

AGREED

By the Director of REDPRINT LLP
(Digital Agency NIDGE)



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03 2024

APPROVED

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



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03 2024

EDUCATIONAL PROGRAM

7M06106 «Data Science»

Code and classification of the field of education: 7M06 – Information and communication technologies

Code and classification of study area: 7M061 - Information and communication technologies

Group of educational programs: M094 – Information technologies

Level according to ISCE: 7

Level according to NQF: 7

Level according to SQF: 7

Duration of study: 2 years

Credits: 120

Almaty, 2024

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List of designations and abbreviations

CD	Cycle of core 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
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
RW	Research work

1. Description of the educational program

Data Science is the science of methods for data analysis and extraction of valuable information and knowledge from them. It closely intersects with such areas as Machine Learning, Cognitive Science and, of course, Big Data. During the mass spread of technology, people have generated a huge amount of data. It is Big Data. And they can be of great use if properly processed. At all times before, computers received new opportunities through programming – a person created understandable algorithms for the machine, which led to the expected result. This approach is outdated.

For effective work with the big data another approach is needed, it was machine learning. In this case, a person only gives the computer some input, but the results of this algorithm are not determined by the person. Man determines how the machine learns, but the machine learns by itself; it comes to certain answers and analyzes them. Neural networks are self-learning networks (i.e. Machine Learning technology), arranged in the image and likeness of the human brain, which use Big Data as the material on which they learn. In other words, it is Data Science product.

All listed Science sections are studied in the EP "Data Science".

2. Goals and objectives of the educational program

The goal of the "Data Science" educational program is to study undergraduates of machine learning, deep learning and neural networks.

The objectives of the "Data Science" educational program are:

- Receiving a good training in databases by master students.
- Learning the machine learning methods by master students.
- Study of the main methods of deep learning
- Getting skills to work with neural networks.

3. Passport of the educational program

3.1 General information

№	Field name	Note
1	Code and classification of the field of education	7M06 – Information and communication technologies
2	Code and classification of study areas	7M061 - Information and communication technologies
3	Educational programs group	094 Information technologies
4	Name of the educational program	7M06106 «Data Science»
5	Purpose of the EP	The purpose of the educational program "Data Science" is to study undergraduates of machine learning, deep learning and neural networks.
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; - administration; - support; - testing.
12	Level according to ISCE	7
13	Level according to NQF	7
14	Level according to SQF	7
15	Number of credits	120

16	Academic degree awarded	Master of Technical Sciences/Master of Engineering and Technology in the educational program «7M06106 - Data Science»
17	<p>List of competences of the educational program:</p> <p>GEC1: To know: social and ethical values based on public opinion, traditions, customs, social norms and be guided by them in their professional activities; traditions and culture of the people of Kazakhstan; human and civil rights and freedoms; the foundations of the legal system and legislation of Kazakhstan; trends in social development of society; the basics of physical culture and the principles of a healthy lifestyle.</p> <p>GEC2: Have an idea about: the ethical and spiritual values; the sociological approach to personality, the basic laws and forms of regulation of social behavior; the nature of power and political life, political relationship and processes, the role of political systems in society and different social groups; the role of consciousness and self-awareness in behavior, communication and activities of people, the formation and development of personality.</p> <p>GEC3: Possess: ethical and legal norms of behavior; a system of practical knowledge and skills ensuring the acquisition, development, improvement and activation of psychophysical abilities and qualities, the acquisition, preservation and strengthening of health, the ability to work in a team, correctly defend their point of view, propose new solutions.</p> <p>GEC4: Ability to write and oral communication in the state language and the language of international communication; ability to logically correct, reasoned and clearly build oral and written speech; readiness to use one of the foreign languages</p> <p>GEC5: Ability to use modern information technologies, manage information using business application programs; use network computer technologies, databases and application packages in their subject area</p> <p>GEC6: To be competent to model financial and economic processes to solve specific problems</p> <p>GEC7: The ability to predict financial and economic data using modern information technologies, computer technologies, databases and application packages programs in their subject area</p> <p>BC1: The ability to actually use the state language, the language of international communication and foreign language in professional activities.</p> <p>BC2: Ability to understand the basics of economic knowledge, scientific ideas about finance, economics.</p> <p>BC3: Ability to professional use of modern equipment, devices, network components, computer systems (in accordance with the objectives of the program), as well as use the rules of safety, industrial hygiene, fire safety and labour protection standards.</p> <p>BC4: Ability to possess skills of using algorithms and programs for calculating parameters of business processes.</p> <p>BC5: The ability to use the basic provisions and methods for solving problems, the ability to carry out project documentation in the software environment of computer graphics for various types of projects.</p> <p>BC6: The ability to be competent in the choice of mathematical modeling methods for solving specific problems, including the willingness to identify the natural scientific essence of the problems arising in the course of professional activity, and the ability to involve the appropriate physical and mathematical apparatus to solve it.</p> <p>BC7: The ability to develop information and software information systems based on modern methods and development tools.</p> <p>BC8: Ability to find limits, uncover uncertainties; differentiate and integrate basic elementary functions; investigate functions using differential calculus; apply the methods of differential and integral calculus in solving applied problems. be able to classify differential equations and apply the necessary methods to solve these equations; solve linear differential</p>	

	<p>equations of order n and systems of linear equations with constant coefficients; find the quiescent points of the autonomous system.</p> <p>PC1: The ability to create mathematical models using the methods of modern information technologies</p> <p>PC2: The ability to model problems of pollution of ecological systems and forecast cause-and-effect relationships in the ecological system</p> <p>PC3: The ability to model energetical problems</p> <p>PC4: The ability to build the problem solution algorithm</p> <p>PC5: The ability to apply the software programs to solve the problem</p> <p>PC6: The ability to build 3D visualizations.</p>	
18	<p>Educational program learning outcomes</p> <p>LO1: 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.</p> <p>LO2: Apply mathematical models and methods of various processes</p> <p>LO3: Create mathematical models using the methods of modern information technologies.</p> <p>LO4: Build a mathematical model of energy problems</p> <p>LO5: Develop and / or use software, hardware, information, mathematical, and functional support for information systems, including algorithms and methods of information security</p> <p>LO6: Demonstrate communication skills, initiative and psychological preparedness for work, including when working in a team and to make managerial and technical decisions</p> <p>LO7: Build 3D visualizations</p> <p>LO8: Extract the desired information from various sources, including information flows in real time</p> <p>LO9: Apply research methodology in the field of data science</p> <p>LO10: Solve applied problems of data processing and analysis in order to identify hidden dependencies in them</p> <p>LO11: Carry out a comprehensive analysis and analytically summarize the results of scientific research using modern achievements of science and technology, skills of independent data collection, study, analysis and generalization.</p>	
19	Form of education	Full-Time
20	Languages of education	Russian, Kazakh, English
21	EP's strategic partners	REDPRINT LLP (Digital Agency NIDGE)
22	Developer (s) and authors:	<p>JSC International Information Technology University, MCM Department:</p> <ul style="list-style-type: none"> - Rysbaiuly B. - Ydyrys A.Zh. - Nurtas M.

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
Basic competencies				
Knowledge and understanding	BC2 BC6 BC8	LO2	Knows the basic concepts of the area under study	Test
		LO3	Knows the basic concepts of the area under study	Case study
		LO8	Knows the basic concepts of the area under study	Test
		LO4	Knows how to apply mathematical methods to solve various problems	Workbook
		LO5	Knows the basic concepts of the area under study	Case study
		LO11	Knows the basic concepts of the area under study	Control work
		LO9	Knows the basic concepts of the area under study	Case study
Putting knowledge and understanding into practice	BC3 BC4 BC5 BC7	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
		LO5	Applies acquired knowledge	Laboratory work
		LO6	Applies acquired knowledge to solve practical problems	Project
		LO9	Applies acquired knowledge to solve practical problems	Project
		LO10	Applies acquired knowledge to solve practical problems	Project
		LO11	Solve complex problems based on acquired knowledge	Multi-level tasks and assignments
Communication skills	BC1	LO1	Able to present his ideas in a compelling manner	Colloquium
		LO6	Able to communicate clearly in writing	Summary
Professional competencies				
Putting knowledge and understanding into practice	PC1 PC3	LO1	Applies acquired knowledge to solve practical problems	Project

	PC4 PC5	LO3	Applies acquired knowledge to solve practical problems	Project
		LO8	Applies acquired knowledge to solve practical problems	Project
		LO9	Applies acquired knowledge to solve practical problems	Calculation and graphic work
		LO5	Applies acquired knowledge	Laboratory work
		LO10	Applies acquired knowledge to solve practical problems	Project
		LO11	Applies acquired knowledge to solve practical problems	Project
Ability to make judgments, evaluate ideas, and formulate conclusions	PC2 PC6 PC7	LO2	Able to present his ideas in a compelling manner	Laboratory work
		LO8	Able to retrieve necessary information	Colloquium
		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	Able to retrieve necessary information	Colloquium
Self-learning	PC8	LO11	Able to apply acquired knowledge in the chosen additional educational program	Project

3.2 Correlation matrix of learning outcomes of the educational program with the formed competencies

	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11
BC1	v					v					
BC2		v			v	v				v	
BC3	v		v				v				
BC4						v		v	v	v	
BC5	v	v	v	v							v
BC6		v	v					v			v
BC7			v				v				
BC8						v				v	v
PC1	v		v						v		
PC2						v			v	v	v
PC3								v			v
PC4				v	v	v					v
PC5			v				v		v	v	
PC6					v					v	

Organization of inclusive education

The educational program 7M06106 - “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 / Module name	Module volume (work intensity)	Learning outcomes	Criteria for assessing learning outcomes	Disciplines forming the module Code and Name
BASIC MODULES				
BM01 Pedagogical-language module	4	Understands the meaning of world knowledge, analysis evaluation and comparison of various theoretical concepts in the field of scientific research. Knows critical analysis of current events. Works with scientific apparatus and sources.	Oral interview, testing, report, midterm calculation and graphic works	History and philosophy of science
	4	Knows English as the language of communication in the scientific environment, sources of information and knowledge bases.		Foreign Language (professional)
	4	They are competent in the field of scientific and scientific-pedagogical activity in the conditions of rapid updating and growth of information flows.		Higher school pedagogy
	4	Team management. Able to conduct a professional and comprehensive analysis of problems in the relevant field.		Management psychology
BM02 Mathematical modeling module	5	Knows mathematical models of liquid and gas dynamics, physics, chemistry, biology, mechanics, Economics, Finance, which consist mainly of a system of differential equations, partial differential equations, stochastic equations, random processes.	Oral interview, testing, report, midterm calculation and graphic works	Methods of mathematical modeling
	5	Can use programming skills to build predictive models, visualize data, and work with neural networks.		Python/R for data analysis
	10	Know the theory of machine learning, including discriminant cluster and regression analysis, and master the skills of practical solutions to data mining problems.		Machine learning 1, 2
	5	Develops software in the field of machine learning, a mathematical model of a neuron.		Problem of neural network retraining and data augmentation

PROFILING MODULES				
PM01 Elective disciplines module	5	Has professional skills	Oral interview, testing, report, midterm calculation and graphic works	Elective discipline №1
	5			Elective discipline №2
	5			Elective discipline №3
	5			Elective discipline №4
	5			Elective discipline №5
	5			Elective discipline №6
PM02 Scientific research module	5	The study of types of scientific research, the methodology of scientific knowledge, research, the formation of conclusions and conclusions, writing scientific articles and reports at the conference, summarizing the results of research work in a dissertation, its structure and content.	Oral interview, testing, report, midterm	Fundamentals of research work
	4	Knows the organizational structure and complex of technical means of the information and analytical center (IAC) of organization.	Report	Pedagogical practice
	8	Can identify the main tasks solved by the IAC.		Research practice
	24	Knows the mathematical support for the selected task (set of tasks or subsystem) and software for the selected task (set of tasks or subsystem), organizational and legal support for the selected task (set of tasks or subsystem). systematization and analysis of actual materials required for writing a course paper, scientific report, and internship report.		Scientific research work of a master's student

3.4. Information about the disciplines of the educational program

№	Name of module / discipline	Brief description of discipline (30-50 words)	Number of credits	Formed competences (codes)	Prerequisites	Post-requisites
Basic disciplines						
University component						
1.	History and philosophy of science	The main stages of development and paradigm change in the evolution of science, environment and innovation, the meaning of knowledge of the world, analysis, evaluation and comparison of various theoretical concepts in the field of scientific research, critical analysis of events, work with scientific apparatus and sources, scientific methods, analysis and synthesis, scientific ethics of a research scientist	4	GEC1 GEC2	-	-
2.	Foreign Language (professional)	Language environment in the context of globalization and internationalization, English as the language of communication in the scientific environment, information sources and knowledge bases, a foreign language for scientific communication and international cooperation	4	BC1	-	-
3.	Higher school pedagogy	"Be competent: in the field of scientific and scientific-pedagogical activity in the conditions of rapid updating and growth of information flows, in conducting theoretical and experimental research; in matters of University training of specialists; responsibility and creative attitude to scientific and scientific-pedagogical activities."	4	GEC3	-	-
4.	Management psychology	"Leadership of management and team management; conducting professional and comprehensive analysis of problems in the relevant field; competence in interpersonal communication and human resource management; public speaking at international scientific forums, conferences and seminars; knowledge of patent search and experience in transmitting scientific information using modern information and innovative technologies; protection of intellectual property rights for scientific discoveries and developments."	4	GEC3	-	-
5.	Pedagogical practice	Practical skills and competencies in teaching at the university; responsibility and creative attitude to scientific and scientific-pedagogical activities.	4	GEC3	-	-
The cycle of basic disciplines						
Elective components						
6.	Python/R for data analysis	Data science is one of the hottest areas today, and Python is one of the most popular tools for data analysis. In this course, you will learn how to use your	5	BC4	Programming in	Machine Learning 1

		programming skills to build predictive models, visualize data, and work with neural networks. The course is focused on practice and will allow you to immediately start working with data and building models.			Python	
7.	Elective discipline №1	Master's students are given elective courses to choose.	5			
8.	Elective discipline №3	Master's students are given elective courses to choose.	5			
9.	Elective discipline №4	Master's students are given elective courses to choose.	5			
Cycle of profiling disciplines University components						
10.	Machine Learning 1	This course focuses on the main types of tasks that can be solved using machine learning — mainly classification, regression, and clustering. It provides knowledge of the main methods of machine learning and their features, teaches you how to evaluate the quality of models and decide whether the model is suitable for a specific task. Introduces modern libraries that implement the discussed models and methods for evaluating their quality.	5	GEC5	Linear algebra	Machine Learning 2
11.	Methods of mathematical modeling	The main mathematical models of fluid and gas dynamics, physics, chemistry, biology, mechanics, economics, and finance consist mainly of a system of differential equations, partial differential equations, stochastic equations, and random processes. The modern theoretical apparatus of mathematics does not allow us to obtain exact solutions to these models in General cases. The role of numerical methods and computational experiments in the field of mathematical modeling is great. Therefore, the purpose of this course is to study approximate methods for solving various applied problems of hydrodynamics and gas dynamics. Each method is accompanied by the creation of an algorithm and the development of a software product. Various properties of the method and the process under study are investigated on the base of computational experiments.	5	BC6	Numerical methods	Elective discipline from CED
12.	Problem of neural network retraining and data augmentation	The first lesson on neural networks is an introduction to a niche, a developer's path in machine learning, a mathematical model of a neuron, principles of neural network training, and training the first neural network for digit recognition.	5	GEC5	Applied deep learning	-
13.	Machine Learning 2	Processing large amounts of data (Big Data) is a time – consuming process. Previously, for a computer to perform even a simple task, the programmer had to write a detailed algorithm of actions. But now you can't make instructions and configure the computer so that it is based on the proposed data to look for patterns and draw conclusions. This process is	5	BC7	Machine Learning 1	-

		called machine learning.				
14.	Research practice	The practice is supervised by the master's supervisor and the head of the research Department. The purpose of the research practice: systematization, expansion and consolidation of professional knowledge, the formation of undergraduates ' skills of conducting independent scientific work, research and experimentation.	8			
Cycle of profiling disciplines Elective components						
15.	Elective discipline №2	Master's students are given elective courses to choose.	5			-
16.	Elective discipline №5	Master's students are given elective courses to choose.	5			
17.	Elective discipline №6	Master's students are given elective courses to choose.	5			
18.	Fundamentals of research work	The study of types of scientific research, the methodology of scientific knowledge, research, the formation of conclusions and conclusions, writing scientific articles and reports at the conference, summarizing the results of research work in a dissertation, its structure and content.	5			
19.	Scientific research work of a master's student, including an internship and writing a master's thesis	Scientific research work of a master's student, including an internship and writing a master's thesis in 2-nd (2 credits), 3-rd (4 credits) and 4th semester (18 credits).	24			

4. Educational program curriculum

№	Module code	Module name in three languages (kaz / rus / eng)	Discipline Code	Discipline name in three languages (kaz / rus / eng)	Cycles (RW, BD, PD)	Components (RC, OC, UC)	Total number of credits (ECTS)	Total number of academic hours	Number of classroom hours				Number of SIS hours		Form of control (Midterm, End-of-term, examination, CP defense, differential test, DP defense)	Prerequisites (Discipline Code)
									Total number of classroom hours	Including			Total number of SIS hours	Including TSIS		
										lectures	practical classes (sem.)	laboratory classes				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 year																
1 semester																
1	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7001	Магистранттың ғылыми-зерттеу жұмысы, оның ішінде тағылымдама және магистрлік диссертациясының орындалуы / Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации (НИРМ) / The research work of a student, including an internship and implementation of master's thesis	RW	RC	2	60	0	0	0	0	60	15	Report Dif.test	-
2	BM01	Педагогикалық-тілдік модуль / Педагогическо-языковой модуль / Pedagogical-language module	SPS7001	Тарих және ғылым философиясы / История и философия науки / History and philosophy of science	BD	UC	4	120	30	15	15	0	90	15	M, E, Exam	-
3	BM01	Педагогикалық-тілдік модуль / Педагогическо-языковой модуль / Pedagogical-language module	SPS7002	Жоғары мектеп педагогикасы / Педагогика высшей школы / High School of Pedagogy	BD	UC	4	120	30	15	15	0	90	15	M, E, Exam	-
4	BM02	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT7508	Машиналық оқыту 1 / Машинное обучение 1 / Machine Learning 1	PD	UC	5	150	45	15	30	0	105	15	M, E, Exam	-

5	BM02	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT753 1	Математикалық модельдеудің әдістері / Методы математического моделирования / Methods of mathematical modelling	PD	UC	5	150	45	15	30	0	105	15	M, E, Exam			
6	BM02	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT750 6	Деректерді талдау үшін Python/R / Python/R для анализа данных / Python/R for analysing data	BD	OC	5	150	45	15	30	0	105	15	M, E, Exam			
7	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT755 2	DS үшін Python көмегімен сандық модельдеу / Численное моделирование с использованием Python для DS / Numerical simulations using Python for DS	BD	OC	5	150	45	15	30	0	105	15	M, E, Exam			
			MAT752 2	Компьютер көзқарасында терең оқыту / Глубокое обучение в компьютерном зрении / Deep Learning in computer vision														
			MAT754 2	DS үшін Mpi бар HPC-ге кіріспе / Введение в HPC с Mpi для DS / Introduction to HPC with Mpi for DS														
			MAT750 2	Деректер қоры: Жоғары деңгейлі / Базы данных: Продвинутой / Databases: Advanced														
			MAT753 2	Oracle database 11g: PLSQL негіздері (Oracle) / База данных Oracle 11g: Основы PLSQL (Oracle) / Oracle database 11g: PLSQL Fundamentals (Oracle)														
							Total for the 1st semester:			30	900	240	90	150	0	660	105	
2 semester																		
8	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7002	Магистранттың ғылыми-зерттеу жұмысы, оның ішінде тағалымдама және магистрлік диссертациясының орындалуы / Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации (НИРМ) / The research work of a student, including an internship and implementation of master's thesis	RW	RC	3	90	0	0	0	0	90	15	Report Dif.test			
9	BM01	Педагогикалық-тілдік модуль / Педагогическо-языковой модуль / Pedagogical-language module	LAN 7001A	Шет тілі (кәсіби) / Иностраный язык (профессиональный) / Foreign language (professional)	BD	UC	4	120	30	15	15	0	90	15	M, E, Exam	-		
10	BM01	Педагогикалық-тілдік модуль / Педагогическо-языковой	SPS7003	Басқару психологиясы / Психология управления / Psychology of management	BD	UC	4	120	30	15	15	0	90	15	M, E, Exam	-		

		модуль / Pedagogical-language module														
11	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	PP7501	Педагогикалық тәжірибе / Педагогическая практика / Teaching practice	BD	UC	4	120	0	0	0	0	120	15	report	
12	BM02	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT7510	Машиналық оқыту 2 / Машинное обучение 2 / Machine Learning 2	PD	UC	5	150	45	15	30	0	105	15	M, E, Exam	MA T7508
13	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RM7502	Ғылыми-зерттеу жұмысының негіздері / Основы научно-исследовательской работы / Fundamentals of research work	BD	UC	5	150	45	15	30	0	105	15	M, E, Exam	
14	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT7536	Дербес туындылы тендеулер үшін ақырлы айырымдар әдісі / Конечно-разностные методы для уравнений в частных производных / Finite-difference methods for partial differential equations	PD	OC	5	150	45	15	30	0	105	15	M, E, Exam	
			MAT7556	Киберқауіпсіздікті математикалық модельдеу / Математическое моделирование кибербезопасности / Mathematical modeling of cybersecurity												
			MAT7576	DS қосымшаларын оңтайландыру әдістері / Методы оптимизации для приложений DS / Optimization methods for DS applications												
			MAT7566	Жоғары деңгейде деректерді зерттеу / Продвинутый анализ данных / Advanced Data Analysis												
				Total number for a 2 semester:			30	900	195	75	120	0	705	105		
				TOTAL NUMBER FOR THE 1 YEAR:			60	1800	435	165	270	0	1365	210		
2 year																
3 semester																
15	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7003	Магистранттың ғылыми-зерттеу жұмысы, оның ішінде тағылымдама және магистрлік диссертациясының орындалуы / Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской диссертации (НИРМ) / The research work of	RW	RC	5	150	0	0	0	0	150	15	Report Dif.test	

				a student, including an internship and implementation of master's thesis													
16	BM02	Математикалық модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT7509	Нейрондық желілерді қайта дайындау, деректерді көбейту проблемасы / Проблема переобучения нейронных сетей, аугментация данных / The problem of retraining neural networks, data argumentation	PD	UC	5	150	45	15	30	0	105	15	M, E, Exam	MA T7510	
17	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT7511	Байестік статистика және талдау / Байесовская статистика и анализ / Bayesian statistics and analysis	BD	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT7501	Қолданбалы көп өлшемді статистикалық талдау / Прикладной многомерный статистический анализ / Applied multivariate statistical analysis													
18	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT7540	Есептеу комбинаторикасын математикалық модельдеу / Математическое моделирование перечислительной комбинаторики / Mathematical modeling of enumerative combinatorics	BD	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT7543	Әлеуметтік игілікке арналған жасанды интеллект / Искусственный интеллект для социального блага / Artificial Intelligence for Social Good													
19	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT7555	Кері есептерді шешудегі машиналық оқыту әдістері / Методы машинного обучения в решениях обратных задач / Machine learning methods for solving inverse problems	PD	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT7545	Параллельді есептеу / Параллельные вычисления / Parallel computation													
20	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT7505	Қолданбалы терең оқыту / Прикладное глубокое обучение / Applied Deep Learning	PD	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT7534	Деректерді зерттеу және визуализация / Исследовательский анализ и визуализация данных / Exploratory data analysis and visualization													
Total number for a 3 semester:							30	900	225	75	150	0	675	90			
4 semester																	
21	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7008	Магистранттың ғылыми-зерттеу жұмысы, оның ішінде тағылымдама және магистрлік диссертациясының орындалуы / Научно-исследовательская работа	RW	RC	14	420	0	0	0	0	420	15	Report Dif.test		

				магистранта, включая прохождение стажировки и выполнение магистерской диссертации (НИРМ) / The research work of a student, including an internship and implementation of master's thesis											
22	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	PP7504	Зерттеу тәжірибесі / Исследовательская практика / Research practice	RW	UC	8	240	0	0	0	0	240	15	Report
23				Магистрлік диссертацияны тіркеу және қорғау / Оформление и защита магистерской диссертации / Registration and defense of a master's thesis			8	240	0	0	0	0	240	15	Defense MS thesis
				Total number for a 4 semester:			30	900	0	0	0	0	900	45	
				TOTAL NUMBER FOR THE 2 YEAR:			60	180	225	75	15	0	157	135	
				TOTAL:			12	360	660	24	42	0	294	345	
							0	0	0	0	0	0	0		

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.	Total of credits ECTS	Note (Structure EP according to higher education NMS)
Cycle of basic disciplines (BD)	18	17	10		45	
- including a university component (BD UC)	8	12			20	
- including an optional component (BD OC)	10	5	10		25	
Cycle of profiling disciplines (PD)	10	10	15	8	43	
- including a university component (PD UC)	10	5	5	8	28	
- including an optional component (PD OC)		5	10		15	
Additional types of training	2	3	5	14	24	
<i>Professional practice (PP)</i>		4		8	12	
Final attestation (FA)					8	*No less than 8 cr.
TOTAL credits for the educational program	30	30	30	22	120	No less than 120 cr.

5. Agreement sheet with the developers

Code and name of the educational program: 7M06106 «Data Science»

№	Position, scientific or academic degree, name and surname of the developer of the educational program	Date	Signature	Note
1	Professor, d.ph.-m.s. Rysbaiuly B.			
2	Assistant professor, PhD Ydyrys A. Zh.			
3	Associative professor, PhD Nurtas M.			