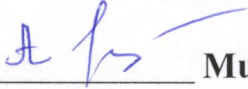


AGREED

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



Mustafina A.

«12» December 2024 Protocol of the EMC № 3

APPROVED

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



Issakhov A.

«28» February 2025 Protocol of the AC № 10

EDUCATIONAL PROGRAM

7M06110 Computer Systems and Software Engineering

Code and classification of the field of education: 7M06 Information and Communication Technology

Code and classification of training area: 7M061 Information and Communication Technology

Group of educational programs: M094 Information Technology

ISCED level: 7

NQR level: 7

ORC level: 7

Academic degree awarded Master of Technical Sciences in the educational program "7M06109 Computer Engineering and Software"

Duration of study: 2 years

Number of credits: 120

AGREED

Director of
«KnewIT Programming School» LLC



Bekaulov N.M.

2025

AGREED

Director of «ITCBOOTCAMP» LLC

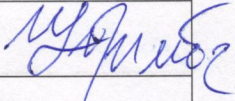
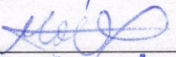
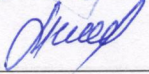


Nazarbekuly B.

2025

Almaty, 2025

The code and name of the educational program: 7M06110 Computer Systems and Software Engineering

№	Educational program developers (Position, scientific degree, academic degree, Full name)	Signature
1	Research Professor of the Department of Computer Engineering, Candidate of Technical Sciences, Tynymbaev S.	
2	Senior Lecturer of the Department of Computer Engineering, Master's degree holder, Mamanova S.E.	
3	Assistant of the Department of Computer Engineering, Master's degree holder, Akim A.M.	

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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 educational program 7M06110 «Computer Systems and Software Engineering» is designed to implement the principles of democratic education management, expanding the boundaries of academic freedom and the powers of educational institutions, which will ensure the adaptation of the system of technical and vocational education to the changing needs of society, the economy of the labor market. The flexibility of the program will take into account the abilities and needs of the individual, production and society.

The educational program is developed taking into account the needs of the labor market in the field of information and communication technologies. This educational program ensures the application of an individual approach to students, ensures the transformation of professional competencies from professional and qualification standards into learning outcomes. Student-centered learning is provided. This principle of education implies a shift in emphasis in the educational process from teaching to learning.

The fields of professional activities of graduates are higher educational institutions, research institutions, production of software development for information and computing systems for various purposes, software companies, IT departments of industrial enterprises, design organizations, public and private enterprises and organizations that develop, implement and use computer hardware and software in various fields, in other words almost all spheres of human activity.

2. Aim and objectives of the educational program

The purpose of the EP - is to train researchers and managers in the field of software development, highly qualified developers and architects of software systems with competencies in the field of data analysis for the IT industry of the Republic of Kazakhstan.

AP objectives:

1. Deepen the theoretical knowledge and practical skills of undergraduates in the areas of training.
2. Teach the implementation of research projects related to objects of professional activity, and the analysis of existing concepts, theories and approaches to software development.
3. Teach graduate students to apply the obtained theoretical and practical knowledge in solving various problems arising in the process of their professional activity.
4. Instill in graduate students the skills to independently, constantly acquire, develop and apply professional knowledge and skills for solving non-standard tasks (interdisciplinary, etc.).
5. Train researchers in the field of software development for various fields of human activity.
6. Teach undergraduates to apply the knowledge of pedagogy and psychology of higher education in their teaching activities.
7. Teach a generalization of the results of research work in the form of a dissertation, a scientific article, a report at conferences, a report, an analytical note, etc.

3. Passport of the academic program

№	Name	Description
1.	Education area code and classification	7M06 Information and Communication Technology
2.	Training direction code and classification	7M061 Information and Communication Technology
3.	Group of academic programs	M094 Information Technology
4.	Name of the educational program	Computer Systems and Software Engineering
5.	Aim of the educational program	Training of research staff in the field of software engineering, managers in the field of software development, highly qualified developers of software and information systems and architects of software systems for the IT industry of the Republic of Kazakhstan.
6.	Type of the educational program	Acting EP

7.	Level according to the National Classifications Framework	7 th level
8.	Level according to the Sectoral Qualifications Framework	7 th level
9.	Distinctive features of the program	No
10.	Partner University	
11.	Academic degree awarded	Master of Technical Sciences in the educational program "7M06109 Computer Engineering and Software"
12.	Duration of study	2 years
13.	Volume of credits	120 ECTS credits
14.	Language of education	English
15.	Atlas of new professions	Architect peripheral computing, R&d manager, Development engineer artificial neural network, Blockchain -technologist
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	ASIIN
20.	Generated learning outcomes	<p>LO1: Formulate and solve problems arising in the course of scientific research and requiring in-depth advanced professional knowledge.</p> <p>LO2: Choose the necessary research approaches and methods, modify existing ones and develop new ones based on the objectives of a specific study, as well as for solving problems in a new environment, in a broader interdisciplinary context.</p> <p>LO3: Apply methodological knowledge in the process of conducting scientific research, pedagogical and educational work. Demonstrate the skills necessary to independently continue further education.</p> <p>LO4: Apply psychological methods and means to increase the effectiveness and quality of teaching in pedagogical activity.</p> <p>LO5: Apply quantitative methods and techniques to develop effective solutions to production problems taking into account social, ethical and scientific considerations.</p> <p>LO6: Analyze software within the scope of production activities.</p> <p>LO7: Design and develop software systems for solving applied problems in the framework of production activities.</p> <p>LO8: Manage the team in the software development process.</p> <p>LO9: Use advanced technologies to organize effective data storage and management; apply data analysis methods to solve various problems.</p> <p>LO10: Know the methods of scientific research and academic writing, understand the meaning</p>

		<p>of the principles and culture of academic integrity; be able to clearly and unambiguously communicate information, ideas, conclusions to both specialists and non-specialists.</p> <p>LO11: Demonstrate the ability to apply modern psychological and pedagogical strategies in managing the educational environment of the university, designing curricula, implementing inclusive and digital approaches, as well as in professional interaction and development of academic teams based on the principles of leadership, coaching and scientific analysis.</p>
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4. Professional Standards (PS), profession cards, labor functions

№	Name of the PS	Profession card	Labor functions
1	Software testing	"QA - Engineer"	Implementation of the quality management system in accordance with internal and external standards and the culture of the organization.
		"Software Engineer"	<ol style="list-style-type: none"> 1. Algorithm creation and flowchart creation based on software specification 2. Code writing and software program development
2	Cloud technology developments	"Cloud Computing Specialist"	<ol style="list-style-type: none"> 1. Technical support for the processes of creation (modification) and maintenance of integration solutions for cloud services 2. Carrying out work on the creation (modification) and maintenance of integration solutions for cloud services
		"Cloud Developer"	Cloud Systems Software Management and Development
3	Development of IoT systems	"Cloud IoT Systems Engineer"	<ol style="list-style-type: none"> 1. Ensuring operability at the physical level 2. Ensuring operability at the application level
		"IoT Systems Software Engineer"	Providing interaction and management of IoT devices
4	Development of systems for processing and storing big data	"Data Mining Specialist"	Development and management of software tools for automation of big data processing
		"Neural Network Specialist"	Application of neural networks in solving complex problems in data processing
		"Machine Learning Specialist"	Design and implementation of systems using machine learning
		"Computer Vision Programmer"	<ol style="list-style-type: none"> 1. Data preparation and software development for video and graphic image processing 2. Application and computer vision hardware management
5	Teacher (teaching staff) of higher and (or) postgraduate education institutions	"Teacher, assistant in the field of education, EPVO"	1. Training
		"Teacher, Senior Lecturer/Senior Lecturer in Education, EPVO"	<ol style="list-style-type: none"> 1. Training 2. Conducting scientific research

5. List of the EP competencies

BC1: The ability to use the acquired knowledge for the original development and application of ideas in the context of scientific research.

BC2: The ability to apply the acquired knowledge in their professional activities to solve production problems.

BC3: The ability to independently, constantly acquire, develop and apply professional knowledge and skills.

BC4: The ability to apply the knowledge of pedagogy and psychology of higher education in pedagogical activities.

BC5: The ability to summarize the results of research and analytical work in the form of a dissertation, a scientific article, a report at scientific and technical conferences, a report, an analytical note, etc.

PC1: The ability to select and develop methods for analyzing objects of professional activity based on general ICT development trends.

PC2: The ability to conduct analysis to solve complex software (technical) problems and ensure the implementation of the most optimal solutions.

PC3: The ability to apply advanced technologies for the development of software products within the professional direction, as well as to lead the development process.

PC4: The ability to improve software products to increase their competitiveness and effectiveness at all stages of the life cycle.

6. List of learning outcomes of the EP

LO1: Formulate and solve problems arising in the course of scientific research and requiring in-depth advanced professional knowledge.

LO2: Choose the necessary research approaches and methods, modify existing ones and develop new ones based on the objectives of a specific study, as well as for solving problems in a new environment, in a broader interdisciplinary context.

LO3: Apply methodological knowledge in the process of conducting scientific research, pedagogical and educational work. Demonstrate the skills necessary to independently continue further education.

LO4: Apply psychological methods and means to increase the effectiveness and quality of teaching in pedagogical activity.

LO5: Apply quantitative methods and techniques to develop effective solutions to production problems taking into account social, ethical and scientific considerations.

LO6: Analyze software within the scope of production activities.

LO7: Design and develop software systems for solving applied problems in the framework of production activities.

LO8: Manage the team in the software development process.

LO9: Use advanced technologies to organize effective data storage and management; apply data analysis methods to solve various problems.

LO10: Know the methods of scientific research and academic writing, understand the meaning of the principles and culture of academic integrity; be able to clearly and unambiguously communicate information, ideas, conclusions to both specialists and non-specialists.

LO11: Demonstrate the ability to apply modern psychological and pedagogical strategies in managing the educational environment of the university, designing curricula, implementing inclusive and digital approaches, as well as in professional interaction and development of academic teams based on the principles of leadership, coaching and scientific analysis.

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
BC1	V	V								V	
BC2					V			V			
BC3			V					V			
BC4			V	V							V
BC5										V	
PC1	V	V			V						
PC2	V					V					
PC3							V	V	V		
PC4							V		V		

8. The relationship of LO with labor functions

№	LO	Labor functions
1.	Formulate and solve problems arising in the course of scientific research and requiring in-depth advanced professional knowledge.	Writing code and developing software for software
2.	Choose the necessary research approaches and methods, modify existing ones and develop new ones based on the objectives of a specific study, as well as for solving problems in a new environment, in a broader interdisciplinary context.	Algorithm creation and flowchart creation based on software specification
3.	Apply methodological knowledge in the process of conducting scientific research, pedagogical and educational work. Demonstrate the skills necessary to independently continue further education.	Application of the quality management system in accordance with internal and external standards and the culture of the organization.
4.	Apply psychological methods and means to increase the effectiveness and quality of teaching in pedagogical activity.	Application of the quality management system in accordance with internal and external standards and the culture of the organization.
5.	Apply quantitative methods and techniques to develop effective solutions to production problems taking into account social, ethical and scientific considerations.	Application of the quality management system in accordance with internal and external standards and the culture of the organization.
6.	Analyze software within the scope of production activities.	Ensuring functionality at the application level.
7.	Design and develop software systems for solving applied problems in the framework of production activities.	Carrying out work on the creation (modification) and maintenance of integration solutions for cloud services
8.	Manage the team in the software development process.	Cloud Systems Software Management and Development
9.	Use advanced technologies to organize effective data storage and management; apply data analysis methods to solve various problems.	Development and management of software tools for automation of big data processing
10.	Know the methods of scientific research and academic writing, understand the meaning of the principles and culture of academic integrity; be able to clearly and unambiguously communicate information, ideas, conclusions to both specialists and non-specialists.	Application of the quality management system in accordance with internal and external standards and the culture of the organization.
11.	Demonstrate the ability to apply modern psychological and pedagogical strategies in	Conducting scientific research. Training.

managing the educational environment of the university, designing curricula, implementing inclusive and digital approaches, as well as in professional interaction and development of academic teams based on the principles of leadership, coaching and scientific analysis.	
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9. Table showing interconnection of competencies, learning outcomes, assessment methods and criteria

Competencies of the EP graduate	Competences expressed in expected learning outcomes	Evaluation criteria	Name of the estimation method
Basic competencies			
BC1	LO1	reproduces theoretical positions related to a scientific problem	project, defense of master's thesis
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO2	reproduces theoretical positions related to a scientific problem	scientific article
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO10	reproduces theoretical positions related to a scientific problem	academic essay
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
BC2	LO5	reproduces theoretical positions related to a scientific problem	test
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO8	reproduces theoretical positions related to a scientific problem	project work
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
BC3	LO3	reproduces theoretical positions related to a scientific problem	project work
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO8	reproduces theoretical positions related to a scientific problem	project, defense of master's thesis
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
BC4	LO3	reproduces theoretical positions related to a scientific problem	project protection
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	

	LO4	reproduces theoretical positions related to a scientific problem	scientific article
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO11	reproduces theoretical positions related to a scientific problem	project
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
BC5	LO10	reproduces theoretical positions related to a scientific problem	academic essay
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
Professional competencies			
PC1	LO1	reproduces theoretical positions related to a scientific problem	project, defense of master's thesis
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO2	reproduces theoretical positions related to a scientific problem	scientific article
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO5	reproduces theoretical positions related to a scientific problem	test
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
PC2	LO1	reproduces theoretical positions related to a scientific problem	Project, defense of master's thesis
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
PC3	LO7	reproduces theoretical positions related to a scientific problem	software product development
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO8	reproduces theoretical positions related to a scientific problem	project work
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
	LO9	reproduces theoretical positions related to a scientific problem	project
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	
PC4	LO7	reproduces theoretical positions related to a scientific problem	

		applies methods of analysis to justify the research problem	software product development
		solves research problems by offering original approaches	
	LO9	reproduces theoretical positions related to a scientific problem	project
		applies methods of analysis to justify the research problem	
		solves research problems by offering original approaches	

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				
BM7300-Humanitarian and pedagogical	20	LO3, LO4, LO10, LO11	<ul style="list-style-type: none"> - Reasonable application of psychological and pedagogical strategies in teaching and research activities - Proficiency in academic writing and integrity - Participation in scientific and philosophical discussions, demonstrating logic and ethics 	SPS7007 Higher education: psychological and pedagogical development strategies
				LAN7001A Foreign language (professional)
				SPS7001 History and philosophy of science
				PP7301 Teaching practice
BASIC MODULES				
BM7301 - Digital Technologies and IT Project Management	15	LO1, LO6, LO7, LO8	<ul style="list-style-type: none"> - Ability to develop digital solutions based on theoretical knowledge - Analyze the effectiveness of using IT solutions in projects - Effective distribution of tasks in a team - Risk management and stage management of IT projects 	SFT7311 Technology of Blockchain
				SFT7315 Algorithms in graph theory
				SFT7310 Project Management in IT
BM7302-Optimization Methods and Data Analytics	10	LO2, LO5, LO9	<ul style="list-style-type: none"> - Application of optimization methods to solve applied problems - Using quantitative methods in data analysis - Development of statistical models and algorithms 	ANL7301 Operations Research and Optimization Techniques
				ANL7305 Machine Learning and Computer Statistics
	13	LO1, LO2, LO3, LO10	<ul style="list-style-type: none"> - Construction of a scientific hypothesis and selection of an adequate methodology 	RM7301 Research Methodology
				PP7302 Research practice

BM7303-Research Methodology and Practice			<ul style="list-style-type: none"> - Conducting research internship - Possession of skills in scientific analysis and presentation of results 	
BM7304-Advanced Web Technologies and Databases	9	LO6, LO7, LO9	<ul style="list-style-type: none"> - Design and implementation of web systems and databases - Using advanced development tools - Big data analysis and storage 	SFT 7302 Advanced Databases SFT7301 Advanced Web-technologies
PROFESSIONAL MODULES				
PM7300-Intelligent Systems and Probabilistic Models	11	LO1, LO2, LO5, LO6, LO7	<ul style="list-style-type: none"> - Development and application of intelligent algorithms - Application of probabilistic models for forecasting and analysis - Solving problems using neural networks and decision-making methods 	ANL7308 Theory of mass service ANL7316 Neural networks in data analysis ANL7311 Generative-adversarial networks ANL7312 Markov chains and decision-making processes ANL7306 Computer Vision
PM7301-Digital Infrastructure and Software Development in Corporate Systems	10	LO6, LO7, LO8, LO9	<ul style="list-style-type: none"> - Design of corporate IT infrastructure - Implementation and support of complex solutions - Using DevOps and automation of development processes - Data management and web information analysis 	NET7304 Corporate Networks Design ANL7307 Web Data Analysis NET7303 Enterprise Linux in Corporate Networks SFT7308 IoT and Artificial Intelligence SFT7317 Devops and Agile Software Development in AWS

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 basic disciplines (BD) University component (UC)						
1.	SPS7001 History and philosophy of science	The purpose of the discipline is to form the skills of working with scientific literature; logical, systemic, and critical thinking skills. The discipline will study: the main stages of the development of science; history and philosophy of science to form a conscious attitude to the environment and history, the basic principles of research activities.	5	LO3, LO4		
2.	LAN 7001A Foreign language (professional)	It is a one-semester practical course that tailors the English language program to the Master's students' professional/research needs. During the course the Master's students will work on an individual project and a research portfolio. By the end of the course, students will organize and present research portfolio.	5	LO3		
3.	SPS7007 Higher education: psychological and pedagogical development strategies	The discipline focuses on studying psychological and pedagogical strategies for the development of higher education, as well as forming competencies in designing and	6	LO3, LO4, LO11		

		organizing the educational process. Master's students will master modern psychological and pedagogical approaches to teaching, methods for diagnosing and assessing students, as well as digital and inclusive education technologies. Special attention is given to the development of pedagogical, research, and communication skills, as well as the prevention of professional burnout among educators. Upon completion of the course, students will be able to develop and implement effective educational strategies in universities.				
4.	PP7301 Педагогическая практика	Педагогическая практика представляет собой вид практической деятельности магистрантов, включающий в себя преподавание специальных дисциплин, организацию учебной деятельности студентов, научно-методическую работу по предмету, получение умений и навыков в работе преподавателя.	4	LO3, LO4, LO11		МФЗЖ
5.						
Cycle of basic disciplines (BD) Elective component (EC)						

6.	SFT7315 Algorithms in graph theory	During the course, the main concepts of graph theory, graph connectivity. Optimization tasks set graph theory: problems of finding optimal paths and location problems, algorithms from the solution are given. A special type of graph is considered - trees and related tasks with them: finding the shortest spanning tree and finding the maximum directed forest, as well as using trees for storing information.	5	LO5	Algorithms and data structures	Network design, Web analysis
7.	SFT7310 Project Management in IT	Familiarization of undergraduates with the theoretical and practical foundations of project management in the field of information technology, as well as development teams, development of practical skills in preparing and managing projects, training in the ability to communicate with the team to achieve productive activities.	6	LO8	DevOps	
8.	SFT7311 Theory and Technology of Blockchain	The purpose of this course is to introduce master students to blockchain technology, its capabilities and prospects. The course examines the mathematical, cryptographic	4	LO6, LO7	Advanced Databases	Web technologies, data analysis

		foundations and the use of this technology for solving applied problems (smart contracts, supply chain management, digital signatures and algorithms for their verification).				
Cycle of major disciplines (MD) University component (UC)						
9.	ANL7301 Operations Research and Optimization Techniques	Research and practical application of the methods of the most effective (or optimal) control. Operations research is focused on solving practical problems that can be described using mathematical models. The main sections of the theory of operations research are presented: mathematical programming (linear and nonlinear, deterministic and stochastic), game theory, inventory control theory, queuing theory, simulation modeling.	5	LO5, LO10	Mathematical analysis, Linear algebra	Queuing Theory, Markov Chains
10.	ANL7305 Machine Learning and Computer Statistics	The course includes topics such as supervised learning (linear learning models, neural networks, reference vector machines); teaching without a teacher (clustering, reduction of dimension); learning theory (CV theory; large fields). It	5	LO6, LO7, LO10	Probability Theory and Statistics	Computer vision

		discusses modern areas of application of machine learning, such as robotic control, data mining, autonomous navigation, speech recognition, as well as text and web data processing.				
11.	RM7301 Research Methodology	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	LO1, LO2		NIRM
12.	SFT7302 Advanced Databases	It covers advanced topics in database theory, such as data mining, data warehousing, distributed databases, client-server architecture. The methods of data storage and presentation, query processing and optimization, transaction processing, parallelism, improved data models for modern applications, temporary, deductive and extended databases, databases for decision support	5	LO7, LO9	Database Basics	Web Data Analysis, Blockchain

		systems are considered.				
13.	SFT7301 Advanced Web-technologies	The course covers concepts, technologies and methods for creating a large-scale distributed software system using service-oriented computing and cloud applications. In-depth study of advanced technologies focused on web standards, interactivity and design.	4	LO7	Web Development Basics	Web Data Analysis
Cycle of major disciplines (MD) Elective component (EC)						
14.	ANL7311 Generative-adversarial networks	Brief course description This discipline is devoted to the latest methods of generative-adversarial networks, and their use to create realistic images and three-dimensional structures. Upon mastering the discipline students should know: the concept and organisation of the generative model; the concept and organisation of the discriminative model; be able to: train generative-adversarial networks and generate images using them, from basic handwritten digits, to restoration, correction, colouring of photographs; generate 3D. Expected learning outcomes Upon	5	LO6, LO7, LO10	Machine learning	Computer vision

		<p>successful completion of the course, students will be able to: - Possess an advanced understanding of the principles of generative-adversarial networks, their structure and basic components. - Design and train generative-adversarial models for different types of data such as images, text, sound and others. - apply GSS in various domains such as computer vision, natural language processing, content generation and other creative applications. - tune and optimise GSS parameters to achieve better results in various tasks.</p>				
15.	ANL7312 Markov chains and decision-making processes	<p>Brief course description This discipline involves the study of Markov chains, in which each element is completely determined by the previous one. These chains are widely used in the formulation of tasks of linking artificial intelligence to the behaviour of an agent in a certain environment, for example, a robot in a real environment, on which, for example, reinforcement</p>	5	LO6, LO7, LO10	Probability Theory	Queuing Theory

		learning is based. Expected learning outcomes Upon successful completion of the course, students will be able to: - work with methods of building probabilistic models describing stochastic dynamics of processes; - perform sampling and estimation; - develop a mass service system - be able to establish properties of solutions of stochastic systems.				
16.	ANL7306 Computer Vision	Introduction to computer vision, image and video analysis for the recognition, reconstruction and modeling of objects in a three-dimensional world. The basics of image formation, camera image geometry, detection and comparison of characteristics, image classification, deep learning using neural networks are considered.	5	LO6, LO7, LO9	Neural networks	
17.	ANL7307 Web Data Analysis	Studying web data mining methods for solving various problems of analytical processing, creating models for analyzing structured and semi-structured web data.	5	LO6, LO7	Advanced Web Technologies	Machine learning

18.	NET7304 Corporate Networks Design	The course is aimed at gaining knowledge and acquiring skills necessary for designing a corporate network, including modern solutions for addressing and routing. It covers concepts such as modern corporate networks, WANs, security services, network services, and SDA with software access.	5	LO6, LO7	Linux in corporate networks	
19.	ANL 7308 Теория массового обслуживания	The course is aimed at gaining knowledge and acquiring skills necessary for designing a corporate network, including modern solutions for addressing and routing. It covers concepts such as modern corporate networks, WANs, security services, network services, and SDA with software access.	6	LO6, LO7, LO10	Operations Research	
20.	ANL7316 Neural networks in data analysis	The purpose of the course is to study the basics of neural networks and their application to solve data analysis problems. The discipline focuses on the theoretical aspects and practical use of modern models.	6	LO6, LO7, LO10	Machine learning	Computer vision
21.	SFT7308 IoT and Artificial Intelligence	The aim of this course is to teach master students advanced artificial intelligence methods that can be useful for industrial automation,	5	LO5, LO6	Programming Basics, Network Technologies	

		environmental assessment, as well as for human-computer interaction, etc.				
22.	NET7303 Enterprise Linux in Corporate Networks	The course aims to study the administration of the Linux operating system. Attention is focused on the fundamental concepts of Linux and its main tasks. It discusses the application of the command line concept and enterprise level tools.	5	LO6, LO7	Enterprise network design	network design
23.	SFT7317 Devops and Agile Software Development in AWS	The purpose of the course is to study DevOps methods and tools to automate the processes of development, testing and deployment of applications in the AWS cloud. Understanding of containerization principles and managing infrastructure as code.	5	LO7, LO8, LO9	Linux in corporate networks	
24.	RW7000 The research work of a student, including an internship and implementation of master's thesis	The discipline "Research Work of the Master's Student" is aimed at developing research competencies necessary for the completion of a qualification work — the master's thesis. Within the framework of this discipline, the master's student undergoes a research internship, learns methods of formulating and solving scientific problems, analyzes	24	LO1, LO2, LO3, LO5, LO10	research practice	Defense of Master's Thesis

		theoretical and applied aspects of the research topic, conducts experimental and analytical work, and presents the results in accordance with academic standards.				
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12. Curriculum of the educational program (Platonus)

№	Module name	Discipline cycle	Discipline component	Code of discipline	Name of discipline	Academic credits	Control in the academic period					Volume of hours						Distribution of credits per academic period				
							Exams	Differentiated test (practice)	Differentiated test (course name)	Practice/SRW	Term name/number	Total	In-class learning	including			MSIWT	MSIW	1 course		2 course	
														Lectures	Practice	Lab practicals			1	2	3	4
							Number of weeks in the academic period															
							15	15	15	15												
Modules of specialty/education program																						
1	PM7301-Digital Infrastructure and Software Development in Corporate Systems	MD	EC	NET7304	Corporate Networks Design	5	3				150.0	45.0	15	0	30	15	90			5.0		
2				ANL7307	Web Data Analysis		3	45.0	15	0		30	15	90								
3		MD	EC	NET7303	Enterprise Linux in Corporate Networks	5	3				150.0	45.0	15	0	30	15	90			5.0		
4				SFT7308	IoT and Artificial Intelligence		3	45.0	15	0		30	15	90								
5				SFT7317	Devops and Agile Software Development in AWS		3	45.0	15	0		30	15	90								
6	BM7303-Research Methodology and Practice	MD	UC	RM7301	Research Methodology	5	2				150.0	45.0	15	30	0	15	90		5.0			
7		MD	UC	PP7302	Research practice	8			240	240.0		0	0	0	0	0				8.0		
8	BM7304-Advanced Web Technologies and Databases	MD	UC	SFT7302	Advanced Databases	5	2				150.0	45.0	15	0	30	15	90		5.0			
9		MD	UC	SFT7301	Advanced Web-technologies	4	3				120.0	45.0	15	0	30	15	60			4.0		
10	BM7300 - Humanitarian and pedagogical	BD	UC	SPS7007	Higher education: psychological and pedagogical development strategies	6	1				180.0	60.0	30	30	0	15	105	6.0				
11		BD	UC	LAN 7001A	Foreign language (professional)	5	1				150.0	45.0	0	45	0	15	90	5.0				
12		BD	UC	SPS7001	History and philosophy of science	5	2				150.0	45.0	30	15	0	15	90		5.0			
13		BD	UC	PP7301	Teaching practice	4			120	120.0		0	0	0	0	0			4.0			
14	BM7301 - Digital Technologies and IT Project Management	BD	EC	SFT7311	Theory and Technology of Blockchain	4	1				120.0	45.0	15	0	30	15	60	4.0				
15		BD	EC	SFT7315	Algorithms in graph theory	5	1				150.0	45.0	15	0	30	15	90	5.0				
16		BD	EC	SFT7310	Project Management in IT	6	3				180.0	60.0	15	15	30	15	105			6.0		
17	PM7300-Intelligent Systems and Probabilistic Models	MD	EC	ANL7306	Computer Vision	5	2				150.0	45.0	15	0	30	15	90			5.0		
18				ANL7312	Markov chains and decision-making processes		2	45.0	15	0		30	15	90								

19				ANL7311	Generative-adversarial networks		2						45.0	15	0	30	15	90						
20		MD	EC	ANL7316	Neural networks in data analysis	6	1					180.0	60.0	15	15	30	15	105	6.0					
21				ANL 7308	Theory of mass service		1						60.0	15	15	30	15	105						
22	BM7302- Optimization Methods and Data Analytics	MD	UC	ANL7301	Operations Research and Optimization Techniques	5	1					150.0	45.0	15	0	30	15	90	5.0					
23		MD	UC	ANL7305	Machine Learning and Computer Statistics	5	3					150.0	45.0	15	0	30	15	90				5.0		
24	Scientific research work	RW	RC	RW7000	The research work of a student, including an internship and implementation of master's thesis	2				60		60.0		0	0	0	0	0	2.0					
25		RW	RC	RW7001	The research work of a student, including an internship and implementation of master's thesis (NIRM)	3				90		90.0		0	0	0	0	0		3.0				
26		RW	RC	RW7002	The research work of a student, including an internship and implementation of master's thesis	5				150		150.0		0	0	0	0	0			5.0			
27		RW	RC	RW7003	The research work of a student, including an internship and implementation of master's thesis	14				420		420.0		0	0	0	0	0					14.0	
Weekly average workload at hours																			0	0	0	0		
Basic disciplines (BD)						35	0	0	120	0	1050	300	105	105	90	90	540	20	9	6	0			
Required component (BD/RC)						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
University component(BD/UC)						20	0	0	120	0	600	150	60	90	0	45	285	11	9	0	0	0	0	
Elective component (BD/EC)						15	0	0	0	0	450	150	45	15	90	45	255	9	0	6	0	0	0	
Major disciplines (MD)						53	0	0	240	0	1590	420	135	45	240	135	795	11	15	19	8			
Required component (MD/RC)						0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
University component (MD/UC)						32	0	0	240	0	960	225	75	30	120	75	420	5	10	9	8	8		
Elective component (MD/EC)						21	0	0	0	0	630	195	60	15	120	60	375	6	5	10	0	0	0	0
Total of theoretical course						88	15	0	0	360	0	2640	720	240	150	330	225	1335	31.0	24.0	25.0	8.0		
USRW/UERW/DSRW						24	0	0	0	720	0	720	0	0	0	0	0	0	2.0	3.0	5.0	14.0		
AC	Additional courses																							
FA	Final attestation						8																	
	Registration and defense of a master's thesis						8				4													
	Total						120				1084			3600	720	240	150	330	225	1335				