“Халықаралық ақпараттық технологиялар университеті” АҚ

АО “Международный университет информационных технологий”

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

8D06103 Information systems

Code and classification of the field of education: 8D06 Information and

Communication Technologies

Code and classification of training area: 8D061 Information and Communication Technologies

Group of educational programs: D094 Information Technologies

ISCED level: 8

NQR level: 8

ORC level: 8

Academic degree awarded: Doctor of Philosophy (PhD) in the educational program “8D06103 Information Systems”

Duration of study: 3 years

Number of credits: 180

AGREED
“Yellow Cloud Technologies” LLP

Director Sadykov N.R.
«__» _____ 2025

AGREED
“Zerone Technology” LLP

Director Rashidinov D.
«__» _____ 2025

Almaty, 2025

The code and name of the educational program: "8D06103 Information systems"

№	Educational program developers (Position, scientific degree, academic degree, Full name)	Signature
1	Professor of the Department of Information Systems, Doctor of Technical Science, Professor Naizabayeva Lyazat	
2	Senior lecturer of the Department of Information Systems, Master of technical sciences Auyezova Anel	

Contents

List of abbreviations and acronyms

BC	Basic competence
BM	Basic module
HE	Higher education
GOSO	State obligatory standard of education
ECR	European Qualifications Framework
ETF	European Training Foundation
ZUN	Knowledge, skills, skills
NKZ	National Classifier of Occupations
NQF	National Qualifications Framework
NQS	National Qualifications System
OGM	General humanitarian module
OM	General module
OP	Educational program
OPM	General professional module
OQF	Sectoral Qualifications Framework
OK	General educational competence
PS	Professional Standard
Air Defense	Postgraduate Education
PC	Professional competence
PM	Professional module
WG	Working Group
RK	Republic of Kazakhstan
RO	Learning Outcome
CM	Special module
QMS	Quality management system
SEM	Socio-economic module
TVE	Technical and Vocational Education
TVET	Technical and Vocational Education and Post-Secondary education
UNESCO	United Nations Educational, Scientific and Cultural Organization/
UNESCO	is a specialized agency of the United Nations Educational, Scientific and Cultural Affairs.
Cedefop	European Center for the Development of Vocational Training
DACUM	from English Developing Curriculum
ECVET	European Credit System for vocational education and training
EQAVET	European Quality Assurance in Vocational Education and Training
ENQA	EuropeanAssociationforQualityAssuranceinHigherEducation / European - Russian Association for Quality Assurance in Higher Education
ESG	Standards and Guidelines for Quality Assurance in the European Higher Education Area
FIBAA	International agency (non-profit foundation) for accreditation and examination of the quality of higher education (Bonn, Germany)
IQM-HE	Internal Quality Management in Higher Education
TACIS	Technical Assistance for the Commonwealth of Independent States
WSI	WorldSkills International

1. Description of the educational program

This educational program (EP) was developed on the basis of professional standards (PS) of the National Chamber of Entrepreneurs "Atameken", the National Qualifications Framework (NQF), the Sectoral Qualifications Framework (SQF) in the field of information technology and regional standards (RS) of education, based on research and trends indicated in the Atlas of new professions and competencies (ANPiK) of Kazakhstan in the field of information technology.

In the modern world of information technology, there is a fundamentally new qualitative shift that is radically changing the markets and the environment in which we live and work every day. This is primarily due to the penetration of digital technologies both into the daily lives of people and companies that have become “digital”. Indeed, with every bit of data digitized and paperless, the global business landscape has become a highly interconnected network.

According to a study by the international research and consulting company International Data Corporation (IDC), almost half of the companies declared their “aspiration to digital technologies”. This means that a workforce is needed that is ready to develop digital strategies and architectures that mimic the work of companies that initially built businesses around digital technologies. Cloud, Agile and DevOps workforce, digital innovation platforms and communities, and integrated data management and monetization.

The digital system is a metaphor that suggests considering modern organizations as mixed communities and systems in which people and digital agents interact. At the same time, openness in combining the efforts of developers, developing public-private partnerships and building a competitive environment in order to ensure the rapid growth in the number of available digital services, as well as improve their quality.

The PhD- level educational program is a co-educational program for all IT programs and provides professional qualifications

- in the field of representation and processing of knowledge in information systems,
- in the field of studying methods for constructing logical, production, network models and their use in information systems for various purposes: expert systems, fuzzy systems, decision support systems, neural network and genetic algorithms.
- development of methods for solving problems for which there are no formal algorithms: natural language understanding, learning, theorem proving, complex pattern recognition, etc.

Theoretical research is aimed at studying information processes and creating appropriate mathematical models. Experimental work is carried out by compiling computer programs and creating machines that solve particular information problems or behave reasonably in a given situation.

The educational program will contribute to the formation of the doctoral candidate's skills and abilities in the areas of solving design and management problems based on artificial intelligence methods, software development for modern information systems.

2. Aim and objectives of the educational program

The purpose of the EP - Preparation of competent research specialists to meet the needs of science, possessing knowledge of the patterns of cognition of information processes, as well as methods for searching, processing, and presenting professionally significant information in computer science, education, and industry in the field of modern information systems.

AP objectives:

1. Study of the principles of organization of modern information systems;
2. Mastery of knowledge representation methods and inference techniques in modern information systems;
3. Study of methods and software tools for developing information systems for various purposes;
4. Analysis of real-world problems and the application of information systems for problem-solving using expert systems and decision support systems;
5. Familiarization with the concepts and methods underlying modern advancements in information systems;
6. Determination of the value of software products through integration with other products;

7. Understanding the practical application of information systems and decision-making systems;
8. Consideration of a set of services, devices, and other products of one company that are inextricably linked into a unified network;
9. Development and maintenance of applied information systems in various domains.

A doctoral student must possess the skills of analytical generalization of the results of scientific research using modern achievements in science and technology, the ability to independently collect data, study, analyze, and summarize scientific and technical information related to the topic of the dissertation research, the ability to create theoretical models that allow forecasting the properties

3. Passport of the academic program

№	Name	Description
1.	Education area code and classification	8D06 Information and Communication Technologies
2.	Training direction code and classification	8D061 Information and Communication Technologies
3.	Group of academic programs	D094 Information Technologies
4.	Name of the educational program	8D06103 Information Systems
5.	Aim of the educational program	Training of competent research specialists to meet the needs of science, equipped with knowledge of the patterns of cognition of information processes, as well as methods for searching, processing, and presenting professionally significant information in computer science, education, and production within the field of modern information systems.
6.	Type of the educational program	New
7.	Level according to the National Classifications Framework	8
8.	Level according to the Sectoral Qualifications Framework	8
9.	Distinctive features of the program	No
10.	Partner University	No
11.	Academic degree awarded	Doctor of Philosophy (PhD) in the Educational Program "8D06103 – Information Systems"
12.	Duration of study	3 years
13.	Volume of credits	180 ECTS
14.	Language of education	English
15.	Atlas of new professions	DevOps Engineer, IT Ecosystem Architect
16.	Regional standard	No
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	The learning outcomes reflect the context and content of the program, correspond to the doctoral level, and are coherent, achievable, and clearly articulated. The doctoral candidate must possess in-depth knowledge of modern theories, methods, and technologies in the field of Information Systems, including related

		disciplines (Big Data, Artificial Intelligence, Cybersecurity, etc.). They must demonstrate the ability to conduct independent scientific research, formulate and solve current scientific problems, develop new approaches, models, and algorithms, and critically interpret and analyze scientific data. The candidate should be able to publish research results in peer-reviewed journals and effectively integrate interdisciplinary knowledge into their professional and research activities. All learning outcomes are integrated into the curriculum and are assessed using appropriate methods and criteria.

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

№	Name of the PS	Profession card	Labor functions
	Software Testing	Researcher in the Field of ICT	1. Analysis of problems to develop solutions using computer hardware and software. 2. Defining the purpose, objectives, and scientific framework of the research. 3. Conducting research, experiments, and collecting evidence-based data on the topic.

5. List of the EP competencies

BC1: Ability to understand the main types and classifications of information systems, the regularities of information processes, and methods for searching, processing, and presenting professionally significant information.
BC2: Ability to effectively plan, implement, configure, and support an organization's computer infrastructure.
BC3: Ability to acquire and apply new knowledge and skills through information technologies, including in new areas of knowledge unrelated to one's primary field.
BC4: Proficiency in methods and tools for acquiring, storing, processing, and transmitting information using modern computer technologies, including global computer networks.
BC5: Ability to create, configure, and manage large-scale ecosystems.
BC6: A well-developed culture of thinking, the ability to construct logical arguments and statements based on data interpretation from various fields of science and technology, and to make judgments based on incomplete data.
BC7: Ability to organize communication between development teams and customers, and to make management decisions in the presence of differing opinions.
BC8: Ability to assess and analyze one’s level of competence, and readiness for self-directed learning and professional mobility.

PC1: Ability to analyze professional information, identify key elements, structure, format, and present it as analytical reviews with justified conclusions and recommendations.
PC2: Ability to develop technical specifications and requirements; formulate performance criteria for information systems.

PC3: Ability to develop new methods for the design and development of information systems.
PC4: Ability to construct knowledge representation models, approaches, and techniques for solving artificial intelligence problems, information knowledge models, and knowledge engineering methods.
PC5: Ability to design and program human-computer interaction systems and solve optimization problems using artificial intelligence algorithms.
PC6: Ability to develop methods for solving non-standard problems and propose new solutions for traditional tasks.
PC7: Ability to develop design strategies, define design goals, effectiveness criteria, and applicability constraints.
PC8: Ability to forecast the development of information systems and technologies.
PC9: Ability to advance competitive ideas in the theory and practice of information technologies and systems.
PC10: Proficiency in the professional use of modern equipment and devices (in accordance with the objectives of the doctoral program).
PC11: Ability to organize effective collaboration and synchronization of development stages for products.
PC12: Ability to conduct staff training.

6. List of learning outcomes of the EP

LO1: Formulate research problems and identify solutions based on models and methods of intelligent data analysis, machine learning, neural networks, computational complexity theory, and optimization.
LO2: Apply big data processing methods and data mining techniques to solve resource-intensive tasks.
LO3: Demonstrate understanding of the patterns of cognition in information processes, and apply methods for searching, processing, and presenting professionally significant information.
LO4: Implement and scale DevOps methodologies by synchronizing all stages and components of the software development lifecycle, from coding to testing and deployment.
LO5: Develop intelligent information systems and their components using contemporary data science methods.
LO6: Design computational algorithms for engineering problems and implement them in high-performance computing systems.
LO7: Design and develop software architectures that incorporate multiple functions, ensure system reliability, and support continuous development.
LO8: Generate original scientific ideas within a specific subject area and effectively communicate them to the scientific community.
LO9: Propose well-substantiated applications or explanatory notes for research projects in the field of information and communication technologies (ICT).
LO10: Evaluate both personal and existing scientific research, and prepare analytical materials to support strategic decision-making in the ICT field.
LO11: Apply control theory using mathematical models and methods of intelligent system management.

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						
BC2		V									
BC3				V							

BC4				V							
BC5				V							
BC6						V					
BC7							V	V			
BC8								V			
PC1	V										
PC2			V								
PC3			V								
PC4			V								V
PC5			V		V						
PC6								V			
PC7								V			
PC8								V			
PC9								V			
PC10							V		V		
PC11						V					
PC12										V	

8. The relationship of LO with labor functions

№	LO	Labor functions
1.	LO1: Formulate research problems and identify solutions based on models and methods of intelligent data analysis, machine learning, neural networks, computational complexity theory, and optimization.	1. Analysis of problems for developing solutions using computer hardware and software. 2. Defining the research purpose, objectives, and scientific framework. 3. Conducting research and experiments, and collecting evidence-based data on the topic.
2.	LO2: Apply big data processing methods and data mining techniques to solve resource-intensive tasks.	Analysis of problems for developing solutions using computer hardware and software.
3.	LO3: Demonstrate understanding of the patterns of cognition in information processes, and apply methods for searching, processing, and presenting professionally significant information.	Conducting research and experiments, and collecting evidence-based data on the topic.
4.	LO4: Implement and scale DevOps methodologies by synchronizing all stages and components of the software development lifecycle, from coding to testing and deployment.	Conducting research and experiments, and collecting evidence-based data on the topic.
5.	LO5: Develop intelligent information systems and their components using contemporary data science methods.	Analysis of problems for developing solutions using computer hardware and software.
6.	LO6: Design computational algorithms for engineering problems and implement them in high-performance computing systems.	Defining the research purpose, objectives, and scientific framework.
7.	LO7: Design and develop software architectures that incorporate multiple functions, ensure system reliability, and support continuous development.	1. Analysis of problems for developing solutions using computer hardware and software. 2. Defining the research purpose, objectives, and scientific framework.

8.	LO8: Generate original scientific ideas within a specific subject area and effectively communicate them to the scientific community.	Defining the research purpose, objectives, and scientific framework.
9.	LO9: Propose well-substantiated applications or explanatory notes for research projects in the field of information and communication technologies (ICT).	1. Defining the research purpose, objectives, and scientific framework. 2. Conducting research and experiments, and collecting evidence-based data on the topic.
3.	LO10: Evaluate both personal and existing scientific research, and prepare analytical materials to support strategic decision-making in the ICT field.	Conducting research and experiments, and collecting evidence-based data on the topic.
4.	LO11: Apply control theory using mathematical models and methods of intelligent system management.	Analysis of problems for developing solutions using computer hardware and software.

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: Ability to understand the main types and classifications of information systems, the regularities of information processes, and methods for searching, processing, and presenting professionally significant information.	LO2 LO5	1. Critically evaluates existing types and architectures of information systems in the context of research and applied tasks. 2. Develops and justifies original approaches to structuring and representing unstructured information in the professional domain. 3. Applies methods of intelligent data analysis and semantic search to identify patterns in information processes. 4. Constructs conceptual models of information systems, taking into account current trends (AI, Big Data, digital transformation) and the specifics of the research domain.	Exam, Project, Practical work, Research article
BC2: Ability to effectively plan, implement, configure, and support an organization's computer infrastructure.	LO2	1. Develops the architecture of computer infrastructure based on the organization’s needs. 2. Plans and implements processes for the deployment and configuration of IT infrastructure.	Project, Research report
BC3: Ability to acquire and apply new knowledge and skills through information technologies, including in new areas of knowledge unrelated to one's primary field.	LO4	1. Analyzes and masters modern IT tools and concepts in related or emerging scientific fields (e.g., bioinformatics, digital humanities, legal information systems, etc.). 2. Integrates interdisciplinary knowledge acquired through IT into scientific research and applied tasks. 3. Critically evaluates digital educational resources and scientific platforms in terms of scientific reliability and applicability.	Research and Development Work (R&D), Research article, Research report, Presentatio

		4. Designs an individual digital learning trajectory based on the objectives of the dissertation research.	n, Methodological development
BC4: Proficiency in methods and tools for acquiring, storing, processing, and transmitting information using modern computer technologies, including global computer networks.	LO4	1. Applies modern IT tools for collecting, storing, and processing large volumes of structured and unstructured data. 2. Develops and optimizes solutions for efficient data transmission and integration in distributed systems. 3. Assesses the reliability, security, and performance of information flows in global networks. 4. Implements innovative technologies for data storage and transmission (cloud solutions, distributed ledgers, etc.) within scientific or applied tasks.	Exam, Research and Development Work (R&D), Research report, Project, Presentation, Research article.
BC5: Ability to create, configure, and manage large-scale ecosystems.	LO4	1. Designs the architecture of digital ecosystems with consideration for scalability, compatibility, and resilience of components. 2. Configures interaction between services, platforms, and ecosystem participants using modern technology stacks.	Research article, Research report
BC6: A well-developed culture of thinking, the ability to construct logical arguments and statements based on data interpretation from various fields of science and technology, and to make judgments based on incomplete data.	LO6	1. Constructs well-reasoned logical arguments based on the analysis of heterogeneous and incomplete data. 2. Interprets data in the context of various scientific and technical disciplines. 3. Formulates well-founded conclusions and scientific judgments, taking into account uncertainty and the multiplicity of possible solutions. 4. Demonstrates a high level of critical thinking in solving research and interdisciplinary tasks.	Research and Development Work (R&D), Research article, Case analysis, Research report, Presentation.
BC7: Ability to organize communication between development teams and customers, and to make management decisions in the presence of differing opinions.	LO7 LO8	1. Organizes effective communication between the technical team and the client, taking into account the project's goals and constraints. 2. Makes managerial decisions under conditions of uncertainty and multiple perspectives. 3. Assesses risks and consequences of managerial decisions in the context of project activities.	Case analysis, Project, Presentation, Research report, Research and Development Work (R&D).
BC8: Ability to assess and analyze one's level of competence, and readiness for self-directed learning and professional mobility.	LO8	1. Analyzes the current level of professional and research competencies. 2. Defines individual educational trajectories in accordance with scientific and professional goals. 3. Demonstrates self-regulation skills and a commitment to lifelong learning. 4. Adapts to new professional conditions and the requirements of an interdisciplinary environment.	Research report, Presentation, Research and Development Work (R&D), Methodological

			developme nt, Case analysis.
Professional competencies			
PC1: Ability to analyze professional information, identify key elements, structure, format, and present it as analytical reviews with justified conclusions and recommendations.	LO1	1. Conducts in-depth analysis of professional information using modern methods of critical and systems thinking. 2. Identifies key ideas and trends within large volumes of data and structures analytical material logically. 3. Presents analysis results in a scientifically sound format, considering the needs of the target audience.	Analytical report, Research article
PC2: Ability to develop technical specifications and requirements; formulate performance criteria for information systems.	LO3	Formulates goals, functional and non-functional requirements for the information system.	Project, Case analysis, Research report.
PC3: Ability to develop new methods for the design and development of information systems.	LO3	1. Analyzes existing methods for designing and developing information systems, identifying their limitations. 2. Develops and substantiates new methods and approaches for creating information systems, taking into account current technological trends.	Research and Developm ent Work (R&D), Research article, Research report.
PC4: Ability to construct knowledge representation models, approaches, and techniques for solving artificial intelligence problems, information knowledge models, and knowledge engineering methods.	LO3 LO11	1. Applies knowledge engineering methods to construct ontologies, semantic, and logical models of knowledge representation. 2. Selects and justifies AI approaches and techniques based on the nature of the task and the type of knowledge.	Research and Developm ent Work (R&D), Research article, Project.
PC5: Ability to design and program human-computer interaction systems and solve optimization problems using artificial intelligence algorithms.	LO3 LO5	1. Designs human-computer interaction interfaces based on UX/UI principles, adaptability, and accessibility. 2. Implements software solutions to ensure effective user interaction with intelligent systems.	Project, Research and Developm ent Work (R&D), Research report.
PC6: Ability to develop methods for solving non-standard problems and propose new solutions for traditional tasks.	LO8	Develops original methods and approaches to problem-solving using modern IT tools.	Research and Developm ent Work (R&D), Research article.
PC7: Ability to develop design strategies, define design goals, effectiveness criteria, and applicability constraints.	LO8	Formulates the goals of information system design, taking into account the specifics of tasks and application context.	Project, Research report.
PC8: Ability to forecast the development of information systems and technologies.	LO8	Analyzes current trends and directions in the development of information systems and technologies.	Research and Developm ent Work (R&D), Research article.

PC9: Ability to advance competitive ideas in the theory and practice of information technologies and systems.	LO8	1. Identifies current scientific and applied problems in the field of IT and systems. 2. Develops original ideas with high potential for scientific novelty and practical applicability.	Research and Development Work (R&D), Research article, Project.
PC10: Proficiency in the professional use of modern equipment and devices (in accordance with the objectives of the doctoral program).	LO7 LO9	1. Performs professional setup, testing, and operation of specialized equipment and IT infrastructure. 2. Utilizes modern technical tools for conducting scientific experiments and data collection. 3. Assesses the technical specifications and capabilities of equipment for solving research and applied tasks.	Practical work, Research report, Research and Development Work (R&D), Project.
PC11: Ability to organize effective collaboration and synchronization of development stages for products.	LO6	1. Plans and coordinates the stages of IT product development, taking into account tasks, timelines, and resource allocation. 2. Ensures synchronization of technical, research, and management components of the project.	Research article, Research report, Methodological development, Report.
PC12: Ability to conduct staff training.	LO10	1. Develops training programs and materials tailored to the skill level and professional tasks of the staff. 2. Conducts training using modern pedagogical and digital technologies. 3. Evaluates training effectiveness and adapts content based on feedback. 4. Develops learners' practical skills and understanding of key concepts in the field of information technology.	Methodological development, Presentation.

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
BASIC MODULES				
BM8102 Technologies and Tools for Big Data Analysis	8 credits	LO1: Formulate research problems and identify solutions based on models and methods of intelligent data analysis, machine learning, neural networks, computational complexity theory, and optimization. LO3: Demonstrate understanding of the patterns of cognition in information processes, and apply methods for searching, processing, and presenting professionally significant information. LO4: Implement and scale DevOps methodologies by synchronizing all stages and components of the software development process—from coding to testing and deployment. LO5: Develop intelligent information systems and their components using modern data science methods.	1. Formulate and justify a scientific problem, selecting appropriate methods of analysis, modeling, and computation in accordance with the research objectives. 2. Apply modern tools and technologies (such as data mining, Big Data, machine learning, DevOps, and HPC) to solve complex research and engineering problems. 3. Evaluate the effectiveness and applicability of developed solutions, interpreting results within an interdisciplinary context. 4. Prepare and present scientific research results in compliance with academic and linguistic standards, including publications and presentations in English. 5.	ANL8102 Big Data Processing ANL8100 Data Analysis Tools
BM8100 Scientific and Pedagogical Training	19 credits	LO1: Formulate research problems and identify solutions based on models and methods of intelligent data analysis, machine learning, neural networks, computational complexity theory, and optimization; LO3: Demonstrate understanding of the patterns of cognition in information processes, and methods for searching, processing, and presenting professionally significant information; LO4: Implement and scale DevOps methodologies by synchronizing all stages and elements of the software development process, from coding to testing and deployment; LO8: Generate original scientific ideas within a specific subject area and communicate them to the scientific community; LO10: Evaluate both personal and existing scientific research and prepare analytical materials for strategic decision-making in the field of ICT.	1. Formulates scientific problems and develops solutions using methods of intelligent data analysis, machine learning, computational mathematics, and optimization. 2. Designs and implements algorithmic and architectural solutions for processing large and complex data in high-performance computing environments. 3. Generates and substantiates original scientific ideas, conducts their validation, and presents them to the scientific community	LAN8001A Academic Writing RM8001 Research Methods PP8100 Teaching Practice

			through publications, reports, and presentations. 4. Evaluates scientific research (own and external) and prepares analytical reviews to support strategic decision-making in the field of ICT and digital technologies.	
PROFESSIONAL MODULES				
PM8101 Deep Learning and Architectural Solutions in Information Systems	18 credits	LO1: Formulate research problems and identify solutions based on models and methods of intelligent data analysis, machine learning, neural networks, computational complexity theory, and optimization; LO2: Apply big data processing and intelligent data analysis methods to solve resource-intensive tasks; LO3: Demonstrate understanding of the cognitive patterns of information processes, and apply methods for searching, processing, and presenting professionally significant information; LO4: Implement and scale DevOps methodologies by synchronizing all stages and components of the software development process, from coding to testing and release; LO6**:** Develop computational algorithms for engineering problems and implement them in high-performance computing systems; LO7: Design and develop software architectures that integrate multiple functions, maintain system operability, and ensure continuous improvement; LO8: Generate original scientific ideas within a specific subject area and communicate them to the scientific community; LO10: Evaluate both personal and existing scientific research and prepare analytical materials for strategic decision-making in the field of ICT.	1. Formulates and solves research problems using methods of intelligent data analysis, machine learning, computational complexity theory, optimization, and engineering modeling. 2. Designs and develops the architecture of software and intelligent information systems, including Big Data processing algorithms, AI components, and high-performance computing. 3. Creates and validates original scientific ideas in the field of information technology, presenting the results through scientific publications, presentations, and project-based solutions. 4. Analyzes and interprets scientific research, including both own and external studies, generating analytical conclusions and recommendations for strategic decision-making in the ICT domain.	PP 8101 Research Practice SFT8105 Advanced Software Architecture SFT8102 Deep Learning Methods SFT8103 Modern Control Theory SFT8101 Theoretical Computer Engineering SFT8104 DevOps Engineering ANL8105 Information Retrieval Systems ANL8101 Intelligent Data Analysis in Information Systems SFT8100 Current Issues in Forecasting
Research Work	123 credits	LO1: Formulate research problems and identify solutions based on models and methods of intelligent data analysis, machine learning, neural networks, computational complexity theory, and optimization; LO3: Demonstrate understanding of the cognitive patterns of information processes, and apply methods for searching, processing, and presenting professionally significant information; LO6: Develop computational algorithms for engineering tasks and implement them in high-performance computing systems; LO9: Propose well-justified applications or explanatory notes for research projects in the field of ICT; LO10: Evaluate both personal and existing scientific research and prepare	1. Formulates and justifies scientific problems by applying methods of intelligent data analysis, machine learning, neural networks, and optimization. 2. Develops and implements intelligent information systems, including big data processing and the use of control methods based on mathematical and neural network models. 3. Evaluates scientific research and strategic ICT initiatives, prepares analytical reviews,	Doctoral research work, including internship completion and doctoral dissertation execution

		analytical materials to support strategic decision-making in the field of ICT; LO11: Apply control theory using mathematical models and methods of intelligent system management.	recommendations, and explanatory notes for projects. 4. Prepares applications and documentation for research projects, including justification of relevance, goals, objectives, and approaches within the framework of modern data science and ICT.	

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.	Academic Writing	The course "Academic Writing" is a mandatory component of the Ph.D. doctoral program. This is a practical 5-credit, one-semester course that builds on doctoral students' research skills and English language proficiency, aiming to develop and deepen their academic writing abilities essential for conducting scientific research, writing academic articles, and completing their dissertation. Within the course, students will engage in intensive reading, study strategies and formats of academic writing, and learn to independently apply them throughout their Ph.D. journey. By the end of the course, students are expected to organize and present a research portfolio and produce a detailed outline of a research article.	5	LO8, LO10	-	Research and Development Work (R&D
2.	Research Methods	The course introduces doctoral students to research methodology in the field of intelligent systems. Topics covered include the importance of research and various research methodologies in information technology, such as the formal method, prototype development, experimentation, and evaluation. The course also addresses methods of presenting research results, including report writing, article writing, and thesis writing; formatting research outcomes; and writing research proposals.	4	LO1, LO3, LO4	"Fundamentals of Research Activity"	-
3.	Big Data Processing	The course covers methods for storing data, analyzing it efficiently, and extracting business- and socially-relevant information. It introduces doctoral students to several key IT technologies that they can use to manipulate, store, and analyze big data. The course explores MapReduce methods for parallel processing and Hadoop, an open-source framework that enables cost-effective and efficient implementation of MapReduce for internet-scale tasks. Doctoral students will gain the ability to design highly scalable systems capable of ingesting, storing, and analyzing large volumes of unstructured data in both batch and real-time modes.	4	LO1, LO3, LO4, LO5	Database Management Systems, Machine Learning	-
Cycle of basic disciplines (BD) Elective component (EC)						
4.	Current Issues in Forecasting	Doctoral students study the fundamental principles, structural features, and application domains of forecasting models. The course provides a detailed overview and classification of forecasting through methods such as classification and clustering, with a focus on practical problems addressed in forecasting tasks. Students will implement predictive models	4	LO1, LO4, LO8, LO10	Intelligent Data Analysis in Information Systems	

		using Python and machine learning techniques, as well as carry out innovative engineering projects to develop forecasting models for various purposes using modern design methodologies.				
5.	Intelligent Data Analysis in Information Systems	This course introduces the fundamentals of data analysis methods, such as classification, modeling, and forecasting techniques based on the use of decision trees, artificial neural networks, genetic algorithms, evolutionary programming, associative memory, and fuzzy logic.	4	LO1, LO2, LO6, LO7	Statistical Data Analysis	-
6.	Information Retrieval Systems	The course covers automated search systems, content analysis, search models, result representation, and system evaluation. It explores the application of search methods on the web, in multimedia and multilingual environments, as well as in text classification and event tracking.	4	LO1, LO3, LO4	Database Management Systems, Data Analysis	-
7.	DevOps Engineering	A DevOps engineer automates build and testing processes, helps companies quickly and safely implement code changes or launch new products, and ensures the stability of high-load services. The goal of this course is to equip doctoral students with knowledge and skills in the DevOps methodology to facilitate active collaboration between development specialists and IT operations teams, integrating workflows to ensure product quality. Throughout the course, students will explore the software development life cycle (SDLC), the role of the DevOps engineer within it, as well as core DevOps tools such as Docker, Jenkins, Ansible, Kubernetes, and Prometheus.	4	LO5	Programming Technology	-
Cycle of major disciplines (MD) University component (UC)						
8	Data Analysis Tools	This course explores the fundamental principles, features, technologies, methods, models, and tools for data analysis and evaluating the effectiveness of analytics systems. Doctoral students will study the capabilities of analytical platforms. The course consists of both theoretical and practical components. The practical part includes tasks related to data analysis, processing, visualization, and interpretation across various subject areas using analytical platforms and tools.	4	LO1 , LO4	Data Analysis	-
Cycle of major disciplines (MD) Elective component (EC)						
9	Modern Control Theory	Modern Control Theory is an applied scientific discipline that incorporates research findings and developments from various other scientific fields. The results of scientific studies in control theory involve the application of mathematical control theory—mathematical outcomes that are invariant with respect to the subject domain of the controlled object—as well as the use of intelligent system control.	4	LO6, LO11	IT Project Management	-

10	Theoretical Computer Engineering	Development of general and professional competencies in doctoral students in the field of *Theoretical Computer Engineering*, enabling them to address complex tasks and practical problems related to the design, construction, and configuration of computer systems, as well as to apply and implement computer engineering technologies.	4	LO2, LO3, LO7, LO9	Database Management Systems, Programming Technology, Decision-Making Theory	-
11	Advanced Software Architecture	The course focuses on the principles and methods that help doctoral students gain confidence in architectural design. It covers architectural patterns, qualitative and quantitative evaluation of architectures, quantitative modeling using architecture description languages such as AADL and MARTE, and qualitative assessment methods like ATAM. Additionally, the course addresses specific challenges related to scale, dynamics, and heterogeneity encountered in ultra-large-scale systems, blockchain systems, and smart contract platforms (e.g., using the Solidity language). The course aims to deepen students' understanding of key concepts such as what software architecture is and how to create and maintain it.	4	LO7	Data Structures (C++, Java), Advanced Programming Techniques	-
12	Deep Learning Methods	The course covers methods of deep learning, including training and deployment of neural networks. Throughout the course, doctoral students will experiment with data, training parameters, neural network architectures, and other settings to improve performance and expand the capabilities of neural networks. They will also deploy neural networks to solve real-world problems. By the end of the course, doctoral students will be able to compare and analyze various neural network models, apply deep learning algorithms to solve their own tasks, formulate research problems, and identify solutions based on deep learning models and methods.	4	LO1, LO4, LO6, LO8	Machine Learning, Natural Language Processing Methods, Analysis and Processing of Unstructured Data, Neural Networks	
	Research Cycle Compulsory Component					

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 project)	Practice/SRW	Term paper/project	Total	In-class learning	including			DSIWT	DSIW	1 course		2 course		3 course	
														Lectures	Practice	Lab practicals			1	2	3	4	5	6
																			Number of weeks in the academic period					
																			15	15	15	15	15	15
Modules of specialty/education programm																								
1	BM8102 Big Data analysis technologies and tools	BD	UC	ANL8102	Big Data processing	4	1					120.0	45.0	15	30	0	15	60	4.0					
2		BD	UC	ANL8100	Data analysis tools	4	2					120.0	45.0	15	30	0	15	60		4.0				
3	PM8101 Deep learning and architectural solutions in information systems	MD	RC	PP 8101	Research practice	10				300		300.0		0	0	0	0	0				10.0		
4		MD	EC	SFT8105	Advanced software architecture	4	1					120.0	45.0	15	30	0	15	60	4.0					
5				SFT8102	Deep Learning		1						45.0	15	30	0	15	60						
6				SFT8103	Modern management theory		1						45.0	15	30	0	15	60						
7				SFT8101	Theoretical computer engineering		1						45.0	15	30	0	15	60						
8		MD	EC	SFT8104	DevOPS-engineering	4	2					120.0	45.0	15	30	0	15	60		4.0				
9				ANL8105	Multi-agent programming technology		2						45.0	15	30	0	15	60						
10				ANL8101	Intelligent data analysis of IS		2						45.0	15	30	0	15	60						
11				SFT8100	Actual problems in forecasting		2						45.0	15	30	0	15	60						
12	BM8100 Scientific and pedagogical training	BD	UC	LAN8001A	Academic writing	5	1					150.0	45.0	0	45	0	15	90	5.0					
13		BD	UC	RM8001	Research methods	4	2					120.0	45.0	15	30	0	15	60		4.0				
14		BD	RC	PP 8100	Teaching practice	10				300		300.0		0	0	0	0	0		10.0				

15	Scientific research work	R W	R C	NIRD-1	Doctoral research work, including internships and doctoral dissertations	17				510		510.0		0	0	0	0	0	17.0					
16		R W	R C	NIRD-2	Doctoral research work, including internships and doctoral dissertations	8				240		240.0		0	0	0	0	0		8.0				
17		R W	R C	NIRD-3	Doctoral research work, including internships and doctoral dissertations	30				900		900.0		0	0	0	0	0			30.0			
18		R W	R C	NIRD- 4	Doctoral research work, including internships and doctoral dissertations	20				600		600.0		0	0	0	0	0				20.0		
19		R W	R C	NIRD-5	Doctoral research work, including internships and doctoral dissertations	30				900		900.0		0	0	0	0	0					30.0	
20		R W	R C	NIRD-6	Doctoral research work, including internships and doctoral dissertations	18				540		540.0		0	0	0	0	0						18.0
Weekly average workload at hours																		0	0	0	0	0	0
1	**General education disciplines (GED)**					**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Required component (GED/RC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (GED/UC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elective component (GED/EC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	**Basic disciplines (BD)**					**27**		**0**	**0**	**300**	**0**	**810**	**180**	**45**	**135**	**0**	**60**	**270**	**9**	**18**	**0**	**0**	**0**	**0**
	Required component (BD/RC)					10		0	0	300	0	300	0	0	0	0	0	0	0	10	0	0	0	0
	University component(BD/UC)					17		0	0	0	0	510	180	45	135	0	60	270	9	8	0	0	0	0
	Elective component (BD/EC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	**Major disciplines (MD)**					**18**		**0**	**0**	**300**	**0**	**540**	**90**	**30**	**60**	**0**	**30**	**120**	**4**	**4**	**0**	**10**	**0**	**0**

	Required component (MD/RC)	10		0	0	300	0	300	0	0	0	0	0	0	0	0	0	10	0	0
	University component (MD/UC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elective component (MD/EC)	8		0	0	0	0	240	90	30	60	0	30	120	4	4	0	0	0	0
4	**Disciplines for the formation of professional competencies (BDFPC)**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Required component (BDFPC/RC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (BDFPC/UC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elective component (BDFPC/EC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	**Disciplines of personal development and the formation of leadership qualities(BDPD)**	**0**		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Required component (BDFPC/RC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (BDFPC/UC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elective component (BDFPC/EC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total of theoretical course		45	6	0	0	600	0	1350	270	75	195	0	90	390	13.0	22.0	0.0	10.0	0.0	0.0
USRW/UERW/DSRW		123	0	0	0	3690	0	3690	0	0	0	0	0	0	17.0	8.0	30.0	20.0	30.0	18.0
AC	**Additional courses**								0											
FA	**Final attestation**	12						360.0												
	Design and defense of a doctoral dissertation	**12**				**6**		**360**												
	Total	**180**				**4296**		**5400**	**270**	**75**	**195**	**0**	**90**	**390**						