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

6B06106 Computer Systems and Software Engineering

Code and classification of the field of education: 6B06 Information and Communication Technology

Code and classification of training area: 6B061 Information and Communication Technology

Group of educational programs: B057 Information Technology

ISCED level: 6

NQR level: 6

ORC level: 6

Academic degree awarded: Bachelor in Information and Communication Technology in educational program «6B06106 Computer Systems and Software Engineering»

Duration of study: 4 years

Number of credits: 240

AGREED

Director of
«KnewIT Programming School» LLC

_____ Bokaulov N.M.

«__» _____ 2025

AGREED

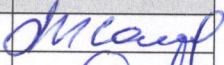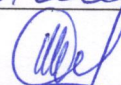Executive Director of
«Internet Society Kazakhstan»
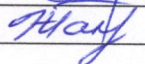
_____ Nurlybayev T.A.

«__» _____ 2025

Almaty, 2025

The code and name of the educational program: 6B06106 Computer Systems and Software Engineering

№	Educational program developers (Position, scientific degree, academic degree, Full name)	Signature
1.	PhD, head of the «CE» Department, assistant professor Mukhanov S.B.	
2	Ph.D., assoc. Professor of the «CE» Department Seilova N.A.	
3	MSc, assistant professor of the «CE» department Bekaulova Zh.M.	

Contents

List of abbreviations and acronyms

BD	Cycle of basic disciplines
BC	Basic competency
BM	Basic module
UC	University component
HE	Higher education
NMS	National Mandatory Standards of Higher and Post-Graduate Education
ATT	Additional types of training
EQF	European qualifications framework
EFE	European foundation for education
KSA	Knowledge, Skills and Abilities
FA	Final attestation
EC	Elective component
ISCED	International Standard Classification of Education
NQF	National qualifications framework
NQS	National qualifications system
GHM	General humanitarian module
RC	Required component
GEM	General education module
GED	Cycle of general education disciplines
EP	Educational program
GPM	General professional module
SQF	Sectoral qualifications framework
GEC	General education competency
MD	Cycle of major disciplines
PI	Professional internship
PS	Professional standard
PE	Postgraduate education
PC	Professional competency
PM	Professional module
LO	Learning outcome
QMS	Quality Management System

1. Description of the educational program

The educational program 6B06106 "Computer Systems and Software Engineering" is designed to implement the principles of a democratic nature of educational management, expanding the boundaries of academic freedom and the authority of educational institutions, which will ensure the adaptation of the technical and vocational education system to the changing needs of society, the labor market economy. The flexibility of the program will allow you to take into account the abilities and needs of the individual, production and society.

The educational program ensures the application of an individual approach to students, ensures the transformation of professional competencies from professional standards and qualification standards into learning outcomes. Provides student-centered learning - the principle of education, involving a shift in emphasis in the educational process from teaching to learning.

The educational program «Computer Systems and Software Engineering» prepares specialists of a wide profile in the field of software development for any areas of human activity. Preparation for this educational program includes disciplines that form competencies in the field of data analysis and machine learning, network technologies, robotic systems and graphic computing.

The area of professional activity of graduates is state and private enterprises and organizations that develop, implement and use computer hardware and software in various fields, namely: telecommunications, science and education, healthcare, agriculture, mechanical engineering, metallurgy, transport, services, administrative management, economics, business, various technology management, etc.

2. Aim and objectives of the educational program

The purpose of the EP - is to provide practice-oriented training of highly qualified specialists in software development in various fields with competencies in the field of data analysis, network technologies, robotics and graphic computing.

AP objectives:

1. To prepare a universal specialist who has knowledge in mathematics, ICT, computer sciences; able to use modern information and communication technologies in substantive activities.

2. To teach students how to formalize the subject area of a software project and develop specifications for software product components.

3. To develop the ability to design software architecture and provide a high level of continuity and quality of complex software development.

4. To teach students to design and develop user interfaces, commercial software components, databases and embedded software modules.

5. To acquaint students with the methods and tools for researching software code to identify / eliminate errors and malfunctions in the software.

6. To provide knowledge to students on the design of logical database schemes using relational, object-oriented, object-relational, key-value schemes for simple and complex defined systems.

7. To acquaint students with data analysis methods and machine learning algorithms for their application in various fields of human detail.

8. To develop students' skills in developing multi-robotic systems using artificial intelligence, sensory technologies, IoT, etc.

9. To train students in network technologies to configure networks of various sizes, prevent threats and troubleshoot.

10. To acquaint students with advanced technologies of three-dimensional visualization.

3. Passport of the academic program

№	Name	Description
1.	Education area code and classification	6B06 Information and Communication Technology
2.	Training direction code and classification	6B061 Information and Communication Technology
3.	Group of academic programs	B057 Information Technology
4.	Name of the educational program	6B06106 Computer Systems and Software Engineering
5.	Aim of the educational program	To provide practice-oriented training of highly qualified specialists in software development in various fields with competencies in the field of data analysis, network technologies, robotics and graphic computing
6.	Type of the educational program	New EP
7.	Level according to the National Classifications Framework	6
8.	Level according to the Sectoral Qualifications Framework	6
9.	Distinctive features of the program	Two-degree program
10.	Partner University	University of Applied Sciences Hof
11.	Academic degree awarded	Bachelor in Information and Communication Technology in educational program 6B06106 «Computer Systems and Software Engineering»
12.	Duration of study	4 years
13.	Volume of credits	240
14.	Language of education	English
15.	Atlas of new professions	not provided
16.	Regional standard	not provided
17.	Availability of an attachment to the training license	provided
18.	License number for the training area	KZ81LAM00001263
19.	Availability of program accreditation	ASIIN
20.	Generated learning outcomes	LO1: Demonstrate the ability to use basic math tools to solve professional problems. LO2: Analyze the structure of the main components of the computer, use a wide range of technologies of internal and external memory; write program code for manipulating bits in the processor. LO3: Apply suitable data structures and develop appropriate algorithms for solving various computational problems. LO4: Apply various tools for software development, user interface, storage and data processing systems. LO5: Use various software development methodologies, draw up software documentation

		using the required diagrams, develop models of the logical and physical architecture of the software system, database, and manage the development process. LO6: Develop effective data storage systems and methods for their processing and analysis using machine learning algorithms. LO7: Own technologies for administering systems and networks of any configuration, troubleshooting and threat prevention. LO8: Design, operate and maintain robotic systems. LO9: Demonstrate the skills to develop complex three-dimensional visualizations using computer vision technologies, augmented and virtual realities. LO10: Independently critically analyze modern sources, draw conclusions, argue them and make decisions based on information. LO11: Is able to apply the acquired knowledge from the chosen supplementary educational program.

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

№	Name of the PS	Profession card	Labor functions
1	Cloud Technology Development	Cloud Technology Developer	- Management of software development for cloud systems - Design and maintenance of cloud systems
2	Computer Systems Architecture Management	Information Systems Architect	- Information system support - Creation of IS architecture
3	Network, System Administrators, and Server Administrators	System and Network Administration Specialist	- Ensuring system security of the organization - Ensuring network

			security of the organization
4	Software Maintenance	Software Maintenance Specialist	- Preparation for software maintenance - User support for software - Technical support for software - Management of software maintenance service development - Analysis of software issues and changes

5. List of the EP competencies

GEC1: To know: socio-ethical values based on public opinion, traditions, customs, social norms and focus on them in their professional activities; history, traditions and culture of the peoples of Kazakhstan; human and civil rights and freedoms; fundamentals of the legal system and legislation of Kazakhstan; trends in the social development of society; the basics of physical culture and the principles of a healthy lifestyle.

GEC2: To be capable of written and oral communication, including professional in the state language, the language of interethnic communication and English; ability is logically true, reasoned and clearly build oral and written speech.

BC1: To be competent in the choice of mathematical modeling methods for solving specific engineering problems, including the willingness to identify the natural science essence of the problems arising in the process of professional activity, and the ability to attract the appropriate physical and mathematical apparatus for its solution.

BC2: The ability to use modern information and communication technologies in substantive activities, to analyze information sources.

BC3: The ability to analyze the architecture of computer systems, the main components of a computer.

PC1: The ability to formalize the subject area of a software project and develop specifications for software product components.

PC2: The ability to design and develop user interfaces, commercial software components, databases and embedded software modules.

PC3: To be competent in choosing software, DBMS, programming language.

PC4: The ability to manage the software development process, the development team, as well as evaluate the economic efficiency of the project.

PC5: The ability to design, configure, operate computer systems and networks.

PC6: The ability to analyze various types of data, apply knowledge extraction methods.

PC7: The ability to design, develop and operate robotic systems.

PC8: The ability to develop three-dimensional visualizations using modern technologies.

6. 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										
BC2										V	
BC3		V									
PC1					V						
PC2			V	V		V					V
PC3			V	V							V
PC4					V						
PC5							V				
PC6						V					
PC7								V			
PC8									V		

7. List of learning outcomes of the EP

LO1: Demonstrate the ability to use basic math tools to solve professional problems.

LO2: Analyze the structure of the main components of the computer, use a wide range of technologies of internal and external memory; write program code for manipulating bits in the processor.

LO3: Apply suitable data structures and develop appropriate algorithms for solving various

computational problems.

LO4: Apply various tools for software development, user interface, storage and data processing systems.

LO5: Use various software development methodologies, draw up software documentation using the required diagrams, develop models of the logical and physical architecture of the software system, database, and manage the development process.

LO6: Develop effective data storage systems and methods for their processing and analysis using machine learning algorithms.

LO7: Own technologies for administering systems and networks of any configuration, troubleshooting and threat prevention.

LO8: Design, operate and maintain robotic systems.

LO9: Demonstrate the skills to develop complex three-dimensional visualizations using computer vision technologies, augmented and virtual realities.

LO10: Independently critically analyze modern sources, draw conclusions, argue them and make decisions based on information.

LO11: Is able to apply the acquired knowledge from the chosen supplementary educational program.

8. The relationship of LO with labor functions

№	LO	Labor functions
1.	LO2: Analyze the structure of the main components of the computer, use a wide range of technologies of internal and external memory; write program code for manipulating bits in the processor.	- Information system support - Creation of IS architecture
2.	LO4: Apply various tools for software development, user interface, storage and data processing systems.	- Management of software development for cloud systems - Preparation for software maintenance User support for software Technical support for software
3.	LO5: Use various software development methodologies, draw up software documentation using the required diagrams, develop models of the logical and physical architecture of the software system, database, and manage the development process.	- Management of software maintenance service development - Analysis of software issues and changes
4.	LO7: Own technologies for administering systems and networks of any configuration, troubleshooting and threat prevention.	- Ensuring system security of the organization - Ensuring network security of the organization
5.	LO9: Demonstrate the skills to develop complex three-dimensional visualizations using computer vision technologies, augmented and virtual realities.	- Design and maintenance of cloud systems

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
General educational competencies			
GEC1	LO10: Independently critically analyze modern sources, draw conclusions, argue them and make decisions based on information.	Clarity of speech, logic of arguments	Oral questioning, essay, presentation
GEC2			
Basic competencies			
BC1	LO1: Demonstrate the ability to use basic math tools to solve professional problems.	Correctness of calculations, logical flow	Testing, problem-solving, midterm assessment
BC2	LO10: Independently critically analyze modern sources, draw conclusions, argue them and make decisions based on information.	Correctness of calculations, logical flow	Testing, problem-solving, midterm assessment
BC3	LO2: Analyze the structure of the main components of the computer, use a wide range of technologies of internal and external memory; write program code for manipulating bits in the processor.	Understanding of architecture, correctness	Lab work, testing
Professional competencies			
PC1	LO5: Use various software development methodologies, draw up software documentation using the required diagrams, develop models of the logical and physical architecture of the software system, database, and manage the development process.	Prototype performance, stability	Project, testing, defence
PC2	LO3: Apply suitable data structures and develop appropriate algorithms for solving various computational problems. LO4: Apply various tools for software development, user interface, storage and data processing systems. LO6: Develop effective data storage systems and methods for their processing and analysis using machine learning algorithms. LO11: Is able to apply the acquired knowledge from the chosen supplementary educational program.	Functionality, compliance with requirements	Term paper, project

PC3	LO3: Apply suitable data structures and develop appropriate algorithms for solving various computational problems. LO4: Apply various tools for software development, user interface, storage and data processing systems. LO11: Is able to apply the acquired knowledge from the chosen supplementary educational program.	Algorithm correctness, result analysis	Project, defense, presentation
PC4	LO5: Use various software development methodologies, draw up software documentation using the required diagrams, develop models of the logical and physical architecture of the software system, database, and manage the development process.	Algorithm correctness, result analysis	Project, defense, presentation
PC5	LO7: Own technologies for administering systems and networks of any configuration, troubleshooting and threat prevention.	Independence, correct configuration	Lab work, practical session
PC6	LO6: Develop effective data storage systems and methods for their processing and analysis using machine learning algorithms.	Algorithm correctness, result analysis	Project, defense, presentation
PC7	LO8: Design, operate and maintain robotic systems.	Prototype performance, stability	Project, testing
PC8	LO9: Demonstrate the skills to develop complex three-dimensional visualizations using computer vision technologies, augmented and virtual realities.	Creativity, technical accuracy	Term project, 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
GENERAL EDUCATION MODULES				
OOM6002 Language and ICT skills development module	25	The student has an understanding of the role and significance of academic English and ICT skills in educational and professional activities, the principles of academic writing, reading, and oral communication in English, the basic information and communication technologies and their application in educational and research activities, modern digital tools for processing, presenting, and sharing information, and the rules of information security and ethics in the digital environment.	Testing, oral interview, report, term paper, presentation, midterm.	LAN6001A Foreign language
				ICT6001 Information and Communication Technologies
				LAN6002A Foreign language
				LAN6001KR Kazakh (Russian) language
				LAN6002KR Kazakh (Russian) language
OOM6003 Module of physical culture	8	The student has an understanding of the role of physical culture in promoting a healthy lifestyle, the physiological effects of physical activity on the body, methods of physical self-improvement, safety rules for performing exercises, and the importance of physical activity for professional and social adaptation.	Testing, oral interview, report, term paper, presentation, midterm.	PhC6005 Physical Culture
				PhC6006 Physical Culture
OOM6001 Module of social and cultural development	18	The student has an understanding of the essence and values of personal socio-cultural development, the features of intercultural communication, the norms of ethics and tolerance in modern society, the role of culture in shaping civic identity, and the significance of social responsibility and volunteer activities.	Testing, oral interview, report, term paper, presentation, midterm.	HK6002 History of Kazakhstan
				SPS6001 Philosophy
				SPS6006 Cultural studies-Psychology
				SPS6007 Sociology-Political science
OOM6004 Module of personal and social development	5	The student has an understanding of the principles of personal growth and self-realization, the basics of effective communication and leadership, the mechanisms of social adaptation and teamwork, the importance of emotional intelligence and critical thinking, and the role of an active civic position in the development of society.	Testing, oral interview, term paper, presentation, midterm.	HUM6400 Inclusive education
				JUR 6505 Ecology and sustainable development
				RM6001 Research metodology
				JUR6413 Fundamentals safety of life activity
				ECO6007 Foundation of economics and financial literacy
				MGT6706 Startups and entrepreneurship

				LAW6007 Fundamentals of law and anti-corruption culture

BASIC MODULES				
BM6301 Module of Basic Mathematics and Natural Sciences	32	The student has an understanding of the fundamental concepts and methods of mathematics and natural sciences, the principles of mathematical analysis and algebra, the basics of physics and chemistry, the application of quantitative and analytical methods for solving applied problems, and the role of mathematical and scientific knowledge in professional activities.	Testing, oral interview, report, term paper, presentation, laboratory work, midterm control.	MAT6001_1 Algebra and geometry PHY6001 Physics MAT6002 Mathematical analysis EGR6302 Information theory MAT6005 Discrete mathematics EEC6001 Basic Circuit Theory MAT6006 Probability theory and mathematical statistics
BM6302 Module of Programming, Algorithms, and System Architectures	45	The student has an understanding of software development principles, the basics of algorithmization and data structures, programming languages and development environments, the architecture and organization of computing systems, and the interaction between software and hardware.	Testing, oral interview, course, laboratory, control work, midterm.	NET6301 Introduction to computer networks SFT6306 Software Architecture and Design SFT6301 Algorithmization and Programming SFT6301 Database Design. Introduction to SQL SFT6304 Programming in Python language SFT6302 Algorithms and Data Structures HRD6302 Architecture and Organization of Computer Systems EGR6301 Operating Systems EEC6004 Fundamentals of Logic Design SFT6320 Microcontroller programming
BM6303 Module of Modern Technologies and Professional Skills	35	The student has an understanding of modern information and digital technologies, tools and platforms for developing and implementing IT solutions, the basics of project management and teamwork, professional ethics and standards in the field of ICT, and the requirements for competencies and skills necessary for successful professional implementation.	Testing, oral interview, course, laboratory, control work, midterm.	EP6301 Educational practice LAN6007K Business correspondence in the state language EEC6006 Digital signal processing SEC6301 Fundamentals of information security RM6301 Research fundamentals PM6303 IT project management SFT6186 Artificial intelligence SFT6319 Blockchain technology
BM6304 Module of Microprocessor and Electronic Systems	10	The student has an understanding of the principles of microprocessor and embedded systems, the basics of digital and analog electronics, the architecture of microcontrollers and their programming principles, the development and debugging tools	Testing, oral interview, course, laboratory, control work, midterm.	CUM 3255 Digital devices and micro processes HRD6307 Microprocessor systems and complexes NET6304 Cloud Computing and Virtualization EEC6002 Design and simulation of electronic devices

		for electronic devices, and the application of electronic and microprocessor systems in technical and IT solutions.		
PROFESSIONAL MODULES				
PM6303 Module of Professional Training and Internships	17	The student has an understanding of the content and objectives of professional training, the specifics of academic and industrial internships, the application of theoretical knowledge in practical activities, the fundamentals of organizing the work process in a professional environment, and the importance of a practice-oriented approach for developing professional competencies.	Testing, oral interview, course, laboratory, control work, midterm.	IP6302 Industrial practice
				LAN6003PA Professionally oriented foreign language
				IP6303 Industrial practice
				PP6304 Pre-diploma practice
PM6304 Module of Minor Components	15	The student has an understanding of additional areas of professional training, interdisciplinary connections and expansion of the field of knowledge, the possibilities of an individual educational trajectory, the application of acquired knowledge in related fields, and the importance of minor components for comprehensive development and adaptation to the requirements of the modern labor market.	Testing, oral interview, course, laboratory, control work, midterm.	MIN601 Minor 1
				MIN602 Minor 2
				MIN603 Minor 3
PM6301 Module of Embedded and Sensor Systems	17	The student has an understanding of the principles of operation of embedded and sensor systems, the architecture and programming of microcontrollers, the types and characteristics of sensors, methods of data collection, processing, and transmission, and the application of embedded and sensor technologies in automated and intelligent devices.	Testing, oral interview, course, laboratory, control work, midterm.	HRD6308 Microcircuitry
				HRD6309 Microelectronics
				HRD6304 Sensor Technologies
				SFT6330 Circuit design language - Verilog
PM6302 Module of Network Technologies and System Integration	5	The student has an understanding of the principles of building computer networks, data transmission protocols and the OSI model, routing and switching technologies, network security tools, and methods of integrating hardware and software into complex information systems.	Testing, oral interview, course, laboratory, control work, midterm.	NET6308 Connecting Networks
				SFT6315 DevOps

11. Information about the disciplines of the educational program

№	Discipline Code and Name	Brief description of the discipline (30-50 words)	Labor intensity of discipline in credits	Learning outcomes formed (codes)	Prerequisites	Postrequisites
Cycle of general education disciplines (GED) Required component (RC)						
1.	History of Kazakhstan	The laws of the historical process, the place of man in the historical process are studied. Historical knowledge is given about the main stages of development of modern Kazakhstan; focuses on the problems of historical and cultural processes and the development of Kazakhstan.	5	LO10	No	Philosophy
2.	Philosophy	Studying the principles of understanding philosophy as a methodology of human activity, the main directions and problems of the world. The formation of a holistic vision of philosophy as a special form of knowledge of the world, its main problems and methods of studying them in the context of future professional activity.	5	LO10	History of Kazakhstan	Research metodology
3.	Foreign language	Written and oral communication skills in English are taught.	5	LO10	no	Professionally-oriented foreign language
4.	Foreign language	Written and oral communication skills in English are taught.	5	LO10	no	Professionally-oriented foreign language
5.	Kazakh (Russian) language	The skills of written and oral communication in the state language (the language of interethnic communication) are inculcated.	5	LO10	no	Business correspondence in the state language
6.	Kazakh (Russian) language	The skills of written and oral communication in the state language (the language of interethnic communication) are inculcated.	5	LO10	no	Business correspondence in the state language
7.	Information and communication technology	The skills of applying information and communication technologies in substantive activities are taught.	5	LO10	no	Basics of computer networks, Operating Systems Basics
8.	Sociology-Political science	The fundamentals of global political processes and the laws of political life are being studied. The development of sociological imagination, understanding of sociology as a science. The study of sociological subject areas, directions and research methods. The basic concepts of	4	LO10	no	Cultural studies-Psychology

		sociological theories are discussed, as well as how society and social processes determine our life.				
9.	Cultural studies-Psychology	As a result of studying a course in the field of cultural studies, students will acquire the fundamentals for studying the entire complex of social sciences and humanities, and master intercultural communication. At the same time, the discipline of cultural studies can serve as an addition to general courses in history and philosophy. The course material can serve as a methodological guide for a number of special disciplines: for example, ethics, history of culture, styles of art, national schools of management, strategy and negotiation tactics, management of culture. Methods and technologies of training used in the implementation of the program: role-playing games and educational discussions in various formats; case study, project method. The psychology course studies main issues of psychology in a wide educational and social context. Knowledge and skills gained in the course give students the opportunity to practically apply them in different life spheres such as personal, family, professional, business, social (working with people of different age and social categories).	4	LO10	no	Research metodology
10.	Physical training		4	LO10	no	
	Physical training	The ability to understand the practical use of healthy living standards, including prevention issues, is being instilled.	4	LO10	no	
Cycle of general education disciplines (GED) **University component (UC) and (or) Elective component (EC)**						
11.	Research metodology	The course is devoted to the study of activities aimed at developing students " ability to independent theoretical and practical judgments and conclusions, skills of objective evaluation of scientific information, freedom of scientific research and the desire to apply scientific knowledge in educational activities, including for the diploma project (work).	5	LO10	Culturology-Psychology	Diploma design
12.	Inclusive education	The philosophy, history and methodology of an inclusive approach. Documents governing the development of an inclusive process in higher professional education. Educational needs of students with disabilities and disabilities. Methods and forms of organization of the educational process at a university for students with disabilities. Development of adapted educational programs, curricula and educational paths for students with disabilities and disabilities. Psychological and pedagogical		LO10	no	Diploma design

		support of students with disabilities and disabilities at the university.				
13.	Ecology and sustainable development	The course reveals the role of ecology in solving modern economic, social and political problems, as well as the emergence of global environmental problems as a result of human production activities and the responsibility of the world community for them. A very important aspect is also international cooperation to ensure sustainable development. Various areas of practical application of ecology are also considered - natural resources and environmental pollution.		LO10	no	Diploma design
14.	Foundation of economics and financial literacy	This course provides an integrated introduction to economics and legal foundations relevant to entrepreneurial decision-making and everyday personal finance. Students will understand basic economic principles, and navigate legal systems affecting individuals and businesses and learn how to manage personal finances. Topics include economic behavior, legal research, business budgeting, taxation, investment and case analysis. The course is open to non-economics majors interested in how economic, legal and financial systems shape our lives.		LO10	no	Diploma design
15.	Fundamentals of law and anti-corruption culture	The course outlines the legal, economic, and social foundations of fighting corruption. Throughout the course, students will gain practical knowledge in identifying the peculiarities of state policies, applying international experiences in combating corruption, mastering skills in conflict resolution, and detecting corruption activities using professional ethics and methods. After successful completion of the course, students will gain the following competencies: 1. Understand the measures of legal responsibility for participation in corruption violations. 2. Determine the conflict of interests in the		LO10	Cultural Studies-Psychology	Diploma design

		activities of organizations leading to corruption. 3. Analyze the work of organizations using various research methods.				
16.	Startups and entrepreneurship	This course provides an introduction to what a business is, how it works and how to run it. Students will define ownership and processes used in manufacturing and marketing, finance, personnel, and management in business operations.		LO10	no	Diploma design
17.	Fundamentals safety of life activity	Studying ways of safe human interaction with the environment (industrial, domestic, urban, natural), sustainable operation of business facilities (organizations) in emergency situations, issues of protection from negative factors, prevention and elimination of the consequences of natural and man-made emergencies and the use of modern means defeat.		LO10	Sociology-Political Science	Diploma design
Cycle of basic disciplines (BD) **University component (UC)**						
18.	Physics	The study of the laws, principles, postulates and equations of mechanics, molecular physics and thermodynamics, electricity and magnetism, the use of the equations of physics to solve specific physical problems, the use of physics methods for research, analysis and laboratory work in order to verify the operation and implementation of the laws of physics in nature and technology.	6	LO1	Mathematical analysis	Theory of electrical circuits
19.	Algebra and geometry	The aim of the course is to introduce students to the key topics of linear algebra and analytic geometry, as well as to develop their mathematical thinking and problem-solving skills. During the course, students are expected to become familiar with and be able to apply algebraic and geometric methods and tools to solve various applied problems related to important concepts such as matrices, determinants, matrix rank, vectors, lines, planes, linear and Euclidean spaces, linear transformations, and quadratic forms. They should also learn to work with equations of lines and planes.	4	LO1	No	Mathematical analysis
20.	Algorithmization and programming	The course is designed to study algorithms and development programs for solving various problems. For this, the program structure, principles of constructing algorithms and programs, methods of solving, algorithmization, programming, debugging and implementing programs using the C ++ language are considered.	6	LO3, LO4, LO6	Information and communication technologies	Operating Systems Basics
21.	Mathematical analysis	The purpose of the course is to familiarize students with important branches of calculus and its applications in computer science. During the educational process, students should familiarize themselves and be able to apply mathematical methods and tools to solve various applied problems. Moreover, they study fundamental methods of studying infinitesimal variables using analysis, which is based on the theory of differential and integral calculations.	6	LO1	Algebra and geometry	Theory of information

22.	Probability theory and mathematical statistics	The course focuses on the probability and statistics of any events, as well as on the relationship between mathematics and programming through an interdisciplinary training program that deepens the mathematical understanding of probability and develops the skills of logical and algorithmic thinking.	4	LO1	Algebra and geometry	Theory of information
23.	Discrete mathematics	The course is devoted to the study of discrete objects and elements of logic. The study of discrete objects, the solution of combinatorial problems, the study of types of mappings and binary relations, the reduction of propositional algebra formulas to normal forms, the application of the algebra of logic to the theory of switching circuits are provided. Ability to analyze and synthesize, mathematical maturity develop.	4	LO1	Algebra and geometry	Theory of information
24.	Architecture and organization of computer systems	We study computer architecture with an emphasis on a quantitative approach to the trade-off between cost and performance. Command sets, pipelining, caching, physical memory, virtual memory, superscalar and disordered execution of I / O commands, multithreading, and introduction to multiprocessors with shared memory are considered.	5	LO2	Information and communication technology	Operating Systems
25.	Information theory	Information theory is a branch of applied mathematics and computer science involving the quantification of information. The aim of course is to form a system of knowledge on the basics of information theory and its application to the practice of modern information systems. Objectives of the course: concept and types of information systems, the concept of entropy and ways of its assess, the concept of information, ways of quantify the information, theoretical and practical aspects of efficient coding, theoretical and practical aspects of noiseless coding, data transfer systems, modulation and demodulation.	4	LO1	Algebra and geometry	Theory of electrical circuits
26.	Algorithms and data structures	The principles of algorithm development, analysis of algorithms and fundamental data structures are considered. The emphasis is on choosing appropriate data structures and developing effective and correct algorithms for their implementation. Important elements of the course are measuring the performance and effectiveness of programs when comparing and comparing the results of small programs written in different languages.	3	LO3, LO4, LO6	Information and communication technologies	Diploma design
27.	Business correspondence in the state language	Business correspondence in the state language is a very important subject for students, because given discipline teaches the preparation, execution of documents in the state language, forms practical skills and ability to independently compose, translate documents into Kazakh language.	2	LO10	Kazakh (Russian) language	Diploma design
28.	Educational practice	The acquisition of primary professional skills and the consolidation of skills by independently solving the problems of algorithmization, design and practical implementation of programs using modern programming technologies.	2	LO10	Algorithmic languages and programming	Industrial practice

29.	Research fundamentals	Studying the issues of practical organization of scientific research, analysis and generalization of research results, mastery of the theory of engineering decision making, the basics of project management, requirements analysis, architecture development, detailed design, development of user interfaces and testing methods.	4	LO10	Philosophy	Writing and defending a diploma project
30.	Basic Circuit Theory	The course has been designed to introduce fundamental principles of circuit theory commonly used in engineering research and science applications. Techniques and principles of electrical circuit analysis including basic concepts such as voltage, current, resistance, impedance, Ohm"s and Kirchoff's law; basic electric circuit analysis techniques, resistive circuits, 1st order and 2nd order circuits; circuits with DC and AC sources.	4	LO1	Physics	Microcircuitry
31.	Introduction to computer networks	Acquaintance with the basic network concepts and technologies, as well as developing the skills of planning and implementing small networks. The architecture, structure, functions, components and models of the Internet and other computer networks are considered. The principles and structure of IP addressing, as well as the basics of Ethernet concepts, media and operations, are presented as the basis for the curriculum.	4	LO7	Information and communication technologies	Diploma design
32.	Software architecture and design	The study of large systems and how they are decomposed into subsystems and components. Various notations and formalisms, detailed design and architecture are considered. The use of various notation with an emphasis on UML is explored. The role of architecture and detailed project specifications are considered in terms of risk management.	4	LO5	Algorithms and data structures	Diploma design
33.	Database design. Introduction to SQL	During the course students will learn how to create relational databases going through all the stages of database design process (conceptual, logical and physical). In the second part of the course students will be introduced with the basics of Structured Query Language (SQL). Within the course work students will design and create databases applying theoretical knowledge in practice.	4	LO3, LO4, LO6	Information and communication technologies	Diploma design
34.	Programming in	Familiarity with the Python programming language and its libraries. The emphasis is on procedural programming, non-strict types of	5	LO3, LO4, LO6	Information and communic	Diploma design

	Python language	variables, designing algorithms, working forms of applications (libraries), object-oriented programming, creating web and database applications, as well as data preprocessing.			ation technologies	
35.	Operating systems	Acquaintance with modern operating systems, their functionality and structure. Methods of process planning, interprocess communication, process synchronization, deadlock processing, main memory management during process execution, classical internal algorithms and storage management structures, and design of an input-output system are considered.	4	LO2, LO7	Algorithms and data structures	Diploma design
36.	Fundamentals of logic design	This course is designed and formulated to help students understand, solve, and design digital logic circuits. In this course, you will learn about the logic behind 21st century technology. This course contains detailed lectures that not only define or describe logic gates, but also examples and problems with which you can explore the actual implementation and operation of gates.	4	LO2	Software architecture and design	Microprocessor systems and complexes Digital signal processing Circuit design language – Verilog
37.	Microcontroller programming	The course teaches the skills of designing professionally-oriented information systems by type of software: technical, software, information; methods for the technical design of electronic devices based on microcontrollers; programming skills and microcontroller administration; skills of carrying out integration and modular testing of microcontroller scenarios.	6	LO2	Information and Communication Technology	Circuit Design Language - Verilog
38.	Digital signal processing	The discipline studies basic methods and algorithms for digital signal processing and their computer modeling using the software package (MATLAB). The specifics of the representation of signals and digital signal processing systems in MATLAB are considered in detail. Linear discrete systems, the synthesis of digital filters and the modeling of these objects and processes using the MATLAB software are described.	6	LO6	Fundamentals of Logical Design	Digital signal processing Circuit design language – Verilog
39.	Fundamentals of information security	It covers basic security concepts, principles and technologies, cryptography, attack methods and security monitoring. Studying basic security methods for searching for threats on the network using various popular security tools in a real network infrastructure.	5	LO7, LO10	Information and communication technologies	Diploma design
40.	IT project management	Discipline will help to develop a holistic view of the theoretical and methodological bases of management of projects; to develop students innovative processes and life cycles of different types of innovations and innovation strategies of the organization, methods and forms of management of innovation projects and programmes; form students " idea of the unity of effective professional activity and the need for constant innovation, ensuring the achievement of new quality of life.	5	LO5	Information Security Fundamentals Architecture and Design Software	Writing and defending a diploma project

41.	Artificial intelligence	The purpose of the course is to study the basics of artificial intelligence, various types of neural networks and their application in various tasks, machine learning methods, principles of building neural networks. As a result of mastering the discipline, students will gain knowledge in the field of modern models of artificial neural networks, learn how to use them to solve practical problems. Students will have to carry out innovative engineering projects on development and software for various purposes using modern design methods, advanced experience in developing competitive products, analyze and compare them. Students will be able to set tasks and develop algorithms for solving them for the implementation of software implementations of neural networks in order to solve various practical problems. This discipline provides a detailed overview and description of the most important methods of training neural networks of various structures, as well as practical tasks solved by these networks.	5	LO4, LO10	Python programming	Diploma design
42.	Blockchain technology	The Blockchain course is for those who want to learn more about blockchain technology and its applications. The course will look at how blockchain works, what its advantages and disadvantages are, what cryptocurrencies and tokens use blockchain, how to create and use smart contracts, and what are the examples of blockchain applications in various fields such as finance, logistics, medicine, etc. others	6	LO3, LO4, LO6	no	Diploma project
Cycle of basic disciplines (BD)						
Elective component (EC)						
43.	Digital devices and micro processes	The purpose of this discipline is to form ideas: - about the principles of construction, operation and use of digital devices combinational and sequential types, as well as microprocessors in modern radio engineering devices, including computer equipment: - about the operation of digital devices and microprocessors in electronic equipment. Objectives of the discipline: - study of processors flowing in typical units of digital devices; - studying the fundamentals of constructing electronic computing devices (ECD); - study of the arithmetic fundamentals of electronic computers; - study of the architectures of modern ECU microprocessors; - study of specific microprocessor components.	5	LO2	Theory of electrical circuits	Circuit Design Language – Verilog Electronic Device Design and Simulation
44.	Microproce ssor systems and complexes	The objectives of studying the discipline "Microprocessor systems and complexes" are: studying the general principles of constructing microprocessor systems; mastering methods for developing and operating microprocessor systems from hardware and software points of view.	5	LO2	Theory of electrical circuits	Circuit Design Language - Verilog
45.	Cloud Computing and Virtualizati on	Introductory course from Linux Foundation experts. Learning the basics of cloud computing, terminology, tools and technologies associated with modern cloud platforms. The course displays the entire cloudy landscape and explains how various tools and platforms interact with each other.	5	LO7	Informati on and communi cation technolog ies	Diploma project

46.	Design and simulation of electronic devices	This course provides a basic understanding of semiconductor materials - characteristics, operating principles and applications; Provides insight useful for understanding semiconductor devices and technologies; physics of semiconductors, diodes of p-n-junctions, metal-semiconductor contacts, heterojunctions, transistors.	5	LO2	Electric circuit theory	Circuit Design Language - Verilog
Cycle of major disciplines (MD) **University component (UC)**						
47.	Industrial practice	The consolidation of theoretical knowledge and the acquisition of practical skills in enterprises.	4	LO10	Study practice	Pre-diploma practice
48.	Professionally oriented foreign language	The course is devoted to the analysis of professional topics: "Computers and work", "Work in ICT", "Types of computer systems", "Basics of working with a computer", "Operating systems and graphical interface", "Text processing", "Cyberspace: security and crime", etc.	4	LO10	Foreign language	Diploma design
49.	Industrial practice	Systematization, consolidation and expansion of theoretical knowledge, development of practical skills, mastery of the elements of independent practical and research work in enterprises.	4	LO10	Study practice	Pre-diploma practice
50.	Pre-diploma practice	Search for information for writing the diploma project	5	LO10	Industrial practice	Diploma design
Cycle of major disciplines (MD) **Elective component (EC)**						
51.	Microcircuitry	The goal of mastering the discipline "Microcircuitry" is the formation of a complex of professional knowledge and skills (possessions) in students and the assimilation of the physical principles of integrated microcircuits, their parameters, characteristics, their theoretical and experimental research and practical application in electronic products.	5	LO2	Electric circuit theory	Microprocessor systems and complexes
52.	Microelectronics	The objective of the course is to study the methods of analysis and calculation of linear and non-linear electric circuits with various input influences; physical principles of action, characteristics, models and features of use in electronic circuits of the main types of active devices; methods for calculating transient processes in electric circuits; principles of construction and fundamentals of analysis of analog and digital electronic circuits and functional units of radio electronic equipment, as well as obtaining basic knowledge necessary for further professional activity.	5	LO2	Electric circuit theory	Digital devices and microprocessors
53.	Sensor technologies	The sensor technology course covers the principles and applications of various types of sensors to collect data from the environment. During the course, students learn the following main aspects of sensor technologies: 1. Basics of sensors: types of sensors (for example, pressure, temperature, humidity, motion, sound, light and others), the principle of operation of sensors. 2. Applications of sensors: Application areas of sensor technologies such as medicine, automotive,	6	LO8	Information and communication technologies	Diploma project

		smart cities, industry 4.0 and others. 3. Data collection and processing: methods of data collection using sensors, processing and analysis of the information received. 4. Internet of Things (IoT): the use of sensors in Internet of Things systems to create smart devices and systems. 5. Data Security and Privacy: Security considerations when working with data collected through sensors. 6. Future Technologies: Latest trends and developments in sensor technologies such as wearable devices, self-driving cars, smart homes and others.				
54.	Minor 1	Additional educational program (minor) - a set of disciplines and (or) modules and other types of educational work, determined by students for study in order to form additional competencies	5	LO11	no	Minor2
55.	Minor 2	Additional educational program (minor) - a set of disciplines and (or) modules and other types of educational work, determined by students for study in order to form additional competencies	5	LO11	No	Minor3
56.	Minor 3	Additional educational program (minor) - a set of disciplines and (or) modules and other types of educational work, determined by students for study in order to form additional competencies	5	LO11	no	Research methodology
57.	Circuit design language - Verilog	The Circuit design language - Verilog course covers the basic concepts and syntax of the language and its application to the modeling and design of digital circuits. During the course, students study the following topics: 1. Introduction to Verilog: history, basic concepts, module structure. 2. Verilog syntax: description of modules, ports, variables, operators and expressions. 3. Modeling of digital circuits: creation of combinational and sequential logic circuits. 4. Testing and Debugging: Using simulators to verify that circuits are working correctly. 5. Verilog synthesis: converting Verilog code into physical elements on a chip. 6. FPGA Circuit Design: Using Verilog to Program Programmable Logic Devices.	6	LO2	Microprocessor systems and complexes Digital signal processing Circuit design language – Verilog	Graduation project
58.	Connecting Networks	This course focuses on the LAN and WAN technologies and network services required in a complex network. Students will be able to integrate several LAN technologies and protocols from previous networking courses, implement WAN interconnection, provide security solutions for IP networks, manage networks in a unified manner.	5	LO8	Network programming	Diploma project
59.	DevOps	The course covers a wide range of topics related to the practices and tools used to automate the processes of software development, testing, delivery and maintenance. During the course, students typically learn the following core aspects of DevOps: 1. DevOps Basics: Concepts, principles and goals of DevOps, history and evolution of the DevOps movement. 2. Cultural	5	LO9	Information and communication technologies	Diploma project

| | | aspects: interaction between development and operations, principles of teamwork and communication. 3. Automation: using tools to automate the processes of building, testing, deploying and monitoring software. 4. Infrastructure as Code: Using tools to manage infrastructure through code, such as Ansible, Terraform, Chef, Puppet and others. 5. Containerization: Introduction to Docker and Kubernetes, using containers to package and deploy applications. 6. Continuous delivery: methodologies and practices for continuous software delivery, including CI/CD pipelines. 7. Monitoring and logging: Tools for monitoring application performance, availability and security. | | | | |

12. Curriculum of the educational program (Platonus)

№	Module name	Discipline cycle	Discipline component	Code of discipline	Name of discipline	Academic credits	Academic study period	Exams	Differentiated test	Term paper/project	Total	Lectures	Laboratory trainings	Practice	Studio lessons	Practice	IWST	IWS	1	2	3	4	5	6	7	8
																			15	15	15	15	15	15	15	15
													Minor module for disciplines													
													General modules													
1	OOM6002 Language and ICT skills development module	GED	RC	LAN6001A	Foreign language	5	1	1			5/150			45			15	90	5.0							
2		GED	RC	ICT6001	Information and Communication Technologies	5	1	1			5/150	15	30.0				15	90	5.0							
3		GED	RC	LAN6002A	Foreign language	5	2	2			5/150			45			15	90		5.0						
4		GED	RC	LAN6001KR	Kazakh (Russian) language	5	3	3			5/150			45			15	90			5.0					
5		GED	RC	LAN6002KR	Kazakh (Russian) language	5	4	4			5/150			45			15	90				5.0				
6	OOM6003 Module of physical culture	GED	RC	PhC6005	Physical Culture	4	2	2			4/120			45			15	60		4.0						
7		GED	RC	PhC6006	Physical Culture	4	3	3			4/120			45			15	60			4.0					
8	OOM6001 Module of social and cultural development	GED	RC	HK6002	History of Kazakhstan	5	4	4			5/150	15		30			15	90				5.0				
9		GED	RC	SPS6001	Philosophy	5	4	4			5/150	15		30			15	90				5.0				
10		GED	RC	SPS6006	Cultural studies-Psychology	4	5	5			4/120	30		15			15	60					4.0			
11		GED	RC	SPS6007	Sociology-Political science	4	6	6			4/120	30		15			15	60						4.0		
12	OOM6004 Module of personal and social development	GED	EC	HUM6400	Inclusive education	5	6	6			5/150	15		30			15	90						5.0		
13		GED		JUR 6505	Ecology and sustainable development			6			5/150	15		30			15	90								
14		GED		RM6001	Research metodology			6			5/150	15		30			15	90								
15		GED		JUR6413	Fundamentals safety of life activity			6			5/150	15		30			15	90								
16		GED		ECO6007	Foundation of economics and financial literacy			6			5/150	15		30			15	90								
17		GED		MGT6706	Startups and entrepreneurship			6			5/150	15		30			15	90								
18		GED		LAW6007	Fundamentals of law and anti-corruption culture			6			5/150	15		30			15	90								
										Modules of specialty/education programm																
19	BM6301 Module of	BD	UC	MAT6001_1	Algebra and geometry	4	1	1			4/120	15		30			15	60	4.0							
20		BD	UC	PHY6001	Physics	6	2	2			6/180	15	30.0	15			15	105		6.0						

F-72, Educational program

№	Module			Code	Discipline	Cr	a	b	c	Cr/Hrs	h1	h2	h3	h4	h5	h6	h7	S1	S2	S3	S4	S5	S6	S7	S8
21	Basic Mathematics and Natural Sciences	BD	UC	MAT6002	Mathematical analysis	6	2	2		6/180	30		30			15	105		6.0						
22		BD	UC	EGR6302	Information theory	4	3	3		4/120	15	30.0				15	60			4.0					
23		BD	UC	MAT6005	Discrete mathematics	4	3	3		4/120	15	30.0				15	60			4.0					
24		BD	UC	EEC6001	Basic Circuit Theory	4	3	3		4/120	15	30.0				15	60			4.0					
25		BD	UC	MAT6006	Probability theory and mathematical statistics	4	4	4		4/120	15	30.0				15	60				4.0				
26	BM6302 Module of Programming, Algorithms, and System Architectures	BD	UC	NET6301	Introduction to computer networks	4	1	1		4/120	15	30.0				15	60	4.0							
27		BD	UC	SFT6306	Software Architecture and Design	4	1	1		4/120	15	30.0				15	60	4.0							
28		BD	UC	SFT6301	Algorithmization and Programming	6	1	1		6/180	30	30.0				15	105	6.0							
29		BD	UC	SFT6305	Database Design. Introduction to SQL	4	2	2		4/120	15	30.0				15	60		4.0						
30		BD	UC	SFT6304	Programming in Python language	5	2	2		5/150	15	30.0				15	90		5.0						
31		BD	UC	SFT6302	Algorithms and Data Structures	3	3	3		3/90	15	15.0				15	45			3.0					
32		BD	UC	HRD6302	Architecture and Organization of Computer Systems	5	3	3		5/150	30		15			15	90			5.0					
33		BD	UC	EGR6301	Operating Systems	4	4	4		4/120	15	30.0				15	60				4.0				
34		BD	UC	EEC6004	Fundamentals of Logic Design	4	4	4		4/120	15	30.0				15	60				4.0				
35		BD	UC	SFT6320	Microcontroller programming	6	7	7		6/180	15	30.0	15			15	105							6.0	
36	BM6303 Module of Modern Technologies and Professional Skills	**BD**	**UC**	**EP6301**	**Educational practice**	**2**	**2**			**2/60**				60					2.0						
37		BD	UC	LAN6007K	Business correspondence in the state language	2	6	6		2/60		30				15	15						2.0		
38		BD	UC	EEC6006	Digital signal processing	6	7	7		6/180	30	30.0				15	105							6.0	
39		BD	UC	SEC6301	Fundamentals of information security	5	7	7		5/150	15	30.0				15	90							5.0	
40		BD	UC	RM6301	Research fundamentals	4	7		7	4/120	30		15			15	60							4.0	
41		BD	UC	PM6303	IT project management	5	8	8		5/150	15	30.0				15	90								5.0
42		BD	UC	SFT6186	Artificial intelligence	5	8	8		5/150	15	30.0				15	90								5.0
43		BD	UC	SFT6319	Blockchain technology	6	8	8		6/180	15	30.0	15			15	105								6.0
44	BM6304 Module of Microprocessor and Electronic Systems	BD		CUM 3255	Digital devices and micro processes	5	5		5	5/150	15	30.0				15	90					5.0			
45		BD	EC	HRD6307	Microprocessor systems and complexes	5	5		5	5/150	15	30.0				15	90					5.0			
46		BD		NET6304	Cloud Computing and Virtualization	5	6		6	5/150	15	30.0				15	90						5.0		
47		BD	EC	EEC6002	Design and simulation of electronic devices	5	6		6	5/150	15	30.0				15	90						5.0		
48		**MD**	**UC**	**IP6302**	**Industrial practice**	**4**	**4**			**4/120**				120							4.0				

F-72, Educational program

№	Module			Code	Discipline																						
49	PM6303 Module of Professional Training and Internships	MD	UC	LAN6003PA	Professionally oriented foreign language	4	5	5			4/120			45			15	60						4.0		
50		**MD**	**UC**	**IP6303**	**Industrial practice**	**4**	**6**				**4/120**				120									4.0		
51		**MD**	**UC**	**PP6304**	**Pre-diploma practice**	**5**	**8**				**5/150**				150											5.0
52	PM6304 Module of Minor Components	MD	EC	MIN601	Minor 1	5	5	5			5/150	15	30.0				15	90						5.0		
53		MD	EC	MIN602	Minor 2	5	6	6			5/150	15	30.0				15	90						5.0		
54		MD	EC	MIN603	Minor 3	5	7	7			5/150	15	30.0				15	90							5.0	
55	PM6301 Module of Embedded and Sensor Systems	MD	EC	HRD6308	Microcircuitry	5	5	5			5/150	15	30.0				15	90						5.0		
56		MD		HRD6309	Microelectronics			5			5/150	15	30.0				15	90								
57		MD	EC	HRD6304	Sensor Technologies	6	5	5			6/180	30		30			15	105						6.0		
58		MD	EC	SFT6330	Circuit design language - Verilog	6	6	6			6/180	30		30			15	105							6.0	
59	PM6302 Module of Network Technologies and System Integration	MD		NET6308	Connecting Networks			7			5/150	15		30			15	90								
60		MD	EC	SFT6315	DevOps	5	7	7			5/150	15		30			15	90								5.0
	Weekly average workload at hours																		0	0	0	0	0	0	0	0
1	**General education disciplines (GED)**					**56**		**12**	**0**	**0**	**1530**	**105**	**30**	**360**	**0**	**0**	**165**	**870**	**10**	**9**	**9**	**15**	**4**	**9**	**0**	**0**
	Required component (GED/RC)					51		11	0	0	1530	105	30	360	0	0	165	870	10	9	9	15	4	4	0	0
	University component (GED/UC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Elective component (GED/EC)					5		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
2	**Basic disciplines (BD)**					**122**		**25**	**0**	**1**	**3360**	**420**	**555**	**165**	**0**	**60**	**360**	**1800**	**18**	**23**	**20**	**12**	**5**	**7**	**21**	**16**
	Required component (BD/RC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component(BD/UC)					112		23	0	1	3360	420	555	165	0	60	360	1800	18	23	20	12	0	2	21	16
	Elective component (BD/EC)					10		2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	0	0
3	**Major disciplines (MD)**					**54**		**8**	**0**	**0**	**1320**	**105**	**90**	**105**	**0**	**390**	**90**	**540**	**0**	**0**	**0**	**4**	**20**	**15**	**10**	**5**
	Required component (MD/RC)					0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (MD/UC)					17		1	0	0	510	0	0	45	0	390	15	60	0	0	0	4	4	4	0	5
	Elective component (MD/EC)					37		7	0	0	810	105	90	60	0	0	75	480	0	0	0	0	16	11	10	0
	Total on curriculum					232			0	1	6210	630	675	630	0	450	615	3210	28	32	29	31	29	31	31	21

Additional courses	Number of credits	Academic period	Number of hours	Number of weeks
Module of final certification (MoFC)	**8**		**240.0**	
Total including FC	**240**		**7200.0**	

13. Additional Educational Programs (Minor)

The name of the AEP (Minor), indicating the list of disciplines forming the Minor	Number of credits AEP / number of credits in the discipline	Description, Competencies generated by the AEP, learning outcomes
PM6304 Module of Minor Components	15	Minors for the Humanities
Minor 1: Database Design. Introduction to SQL (SFT6305)	5	**Competencies Developed:** • Ability to apply basic principles of database design and query languages in humanities research. • Proficiency in data storage, structuring, and retrieval tools. • Skills in analyzing and visualizing humanities data using DBMS. **Learning Outcomes:** • Understanding of major database types, data models, and normalization. • Ability to develop database structure based on the subject area. • Proficiency in basic SQL syntax (SELECT, JOIN, filtering, aggregation). • Ability to use databases for processing and analyzing humanities information (e.g., linguistic corpora, historical archives).
Minor 2: UX/UI Design (SFT6309)	5	**Competencies Developed:** • Ability to design user interfaces and experiences in digital humanities projects. • Skills in engaging with end users during the development of digital tools. • Understanding of aesthetics and functionality in digital solutions for the humanities. **Learning Outcomes:** • Knowledge of core interface design principles (usability, accessibility, cognitive load). • Proficiency in UX research methods. • Ability to create low-fi and hi-fi prototypes using modern tools (Figma, Adobe XD, etc.). • Skills in evaluating and improving interfaces based on feedback and testing.
Minor 3: Introduction to Data Science (ANL6301)	5	**Competencies Developed:** • Basic understanding of data analysis methods applicable in the humanities. • Skills in data interpretation and visualization. • Ability to use data processing tools for humanities research. **Learning Outcomes:** • Familiarity with basics of statistics, machine learning, and data visualization. • Proficiency in basic data analysis tools (Python, Jupyter Notebook, pandas, matplotlib, etc.). • Ability to collect, clean, and analyze data, including text and historical data.

		• Understanding of the potential and limitations of data science in digital history, philology, linguistics, etc.
PM6304 Module of Minor Components	15	Minors for Technical Sciences
Minor 1: ICPC – LeetCode Problem Solving 1 (SFT6336)	5	Competencies Developed: • Proficiency in basic algorithms and data structures used in technical interviews. • Skills in formulating, decomposing, and efficiently solving typical algorithmic problems. • Ability to implement algorithms with time and memory constraints. Learning Outcomes: • Knowledge of core data structures: arrays, strings, lists, stacks, queues, hash tables. • Ability to solve beginner (Easy to some Medium) LeetCode problems. • Skills in algorithm complexity evaluation (Big O notation). • Ability to explain and present solutions orally.
Minor 2: ICPC – LeetCode Problem Solving 2 (SFT6338)	5	Competencies Developed: • Development of algorithmic thinking and confidence in key problem-solving techniques. • In-depth knowledge of search, sorting, recursion, and dynamic programming algorithms. • Skills in solution optimization and handling constraints. Learning Outcomes: • Confidently solve Medium-level LeetCode problems. • Application of search algorithms (DFS, BFS, binary search), sorting, greedy methods. • Ability to create recursive and iterative solutions. • Ability to write clean and efficient code for interviews.
Minor 3: ICPC – LeetCode Problem Solving 3 (SFT6339)	5	Competencies Developed: • Mastery of advanced algorithmic techniques in demand at leading tech company interviews. • Ability to solve complex problems involving graphs, trees, backtracking, and dynamic programming. • Skills in communication and teamwork under time constraints. Learning Outcomes: • Ability to solve Hard-level LeetCode problems involving trees, graphs, segment trees, suffix structures. • Knowledge of advanced topics: memoized dynamic programming, topological sorting, combinatorics. • Skills in structuring solutions and presenting reasoning effectively. • High readiness for FAANG-level interviews and ICPC programming competitions.