protection, and web application defense.
SEC6206 Cryptographic methods of information protection	5	
SEC6211 Protecting Database Management Systems	5	
SEC6236 Protecting applications and scripts from modifications	5	
Accounting by ACCA		Develops competencies in international accounting, financial reporting, and auditing in accordance with ACCA standards.
ACC6701 Business technology (ACCA)	5	
ACC6702 Financial Accounting	5	
ACC6703 Management Accounting	5	
Management & Leadership		Develops managerial and leadership competencies, including personnel management and behavior in organizations.
MGT6701 Management	5	
MGT6707 Psychology of Management	5	
MGT6702 Organizational Behavior and Leadership	5	
IoT Security Technologies		Provides competencies in the field of IoT security, including IoT technologies, device protection, and biometric control methods.
HRD6202 IoT Technologies	5	
SEC6215 IoT Security	5	
SEC6235 Biometric access control systems	5	