

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

6B06107 Cyberphysical Systems

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's degree in information and communication technologies in
the educational program «6B06107 Cyberphysical Systems»

Duration of study: 3 years

Number of credits: 240

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Director of
«KnewIT Programming School» LLC

 **Bekmurov N.M.**

2025



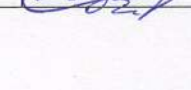
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Executive Director of
«Internet Society Kazakhstan»

 **Nurlybayev T.A.**

2025

The code and name of the educational program: 6B06107 «Cyberphysical Systems»

№	Educational program developers (Position, scientific degree, academic degree, Full name)	Signature
1	PhD, head of the «CE» department, assoc. professor Bykov A.A.	
2	MSc, assistant professor of the «CE» department Bekaulova Zh.M.	
3	MSc, assistant G1 of the «CE» department Sarsenbek K.	

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List of abbreviations and acronyms

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

1. Description of the educational program

The basis for the development of educational program «6B06107 Cyberphysical systems» is the need to train qualified specialists in the field of robotics and information and communication systems who have the necessary knowledge to develop and maintain software products that have the necessary practical skills in the field of hardware construction of information and communication systems with engineering thinking.

At present, new types of robotic systems are developing rapidly and are in demand. There is wide experience in the use of robots and flexible manufacturing systems in industry and manufacturing. Their application requires a new organization of the technological process and, as a result, special training of specialists in this field. Only under such a condition industrial robots and production robotics can give the greatest effect during application.

Robotic systems with adaptive and intelligent robots need microprocessor-based distributed control. Therefore, the training of specialists of this level requires systematic training and affects the development of this subject area. This profession requires artificial intelligence knowledge from a specialist and includes: the creation and operation of devices and systems based on the use of information processing, the ability to solve software development and maintenance tasks, the research and development of robotic technologies, the creation of robotic systems models, the ability to create smart technical systems obtaining information about technical objects, modeling robots, prototyping robots.

2. Aim and objectives of the educational program

The purpose of the EP - to provide practice-oriented training of highly qualified specialists in the field of robotics and production and administrative activities related to the process of creating and using a fundamentally new means of complex automation of production processes - robotic systems for the manufacturing industry of Kazakhstan.

AP objectives:

1. The formation of knowledge and skills: on the design and operation of specialized software and hardware for industrial use; on the organization of database systems, information processing and storage systems; on the design and administration of local and corporate computing systems and networks; business process automation.

2. Obtaining knowledge and skills in the field of network and telecommunication technologies, system, application, software and hardware.

3. Providing training for bachelors in robotics researching the theory, development and application of robotic technologies. Development of skills in applying information technologies for robotics, machine learning, artificial intelligence and design of robotics systems, as well as creating new generation technical systems designed for industrial robotics.

4. Developing respect for the university. Ensuring the demand, mobility of the specialty, obtaining high-quality knowledge and the ability to work in a team.

5. Formation of competitive graduates in the labor market, which would provide the opportunity for the fastest possible employment in the specialty.

6. Training of specialists in the field of robotics and production and management activities related to the process of creating and using a fundamentally new technical tool for the comprehensive automation of production processes - robotic systems.

7. Creation of conditions for professional growth and self-improvement, development of social and personal competencies of graduates and the formation of a steady interest in robotics (active citizenship, determination, organization, industriousness, sociability, the ability to make organizational and managerial decisions and stimulate creative activity, knowledge of modern information technologies, fluency in several languages, the desire for self-education and self-development, the ability to work in a team, responsibility for the end result of one's professional activity, involvement in universal values), social mobility and demand in the labor market.

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	6B06107 Cyberphysical systems
5.	Aim of the educational program	to provide practice-oriented training of highly qualified specialists in the field of robotics and production and administrative activities related to the process of creating and using a fundamentally new means of complex automation of production processes - robotic systems for the manufacturing industry of Kazakhstan
6.	Type of the educational program	Innovative 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	-
10.	Partner University	-
11.	Academic degree awarded	Bachelor's degree in information and communication technologies in the educational program «6B06107 Cyberphysical systems»
12.	Duration of study	3 years
13.	Volume of credits	240
14.	Language of education	English
15.	Atlas of new professions	Designer/Developer/Engineer of technological intelligent cyber-physical infrastructures; IoT specialist; Cyborg engineer
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	<p>LO1: Demonstrate the ability to use basic mathematical tools to solve the problems of analysis and calculation of the characteristics of robotic systems.</p> <p>LO2: To conduct a feasibility study of projects of robotic systems, to collect, process, analyze and systematize scientific and technical information on the research topic.</p> <p>LO3: To develop design and technical documentation, to draw up design work.</p> <p>LO4: Operate and maintain robotic systems.</p> <p>LO5: Carry out the calculation and design of robotic equipment.</p> <p>LO6: Own the methods of installation,</p>

		<p>configuration and adjustment of robotic systems, perform maintenance and installation work on robotic equipment.</p> <p>LO7: To carry out verification, adjustment and adjustment of equipment, tuning of software tools used for the development, production and tuning of robotic systems and devices.</p> <p>LO8: Conduct software testing for robotic systems, technical support and maintenance of software for robotic systems.</p> <p>LO9: Develop operating instructions for technical equipment and software for robotic systems.</p> <p>LO10: Perform mathematical modeling of objects of robotic systems, design and development of software for robotic systems.</p> <p>LO11: Independently critically analyze modern sources, draw conclusions, argue them and make decisions based on information.</p>
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4. Professional Standards (PS), profession cards, labor functions

№	Name of the PS	Profession card	Labor functions
1	IoT systems development	Cloud IoT Engineer	Ensuring operability at the physical level
			Ensuring operability at the network level
			Ensuring operability at the application level
		IoT Software Engineer	Ensuring interaction and management of IoT devices
			Improving and conducting a procedure for monitoring the operability of the IoT system.
2	Technical support of electronics	Objective Control Technician	Maintenance of equipment for objective control systems
			Technical support for objective control systems
		Electronic Engineering Technician	Installation and adjustment of devices, units and instruments of electronic equipment
			Maintenance and repair of various types of electronic equipment
			Operation and technical support of electronic equipment
		Electronic Technician	Testing of electronic circuits, diagnostics of faults
			Modification of electronic circuits
			Development of electronic circuits based on standard projects
		Electronic Engineer	Operation of electronic equipment
			Development and design of electronic equipment, electronic complexes and systems for various purposes

5. List of the EP competencies

GEC1: Explain the principles and laws of the historical development of society, know your role in the development of information technology, strive for self-improvement.

BC1: The ability to use modern information and communication technologies in substantive activities.

BC2: The ability to formalize the subject area of the project and draw up the terms of reference for the development of robotic systems.

PC1: The ability to develop and integrate software modules and software components. Maintain robotic system management software.

PC2: The ability to develop and implement intelligent algorithms for robotic systems.

PC3: The ability to develop and model robots according to the terms of reference. Prototype robots.

PC4: The ability to program and reprogram robots. Upgrade and upgrade robotic systems.

PC5: To carry out commissioning work on the launch of the robotic system (load calculation, construction of optimal motion paths, troubleshooting). Perform maintenance of robotic systems.

6. List of learning outcomes of the EP

LO1: Demonstrate the ability to use basic mathematical tools to solve the problems of analysis and calculation of the characteristics of robotic systems.

LO2: To conduct a feasibility study of projects of robotic systems, to collect, process, analyze and systematize scientific and technical information on the research topic.

LO3: To develop design and technical documentation, to draw up design work.

LO4: Operate and maintain robotic systems.

LO5: Carry out the calculation and design of robotic equipment.

LO6: Own the methods of installation, configuration and adjustment of robotic systems, perform maintenance and installation work on robotic equipment.

LO7: To carry out verification, adjustment and adjustment of equipment, tuning of software tools used for the development, production and tuning of robotic systems.

LO8: Conduct software testing for robotic systems, technical support and maintenance of software for robotic systems.

LO9: Develop operating instructions for technical equipment and software for robotic systems.

LO10: Perform mathematical modeling of objects of robotic systems, design and development of software for robotic systems.

LO11: Independently critically analyze modern sources, draw conclusions, argue them and make decisions based on information.

LO12: Is able to apply the acquired knowledge from the chosen supplementary educational program

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	LO12
GEC1		V		V			V	V	V		V	V
BC1	V									V		V
BC2		V	V						V		V	
PC1			V	V		V	V	V	V	V		
PC2	V				V					V		

PC3	V				V					V		
PC4	V					V				V		
PC5				V		V	V					

8. The relationship of LO with labor functions

№	LO	Labor functions
1.	Demonstrate the ability to use basic mathematical tools to solve problems of analysis and calculation of characteristics of robotic systems	Ensuring operability at the physical level
		Ensuring operability at the network level
		Ensuring operability at the application level
		Ensuring interaction and management of IoT devices
		Improving and conducting a procedure for monitoring the operability of the IoT system.
2.	Conduct a feasibility study of robotic systems projects, collect, process, analyze and systematize scientific and technical information on the research topic	Ensuring interaction and management of IoT devices
		Improving and conducting the procedure for monitoring the performance of the IoT system.
		Testing electronic circuits, troubleshooting
		Development and design of electronic equipment, electronic complexes and systems for various purposes
3.	Develop design and technical documentation, execute design and engineering work	Development of electronic circuits based on standard projects
		Development and design of electronic equipment, electronic complexes and systems for various purposes
4.	Operate and maintain robotic systems	Ensuring operability at the physical level
		Ensuring interaction and management of IoT devices
		Improving and implementing a procedure for monitoring the operability of the IoT system.
		Maintenance of equipment for objective control systems
		Technical support for objective control systems
		Operation and technical support of electronic equipment
		Operation of electronic equipment
5.	Carry out calculation and design of robotic equipment	Development of electronic circuits based on standard projects
		Development and design of electronic equipment, electronic complexes and systems for various purposes
6.	Master the methods of installation, setup and adjustment of robotic systems, perform work on maintenance and installation of robotic equipment	Providing interaction and control of IoT devices
		Maintenance of equipment for objective control systems
		Installation and adjustment of devices, units and instruments of electronic equipment
		Maintenance and repair of various types of electronic equipment
7.	Conduct verification, setup and adjustment of equipment, setup of software used for the development, production and setup of robotic systems and devices	Ensuring interaction and management of IoT devices
		Improving and conducting the procedure for monitoring the performance of the IoT system.
		Technical support for objective control systems
		Testing electronic circuits, troubleshooting

8.	Conduct software testing for robotic systems, technical support and maintenance of software for robotic systems	Ensuring operability at the application level
		Improving and conducting the procedure for monitoring the operability of the IoT system.
		Technical support for objective control systems
		Testing electronic circuits, troubleshooting
9.	Develop operating instructions for technical equipment and software for robotic systems	Technical support of objective control systems
		Operation and technical support of electronic equipment
		Operation of electronic equipment
10.	Perform mathematical modeling of robotic systems objects, design and develop software for robotic systems	Ensuring operability at the physical level
		Ensuring operability at the network level
		Ensuring operability at the application level
		Modification of electronic circuits
		Development of electronic circuits based on standard projects
		Development and design of electronic equipment, electronic complexes and systems for various purposes
11.	Independently analyze modern sources in a comprehensive and critical manner, draw conclusions, argue them and make decisions based on the information	Ensuring operability at the network level
		Ensuring interaction and management of IoT devices
		Improving and conducting a procedure for monitoring the operability of the IoT system.
		Testing electronic circuits, troubleshooting
		Development and design of electronic equipment, electronic complexes and systems for various purposes
12.	Able to apply acquired knowledge in the chosen additional educational program	Depends on the profile of the DPP

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 evaluation method
General educational competencies			
GEC1	LO11	Able to analyze information, justify and make decisions	Oral exam
			Written exam
	LO12	Able to apply knowledge of an additional program, shows a desire for development	Project
			Written exam
Basic competencies			
BC1	LO1	Ability to use mathematical methods for analysis and calculations	Computer testing
			Practical exam
	LO3	Proficiency in ICT when preparing technical documentation	Project
			Practical exam
	LO8	Using ICT for testing and maintaining software	Practical exam
	LO10	Use of ICT in modeling and design	Practical exam
			Solving problems on PC
BC2	LO2	Ability to formalize a project, perform a feasibility study	Written exam

	LO5	Able to develop technical specifications and perform design	Defense of the course project
Professional competencies			
PC1	LO8	Software development, testing and support	Practical exam
	LO10	Integration and support of software modules	Project
PC2	LO10	Ability to apply intelligent algorithms	Comprehensive exam
	LO11	Validity of adopted technical solutions	Project
PC3	LO5	Ability to design, model and assemble robot prototypes	Solving problems on PC
	LO10	Carrying out modeling and calculations according to the technical specifications	Comprehensive exam
PC4	LO6	Installation, setup and updating of robotic systems	Project defense
	LO7	Setup, adjustment, updating of systems	Practical exam
	LO10	Programming and adaptation of systems	Practical exam
PC5	LO4	Operation and maintenance of robotic systems	Project
	LO6	Carrying out commissioning and maintenance work	Practical exam
	LO7	Diagnostics, troubleshooting	Practical exam

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 methodology
				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`	28	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
				MAT6005 Discrete mathematics
				EEC6001 Basic Circuit Theory
BM6302 Module of Programming, Algorithms, and System Architectures	31	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.	MAT6006 Probability theory and mathematical statistics
				NET6301 Introduction to computer networks
				SFT6301 Algorithmization and Programming
				SFT6301 Database Design. Introduction to SQL
				SFT6304 Programming in Python language
BM6303 Module of Modern Technologies and Professional Skills	25	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.	SFT6302 Algorithms and Data Structures
				EEC6004 Fundamentals of Logic Design
				EP6301 Educational practice
				IP6305 Industrial practice
				RM6301 Research fundamentals
BM6311 Module of Robotics and Computer Graphics	23	The student has an understanding of the basics of constructing and operating robotic systems, the principles of their operation and programming, methods of 3D modeling and visualization, additive manufacturing technologies, means of designing electronic circuits and devices, as well as the integration of robotics and computer graphics in solving engineering problems.	Testing, oral interview, course, laboratory, control work, midterm.	LAN6007K Business correspondence in the state language
				EEC6006 Digital signal processing
				EGR6300 Fundamentals of computer graphics
				HRD6301 Introduction to Robotics
				HRD6305 Applied Robotics (IoT)
				HRD6306 Robotics with Artificial Intelligence

PROFESSIONAL MODULES

PM6301 Module of Embedded and Sensor Systems	23	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.	HRD6304 Sensor Technologies
				HRD6310 Embedded Systems 1. Architecture of microcontrollers and microprocessors
				HRD6311 Embedded systems 2. Digital systems design
				HRD6312 Embedded systems 3. Development of cyber-physical systems

PM6302 Module of Network Technologies and System Integration	10	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.	HRD6313 Electronic systems
				NET6303 Network programming
PM6303 Module of Professional Training and Internships	12	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.	LAN6003PA Professionally oriented foreign language
				EGR6303 Project management
				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
PM6308 Module of Digital Technologies and Artificial Intelligence	14	The student has an understanding of the basics of artificial intelligence and machine learning, modern digital and Smart technologies, principles of information security, methods of 3D modeling and additive manufacturing, as well as the use of specialized software for designing and automating engineering tasks.	Testing, oral interview, course, laboratory, control work, midterm	SFT6322 Introduction of artificial intelligence
				EGR6305 3D modeling Altium Designer
				EGR6304 3D printing Solidworks
				SFT6317 Machine Learning - 1
				SEC6301 Fundamentals of information security
				SFT6331 Smart technologies

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.	ICT6001 Information and Communication Technologies	The skills of applying information and communication technologies in substantive activities are taught.	5	LO4	-	
2.	LAN6001A Foreign language	Written and oral communication skills in English are taught.	5	LO2, LO3	-	LAN6001A
3.	LAN6002A Foreign language	Written and oral communication skills in English are taught.	5	LO2, LO3	LAN6001A	LAN6003PA
4.	PhC6005 Physical Culture	The ability to understand the practical use of healthy living standards, including prevention issues, is being instilled.	4		-	PhC6005
5.	PhC6006 Physical Culture	The ability to understand the practical use of healthy living standards, including prevention issues, is being instilled.	4		PhC6005	-
6.	LAN6001KR Kazakh (Russian) language	The skills of written and oral communication in the state language (the language of interethnic communication) are inculcated.	5	LO2, LO3	-	LAN6001KR
7.	LAN6002KR Kazakh (Russian) language	The skills of written and oral communication in the state language (the language of interethnic communication) are inculcated.	5	LO2, LO3	LAN6001KR	LAN6007K
8.	HK6002 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	LO11	-	
9.	SPS6001 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	LO11	-	

10.	SPS6006 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	LO11	-	
11.	SPS 6007 Sociology- Political science	During the course "Sociology" various phenomena of social life are studied. At the same time the study is carried out from various paradigms of social knowledge, using theories and scientific methods. Students successfully completing the course will be able to: 1. Use qualitative and quantitative research methods, which will be useful in scientific and professional field. 2. Distinguish between scientific and non-scientific knowledge. 3. Understand and analyze social phenomena and issues from different perspectives. 4. Manage to work in a team. The course Political science provides comprehensive coverage of all key elements, the study of sources and political relations, types of political systems, democratic and authoritarian systems, political mechanisms, political competition and power, political capital and values, survival of political ideas, nationalism, analysis of domestic and foreign policy, political growth, state policy in the world political system.	4	LO11	-	
Cycle of general education disciplines (GED)						
Elective component (EC)						
12.	RM6001	The course is devoted to the study of	5	LO2,	SPS6006	

	Research methodology	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).		LO3		
13.	HUM6400 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 support of students with disabilities and disabilities at the university.		LO9	-	
14.	JUR 6505 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.		LO9	-	
15.	ECO6007 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		LO1	-	

		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.				
16.	LAW6007 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 activities of organizations leading to corruption. 3. Analyze the work of organizations using various research methods.		LO11	SPS6006	
17.	MGT6706 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.		LO11	-	
18.	JUR6413 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.		LO9	SPS6007	
Cycle of basic disciplines (BD) University component (UC)						
19.	MAT6001** 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,	4	LO1	-	MAT6002

		lines, planes, linear and Euclidean spaces, linear transformations, and quadratic forms. They should also learn to work with equations of lines and planes.				
20.	NET6301 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.	5	LO6	-	NET6303
21.	SFT6301 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	LO6, LO10	-	SFT6302 SFT6304
22.	HRD6301 Introduction to robotics	Comprehensive and comprehensive coverage of robotics as a science and technology. It covers topics from basics to advanced applications and services, providing students with practical experience with Arduino and desktop robots.	6	LO4, LO5	-	HRD6304
23.	MAT6002 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	MAT6001 **	MAT6005
24.	PHY6001 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	LO5	-	EEC6001
25.	PP6301 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.	4	LO2, LO3	-	
26.	SFT6305	During the course students will learn	5	LO7	-	EEC6004

	Database design. Introduction to SQL	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.				
27.	EEC6001 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	LO5	PHY6001	HRD6310
28.	MAT6005 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	MAT6002	MAT6006
29.	SFT6302 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.	5	LO7	SFT6301	
30.	SFT6304 Programming in Python language	Familiarity with the Python programming language and its libraries. The emphasis is on procedural programming, non-strict types of variables, designing algorithms, working forms of applications (libraries), object-oriented programming, creating web and database applications, as well as data preprocessing.	5	LO8, LO10	SFT6301	SFT6322
31.	EGR6300 Fundamentals of computer graphics	"Fundamentals of Computer Graphics" presents the basic principles of creating and processing graphic images using a computer. The discipline covers the basic concepts of raster and vector graphics, image editing techniques, as well as the basics of three-dimensional	5	LO3	-	EGR6305

		modeling and animation.				
32.	EEC6004 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.	5	LO5	SFT6305	EEC6006
33.	MAT6006 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	MAT6005	ECO6002
34.	HRD6310 Embedded Systems 1. Architecture of microcontrollers and microprocessors	The objectives of the course "Embedded Systems 1. Architecture of Microcontrollers and Microprocessors" is to provide basic theoretical knowledge and practical skills of Embedded Systems. This discipline is the initial stage in a series of courses studying Embedded Systems and how to develop them.	6	LO4, LO9	EEC6001	HRD6311
35.	HRD6304 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, 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.	6	LO4	HRD6301	HRD6305 HRD6306
36.	LAN6007K 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	3	LO2, LO3	LAN6002 KR	EGR6303

		documents into Kazakh language.				
37.	HRD6311 Embedded systems 2. Digital systems design	The purpose of mastering the discipline "Embedded Systems 2. Design of Digital Systems" is to consolidate the past material and continue to study Embedded Systems in depth. The students' tasks are to study the process and independently design digital systems.	6	LO3	HRD6310	HRD6312 HRD6313
38.	EEC6006 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	LO10	EEC6004	
39.	HRD6305 Applied robotics (IoT)	Modeling, creating and demonstrating complex multi-robotic systems, including sensing, computation and actuation. The industrial problems of the real world are considered. The student will design and build a mechanical subsystem with appropriate drives and sensors for computer control.	6	LO6	HRD6304	
40.	HRD6306 Robotics with artificial intelligence	The study of the basic methods in the field of artificial intelligence, including probabilistic inference, planning and search, localization, tracking and control, all with an emphasis on robotics.	6	LO6	HRD6304	
41.	RM6301 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.	5	LO2, LO11	LAN6003 PA	
42.	HRD6312 Embedded systems 3. Development of cyber-physical systems	The goals of studying the discipline "Embedded Systems 3. Development of Cyber-Physical Systems" are to teach independent practical development of cyber-physical systems, and to consolidate the knowledge acquired in previous courses.	5	LO3	HRD6311	
43.	PP6305 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.	7	LO3, LO4, LO6, LO7	-	
Cycle of major disciplines (MD)						
University component (UC)						
44.	LAN6003PA 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	3	LO2, LO3	LAN6002 A	RM6301

		and graphical interface", "Text processing", "Cyberspace: security and crime", etc.				
45.	EGR6303 Project management	Learning the basics of project management and the necessary steps to ensure successful project management. Studying the main characteristics of project management and various roles in the project to ensure success. Application of key skills to the project to evaluate, plan and develop control mechanisms.	4	LO3, LO11	LAN6007 K	
46.	PP6304 Pre-diploma practice	Search for information for writing the diploma project	5	LO2, LO3	-	
Cycle of major disciplines (MD) Elective component (EC)						
47.	SFT6322 Introduction of artificial intelligence	The course will cover basic machine learning algorithms such as regression, classification, clustering, and neural networks, as well as deep learning and natural language processing technologies.	5	LO10	SFT6304	SFT6317
48.	EGR6305 3D modeling Altium Designer	Altium Designer 3D Modeling teaches you how to create three-dimensional models of electronic components and printed circuit boards in Altium Designer. Students learn how to create and edit 3D models, which helps in the visualization and design of electronic devices and their components.		LO10	EGR6300	EGR6304
49.	SFT6317 Machine Learning - 1	Machine Learning - 1 introduces students to the basic concepts and methods of machine learning. Teacher-led, unsupervised and partial learning, as well as classification and regression algorithms, including linear regression and the support vector machine, are the key topics of this discipline.	5	LO8, LO10	SFT6322	SFT6331
50.	EGR6304 3D printing Solidworks	3D Printing Solidworks teaches students how to use the Solidworks software to create models and prepare them for 3D printing. The course covers the basic principles of modeling, the choice of materials and printing processes, as well as methods of quality management and economical use of resources.		LO3	EGR6305	SEC6301
51.	MIN601 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	LO12	-	
52.	MIN602 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	LO12	-	
53.	SFT6331 Smart	The subject of the discipline is information technology infrastructure,	4	LO5	SFT6317	

	technologies	the use of software, communication systems, networks and databases. The purpose of this course is to study rapidly developing and changing technologies in the field of embedded systems, sensors, and wireless networks.				
54.	SEC6301 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.		LO7	EGR6304	
55.	NET6303 Network programming	The study of network connectivity from local networks to the global Internet. We study standard problems and a number of solutions for each of them with special emphasis on the set of TCP / IP protocols. This course provides students with a working vocabulary, as well as the knowledge and skills necessary to implement, debug, and improve basic network applications.	5	LO7	NET6301	
56.	HRD6313 Electronic systems	The objectives of the course are to introduce students to the basic principles and technologies of design, analysis and development of electronic systems; consideration of various types of sensors and actuators, their operating principles, connection and control.		LO4, LO9	HRD6311	
57.	MIN603 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	LO12	-	

12. Curriculum of the educational program (Platonus)

WORKING CURRICULUM
for the 2025-2028 academic years
for the educational program “6B06107-Cyberphysical systems”
field of education 6B06 – Information and Communication technologies
area of training 6B061 – Information and Communication technologies
specialty/ group of educational programs B057 – Information technologies
Degree: Bachelor
Form of study: Full 3 year
Year of admission: 01-09-2025

№	Module name	Discipline cycle	Discipline component	Code of discipline	Name of discipline	Academic credits	Academic study period	Control in the academic period			Number of hours									Distribution of credits per academic period						
											Total	Classroom work					IWS		1 course		2 course		3 course			
								Exams	Differentiated test	paper/project		Lectures	Laboratory trainings	Practice	Studio lessons	Practice	IWST	IWS	1	2	3	4	5	6		
																			Number of weeks in the academic period							
																			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	SPS6001	Philosophy	5	4	4			5/150	15		30			15	90				5.0				
9		GED	RC	HK6002	History of Kazakhstan	5	4	4			5/150	15		30			15	90				5.0				
10		GED	RC	SPS6006	Cultural studies- Psychology	4	5	5			4/120	15	30.0				15	60					4.0			
11		GED	RC	SPS6007	Sociology- Political science	4	6	6			4/120	15	30.0				15	60								4.0
12	OOM6004 Module of personal and social development	GED	EC	JUR 6505	Ecology and sustainable development	5	6	6			5/150	15		30			15	90								5.0
13		GED		RM6001	Research methodology			6			5/150	15		30			15	90								
14		GED		JUR6413	Fundamentals safety of life activity			6			5/150	15		30			15	90								

15		GED		ECO6007	Foundation of economics and financial literacy			6			5/150	15		30			15	90								
16		GED		MGT6706	Startups and entrepreneurship			6			5/150	15		30			15	90								
17		GED		LAW6007	Fundamentals of law and anti-corruption culture			6			5/150	15		30			15	90								
18		GED		HUM6400	Inclusive education			6			5/150	15		30			15	90								
Modules of specialty/education programm																										
19	BM6301 Module of Basic Mathematics and Natural Sciences	BD	UC	PHY6001	Physics	6	1	1			6/180	15	30.0	15			15	105	6.0							
20		BD	UC	MAT6001_1	Algebra and geometry	4	1	1			4/120	15		30			15	60	4.0							
21		BD	UC	EEC6001	Basic Circuit Theory	4	2	2			4/120	15	30.0				15	60		4.0						
22		BD	UC	MAT6002	Mathematical analysis	6	2	2			6/180	30		30			15	105		6.0						
23		BD	UC	MAT6005	Discrete mathematics	4	3	3			4/120	15	30.0				15	60			4.0					
24		BD	UC	MAT6006	Probability theory and mathematical statistics	4	4	4			4/120	15		30			15	60				4.0				
25	BM6302 Module of Programming, Algorithms, and System Architectures	BD	UC	SFT6301	Algorithmization and Programming	6	1	1			6/180	30	30.0				15	105	6.0							
26		BD	UC	SFT6302	Algorithms and Data Structures	5	1	1			5/150	15	30.0				15	90	5.0							
27		BD	UC	NET6301	Introduction to computer networks	5	1	1			5/150	15	30.0				15	90	5.0							
28		BD	UC	SFT6304	Programming in Python language	5	2	2			5/150	15	30.0				15	90		5.0						
29		BD	UC	SFT6305	Database Design. Introduction to SQL	5	2	2			5/150	15	30.0				15	90		5.0						
30		BD	UC	EEC6004	Fundamentals of Logic Design	5	3	3			5/150	15	30.0				15	90			5.0					
31	BM6311 Module of Robotics and Computer Graphics	BD	UC	EGR6300	Fundamentals of computer graphics	5	2	2			5/150	15	30.0				15	90		5.0						
32		BD	UC	HRD6301	Introduction to Robotics	6	2	2			6/180	15	30.0	15			15	105		6.0						
33		BD	UC	HRD6305	Applied Robotics (IoT)	6	5	5			6/180	30	30.0				15	105						6.0		
34		BD	UC	HRD6306	Robotics with Artificial Intelligence	6	6	6			6/180	30	30.0				15	105							6.0	
35	BM6303 Module of Modern Technologies and Professional	BD	UC	EP6301	Educational practice	4	2				4/120					120				4.0						
36		BD	UC	IP6305	Industrial practice	7	4				7/210					210							7.0			
37		BD	UC	RM6301	Research fundamentals	5	5	5			5/150	30		15			15	90						5.0		

38	Skills	BD	UC	LAN6007K	Business correspondence in the state language	3	5	5			3/90			30			15	45					3.0	
39		BD	UC	EEC6006	Digital signal processing	6	5	5			6/180	15	30.0	15			15	105					6.0	
40	PM6301 Module of Embedded and Sensor Systems	BD	UC	HRD6310	Embedded Systems 1. Architecture of microcontrollers and microprocessors	6	3	3			6/180	30	30.0				15	105			6.0			
41		BD	UC	HRD6304	Sensor Technologies	6	4	4			6/180	30	30.0				15	105				6.0		
42		BD	UC	HRD6311	Embedded systems 2. Digital systems design	6	4	4			6/180	30	30.0				15	105				6.0		
43		BD	UC	HRD6312	Embedded systems 3. Development of cyber-physical systems	5	5	5			5/150	15	30.0				15	90					5.0	
44	PM6303 Module of Professional Training and Internships	MD	UC	LAN6003PA	Professionally oriented foreign language	3	3	3			3/90			30			15	45			3.0			
45		MD	UC	EGR6303	Project management	4	6	6			4/120	15	30.0				15	60					4.0	
46		MD	UC	PP6304	Pre-diploma practice	5	6				5/150				150									5.0
47	PM6308 Module of Digital Technologies and Artificial Intelligence	MD	EC	SFT6322	Introduction of artificial intelligence	5	3	3			5/150	15	30.0				15	90			5.0			
48		MD		EGR6305	3D modeling Altium Designer			3			5/150	15	30.0				15	90						
49		MD	EC	EGR6304	3D printing Solidworks	5	5	5			5/150	15	30.0				15	90				5.0		
50		MD		SFT6317	Machine Learning - 1			5			5/150	15	30.0				15	90						
51		MD	EC	SEC6301	Fundamentals of information security	4	6	6			4/120	15		30			15	60					4.0	
52		MD		SFT6331	Smart technologies			6			4/120	15		30			15	60						
53	PM6304 Module of Minor Components	MD	EC	MIN601	Minor 1	5	3	3			5/150	15	30.0				15	90			5.0			
54		MD	EC	MIN602	Minor 2	5	4	4			5/150	15	30.0				15	90				5.0		
55		MD	EC	MIN603	Minor 3	5	6	6			5/150	15	30.0				15	90						5.0
56	PM6302 Module of Network Technologies and System Integration	MD	EC	HRD6313	Electronic systems	5	5	5			5/150	15	30.0				15	90					5.0	
57		MD		NET6303	Network programming			5			5/150	15	30.0				15	90						
Additional modules beyond qualification																								
Modules of choice																								
Weekly average workload at hours																		0	0	0	0	0	0	

1	General education disciplines (GED)	56		12	0	0	1530	75	90	330	0	0	165	870	10	9	9	15	4	9
	Required component (GED/RC)	51		11	0	0	1530	75	90	330	0	0	165	870	10	9	9	15	4	4
	University component (GED/UC)	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
2	Basic disciplines (BD)	130		23	0	0	3900	450	540	180	0	330	345	2055	26	35	15	23	25	6
	Required component (BD/RC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (BD/UC)	130		23	0	0	3900	450	540	180	0	330	345	2055	26	35	15	23	25	6
	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)	46		9	0	0	810	60	120	30	0	150	75	375	0	0	13	5	10	18
	Required component (MD/RC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (MD/UC)	12		2	0	0	360	15	30	30	0	150	30	105	0	0	3	0	0	9
	Elective component (MD/EC)	34		7	0	0	450	45	90	0	0	0	45	270	0	0	10	5	10	9
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 on curriculum	232			0	0	6240	585	750	540	0	480	585	3300	36	44	37	43	39	33
6	Additional courses											Number of credits		Academic period		Number of hours		Number of weeks		
7	Module of final certification (MoFC)											8				240.0				
	Total including FC											240				7200.0				

WORKING CURRICULUM
for the 2025-2028 academic years
for the educational program “6B06107-Cyberphysical systems”
field of education 6B06 – Information and Communication technologies
area of training 6B061 – Information and Communication technologies
specialty/ group of educational programs B057 – Information technologies
Degree: Bachelor
Form of study: reduced 3 years
Year of admission: 01-09-2025

№	Module name	Discipline cycle	Discipline component	Code of discipline	Name of discipline	Academic credits	Academic study period	Control in the academic period			Number of hours								Distribution of credits per academic period						
								Exams	Differentiated test	paper/project	Total	Classroom work				IWS				1 course		2 course		3 course	
												Lectures	Laboratory trainings	Practice	Studio lessons	Practice	IWST	IWS	1	2	3	4	5	6	
																			Number of weeks in the academic period						
														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	OOM6001 Module of social and cultural development	GED	RC	SPS6006	Cultural studies- Psychology	4	1	1			4/120	15		30			15	60	4.0						
7		GED	RC	SPS6007	Sociology- Political science	4	2	2			4/120	15		30			15	60		4.0					
8		GED	RC	SPS6001	Philosophy	5	4	4			5/150	15		30			15	90				5.0			
9		GED	RC	HK6002	History of Kazakhstan	5	4	4			5/150	15		30			15	90				5.0			
10	OOM6004 Module of personal and social development	GED	EC	LAW6007	Fundamentals of law and anti-corruption culture	5	1	1			5/150	15		30			15	90	5.0						
11		GED		MGT6706	Startups and entrepreneurship			1			5/150	15		30			15	90							
12		GED		ECO6007	Foundation of economics and financial literacy			1			5/150	15		30			15	90							
13		GED		JUR6413	Fundamentals safety of life activity			1			5/150	15		30			15	90							
14		GED		RM6001	Research methodology			1			5/150	15		30			15	90							
15		GED		JUR 6505	Ecology and sustainable development			1			5/150	15		30			15	90							

16		GED		HUM6400	Inclusive education			1			5/150	15		30			15	90							
17	OOM6003 Module of physical culture	GED	RC	PhC6005	Physical Culture	4	2	2			4/120			45			15	60		4.0					
18		GED	RC	PhC6006	Physical Culture	4	3	3			4/120			45			15	60			4.0				
Modules of specialty/education programm																									
19	BM6302 Module of Programming, Algorithms, and System Architectures	BD	UC	SFT6302	Algorithms and Data Structures	5	1	1			5/150	15	30.0				15	90	5.0						
20		BD	UC	NET6301	Introduction to computer networks	5	1	1			5/150	15	30.0				15	90	5.0						
21		BD	UC	SFT6301	Algorithmization and Programming	6	1	1			6/180	30	30.0				15	105	6.0						
22		BD	UC	SFT6305	Database Design. Introduction to SQL	5	2	2			5/150	15	30.0				15	90		5.0					
23		BD	UC	SFT6304	Programming in Python language	5	2	2			5/150	15	30.0				15	90		5.0					
24		BD	UC	EEC6004	Fundamentals of Logic Design	5	3	3			5/150	15	30.0				15	90			5.0				
25	BM6301 Module of Basic Mathematics and Natural Sciences	BD	UC	PHY6001	Physics	6	1	1			6/180	15	30.0	15			15	105	6.0						
26		BD	UC	MAT6001_1	Algebra and geometry	4	1	1			4/120	15		30			15	60	4.0						
27		BD	UC	EEC6001	Basic Circuit Theory	4	1	1			4/120	15	30.0				15	60	4.0						
28		BD	UC	MAT6002	Mathematical analysis	6	2	2			6/180	30		30			15	105		6.0					
29		BD	UC	MAT6005	Discrete mathematics	4	3	3			4/120	15	30.0				15	60			4.0				
30		BD	UC	MAT6006	Probability theory and mathematical statistics	4	4	4			4/120	15		30			15	60				4.0			
31	BM6303 Module of Modern Technologies and Professional Skills	BD	UC	LAN6007K	Business correspondence in the state language	3	2	2			3/90			30			15	45		3.0					
32		BD	UC	IP6302	Industrial practice	3	2				3/90					90				3.0					
33		BD	UC	EP6301	Educational practice	4	2				4/120					120				4.0					
34		BD	UC	IP6303	Industrial practice	4	4				4/120					120						4.0			
35		BD	UC	RM6301	Research fundamentals	5	5	5			5/150	30		15			15	90					5.0		
36		BD	UC	EEC6006	Digital signal processing	6	5	5			6/180	15	30.0	15			15	105						6.0	
37	BM6311 Module of Robotics and Computer Graphics	BD	UC	HRD6301	Introduction to Robotics	6	2	2			6/180	15	30.0	15			15	105		6.0					
38		BD	UC	EGR6300	Fundamentals of computer graphics	5	2	2			5/150	15	30.0				15	90		5.0					
39		BD	UC	HRD6305	Applied Robotics (IoT)	6	5	5			6/180	30	30.0				15	105						6.0	

40		BD	UC	HRD6306	Robotics with Artificial Intelligence	6	6	6			6/180	30	30.0				15	105					6.0	
41	PM6301 Module of Embedded and Sensor Systems	BD	UC	HRD6310	Embedded Systems 1. Architecture of microcontrollers and microprocessors	6	3	3			6/180	30	30.0				15	105			6.0			
42		BD	UC	HRD6304	Sensor Technologies	6	4	4			6/180	30	30.0				15	105				6.0		
43		BD	UC	HRD6311	Embedded systems 2. Digital systems design	6	4	4			6/180	30	30.0				15	105				6.0		
44		BD	UC	HRD6312	Embedded systems 3. Development of cyber-physical systems	5	5	5			5/150	15	30.0				15	90					5.0	
45	PM6303 Module of Professional Training and Internships	MD	UC	LAN6003PA	Professionally oriented foreign language	3	1	1			3/90			30			15	45	3.0					
46		MD	UC	EGR6303	Project management	4	1	1			4/120	15	30.0				15	60	4.0					
47		MD	UC	PP6304	Pre-diploma practice	5	6				5/150					150							5.0	
48	PM6308 Module of Digital Technologies and Artificial Intelligence	MD	EC	EGR6305	3D modeling Altium Designer	5	3	3			5/150	15	30.0				15	90			5.0			
49		MD		SFT6322	Introduction of artificial intelligence			3			5/150	15	30.0				15	90						
50		MD	EC	EGR6304	3D printing Solidworks	5	5	5			5/150	15	30.0				15	90				5.0		
51		MD		SFT6317	Machine Learning - 1			5			5/150	15	30.0				15	90						
52		MD	EC	SEC6301	Fundamentals of information security	4	6	6			4/120	15		30			15	60					4.0	
53		MD		SFT6331	Smart technologies			6			4/120	15		30			15	60						
54	PM6304 Module of Minor Components	MD	EC	MIN601	Minor 1	5	3	3			5/150	15	30.0				15	90			5.0			
55		MD	EC	MIN602	Minor 2	5	4	4			5/150	15	30.0				15	90				5.0		
56		MD	EC	MIN603	Minor 3	5	6	6			5/150	15	30.0				15	90					5.0	
57	PM6302 Module of Network Technologies and System Integration	MD	EC	NET6303	Network programming	5	5	5			5/150	15	30.0				15	90					5.0	
58		MD		HRD6313	Electronic systems			5			5/150	15	30.0				15	90						
Additional modules beyond qualification																								
Modules of choice																								
Weekly average workload at hours																		0	0	0	0	0	0	
1	General education disciplines (GED)					56		12	0	0	1530	75	30	390	0	0	165	870	19	13	9	15	0	0
	Required component (GED/RC)					51		11	0	0	1530	75	30	390	0	0	165	870	14	13	9	15	0	0
	University component (GED/UC)					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	5	0	0	0	0	0
2	Basic disciplines (BD)	130		23	0	0	3900	450	540	180	0	330	345	2055	30	37	15	20	22	6
	Required component (BD/RC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component(BD/UC)	130		23	0	0	3900	450	540	180	0	330	345	2055	30	37	15	20	22	6
	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)	46		9	0	0	810	60	120	30	0	150	75	375	7	0	10	5	10	14
	Required component (MD/RC)	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	University component (MD/UC)	12		2	0	0	360	15	30	30	0	150	30	105	7	0	0	0	0	5
	Elective component (MD/EC)	34		7	0	0	450	45	90	0	0	0	45	270	0	0	10	5	10	9
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 on curriculum	232		0	0	0	6240	585	690	600	0	480	585	3300	56	50	34	40	32	20
6	Additional courses											Number of credits	Academic period	Number of hours						
7	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	<p>Competencies Developed:</p> <ul style="list-style-type: none"> • 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. <p>Learning Outcomes:</p> <ul style="list-style-type: none"> • 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	<p>Competencies Developed:</p> <ul style="list-style-type: none"> • 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. <p>Learning Outcomes:</p> <ul style="list-style-type: none"> • 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	<p>Competencies Developed:</p> <ul style="list-style-type: none"> • 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. <p>Learning Outcomes:</p> <ul style="list-style-type: none"> • 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. <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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.