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M. Ryskeldi
2023



«РЕДПРИНТ»

APPROVED
by the Chairman of the Board, Rector of the
JSC «International Information Technology
University»


A.K. Khikmetov
2023



Международный
информационный
технологический
университет

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: 057 – Information technologies

Level according to ISCE: 7

Level according to NQF: 7

Level according to SQF: 7

Duration of study: 2 years

Credits: 120

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List of designations and abbreviations

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

1. Description of the educational program

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 This approach is outdated.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. Requirements for evaluation of learning outcomes of the educational program

By the end of the Data Science program, undergraduates will be able to:

- Explain the choice of basic methods for solving inverse and incorrect problems
- Link inverse problems with Data Science.
- Create mathematical models using modern information technology methods.
- Build a mathematical model of production processes.
- Demonstrate sociability initiative and psychological readiness for work, including teamwork, and make managerial and technical decisions.
- Apply research methodology in the field of data science.
- Solve applied tasks for data processing and analysis in order to detect hidden dependencies in them.

- Conduct a comprehensive analysis and analytically summarize the results of research using modern science and technology progress, skills of independent data collection, study, analysis and generalization.

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

Table 1

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

The final certification finishes with the defense of the master's thesis.

4. Passport of the educational program

4.1 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	057 – Information technologies
4	Name of the educational program	7M06106 «Data Science»
5	Brief description of the educational program	<p>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.</p> <p>Structure of the EP:</p> <ul style="list-style-type: none"> - Machine Learning; - Neural Networks and data augmentation; - Python/R for data analysis; - Deep learning; - Mathematical Modeling methods;
6	Purpose of the EP	The purpose of the educational program "Data Science" is to study undergraduates of machine learning, deep learning and neural networks.
7	Level according to ISCE	7
8	Level according to NQF	7
9	Level according to SQF	7
10	List of competences of the educational program:	<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 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>
11	<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>

	LO8: Extract the desired information from various sources, including information flows in real time LO9: Apply research methodology in the field of data science LO10: Solve applied problems of data processing and analysis in order to identify hidden dependencies in them 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.	
12	Form of education	Full-Time
13	Languages of education	Russian, Kazakh, English
14	Credits	120
15	Academic degree awarded	Master of Technical Sciences/Master of Engineering and Technology in the educational program «7M06106 - Data Science»
16	Developer (s) and authors:	JSC International Information Technology University, MCM Department: - Rysbaiuly B. - Ydyrys A.Zh. - Nurtas M.

4.2 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	

4.3. Information about disciplines

№	Name of module / discipline	Brief description of discipline (30-50 words)	Number of credits	Formed competences (codes)	Prerequisites	Post-requisites
General 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 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.	5	BC4	Progr ammi ng in Pytho n	Mach ine Learn ing 1
7.	Elective discipline №1	Master's students are given elective courses to choose.	5			
8.	Elective discipline №2	Master's students are given elective courses to choose.	5			
Cycle of profiling disciplines						
University components						

9.	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
10.	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
11.	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	-
12.	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 called machine learning.	5	BC7	Machine Learning 1	-
13.	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						
14.	Elective discipline №3	Master's students are given elective courses to choose.	5			-
15.	Elective discipline №4	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 №5	Master's students are given elective courses to choose.	6			
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			

4.4. List of modules and learning outcomes

Name of the educational program «Data Science»

Qualification: master's degree in information and communication technologies in the educational program «7M06106 – Data Science»

Module code / Module name	Complexity of the module in credits	Learning outcome	Learning outcomes evaluation criteria	Module shaping disciplines Code / 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	Elective discipline №1	
	5		Elective discipline №2	
	5		Elective discipline №3	
	5		Elective discipline №4	
	5		Elective discipline №5	
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 calculation and graphic works	
	4		Knows the organizational structure and complex of technical means of the information and analytical center (IAC) of organization. Can identify the main tasks solved by the IAC. 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.	Oral interview, testing, report, midterm
	8			Report
	24		Pedagogical practice Research practice Scientific research work of a master's student	

5. Curriculum of the educational program

№	Module code	Module name in three languages (kaz / rus / eng)	Discipline Code	Discipline name in three languages (kaz / rus / eng)	Cycles (GED, CD, M)	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, CP defense, differential test, DP defense)	Prerequisites (Discipline Code)
									Total number of classroom hours	lectures	practical classes (sem.)	laboratory classes	Total number of SIS hours	Including TSIS		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

1 year

I semester

1	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7001	Магістранттың ғылыми-зерттеу жұмысы, оның ішінде тағылымдама және магистрілік диссертациясының орындауы / 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	GED	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	GED	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	CD	UC	5	150	45	15	30	0	105	15	M, E, Exam	-
5	BM02	Математикалық модельдеу модулі / Модуль математического	MAT7531	Математикалық модельдеудің әдістері / Методы математического моделирования / Methods of mathematical modelling	CD	UC	5	150	45	15	30	0	105	15	M, E, Exam	-

6	BM02	моделирования / Mathematical modeling module Математикалык модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT750 6	Деректерлі талдау үшін Python/R / Python/R для анализа данных / Python/R for analysing data	CD	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 MAT752 2 MAT754 2 MAT750 2 MAT753 2	DS үшін Python көмегімен сандық модельдеу / Численное моделирование с использованием Python для DS / Numerical simulations using Python for DS Компьютер көзқарасында терен оқыту / Глубокое обучение в компьютерном зрении / Deep Learning in computer vision DS үшін Mpi бар HPC-ге кіріспе / Введение в HPC с Mpi для DS / Introduction to HPC with Mpi for DS Деректер қоры: Жоғары деңгейлі / Базы данных: Продвинутой / Databases: Advanced Oracle database 11g: PLSQL негіздері (Oracle) / База данных Oracle 11g: Основы PLSQL (Oracle) / Oracle database 11g: PLSQL Fundamentals (Oracle)	CD	OC	5	150	45	15	30	0	105	15	M, E, Exam
Total number for a 1 semester:															
2 semester															
8	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7002	Магістранттың ғылыми-зерттеу жұмысы, оның ішінде тағылымдама және магистрілік диссертациясының орындауы / 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 тіл (кәсіби) / Иностранний язык (профессиональный) / Foreign language (professional)	GED	UC	4	120	30	15	15	0	90	15	M, E, Exam
10	BM01	Педагогикалық-тілдік модуль / Педагогическо-языковой модуль / Pedagogical-language module	SPS7003	Басқару психологиясы / Психология управления / Psychology of management	GED	UC	4	120	30	15	15	0	90	15	M, E, Exam

11	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	PP7501	Педагогикалық тәжірибе / Педагогическая практика / Teaching practice	GED	UC	4	120	0	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	CD	UC	5	150	45	15	30	0	0	105	15	M, E, Exam
13	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RM7502	Ғылыми-зерттеу жұмысының негіздері / Основы научно-исследовательской работы / Fundamentals of research work	CD	OC	5	150	45	15	30	0	0	105	15	M, E, Exam
14	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT7536	Дербес туындылы теңдеулер үшін ажырау айырымдар әдiсi / Конечно-разностные методы для уравнений в частных производных / Finite-difference methods for partial differential equations	CD	OC	5	150	45	15	30	0	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			30	900	195	75	120	0	0	705	105	
				Total number for a 2 semester:												
				TOTAL NUMBER FOR THE 1 YEAR:			60	1800	435	165	270	0	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 магистрілік диссертациясының орындауы / 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	5	150	0	0	0	0	0	150	15	Report Dif.test
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16	BM02	Математикалык модельдеу модулі / Модуль математического моделирования / Mathematical modeling module	MAT750 9	Нейрондук желілерді кайта дайындау, деректерді көбөйтүү проблемасы / Проблема переобучения нейронных сетей, аугментация данных / The problem of retraining neural networks, data augmentation	M	UC	5	150	45	15	30	0	105	15	M, E, Exam	MA T75 10	
17	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT751 1	Байесик статистика және талдау / Байесовская статистика и анализ / Bayesian statistics and analysis	CD	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT750 1	Қолданбалы көп өлшемді статистикалық талдау / Прикладной многомерный статистический анализ / Applied multivariate statistical analysis													
18	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT754 0	Есептеу комбинаторикасын математикалық модельдеу / Математическое моделирование перечислительной комбинаторики / Mathematical modeling of enumerative combinatorics	CD	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT754 3	Әлеуметтік итілікке арналған жасанды интеллект / Искусственный интеллект для социального блага / Artificial Intelligence for Social Good													
19	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT755 5	Кері есептерді шешудегі машиналық оқыту әдістері / Методы машинного обучения в решении обратных задач / Machine learning methods for solving inverse problems	M	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT754 5	Параллельді есептеу / Параллельные вычисления / Parallel computation													
20	PM01	Элективті пәндер модулі / Модуль элективных дисциплин / Elective disciplines module	MAT750 5	Қолданбалы терең оқыту / Прикладное глубокое обучение / Applied Deep Learning	M	OC	5	150	45	15	30	0	105	15	M, E, Exam		
			MAT753 4	Деректерді зерттеу және визуализация / Исследовательский анализ и визуализация данных / Exploratory data analysis and visualization													
								900	225	75	150	0	675	90			
								Total number for a 3 semester:									
								4 semester									
21	PM02	Ғылыми-зерттеу модулі / Научно-исследовательский модуль / Scientific research module	RW7008	Магистранттың ғылыми-зерттеу жұмысы, оның ішінде тағылымдама және магистрілік диссертациясының орындауы / Научно-исследовательская работа магистранта, включая прохождение стажировки и выполнение магистерской	RW	RC	14	420	0	0	0	0	420	15	Report Dif.test		

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

6. Agreement sheet with the developers

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, Doctor of Physics and Mathematics Rysbaiuly B.			
2	Assistant professor, PhD Ydyrys A. Zh.			
3	Assistant professor, PhD Nurtas M.		