“Халықаралық ақпараттық технологиялар университеті” АҚ

АО “Международный университет информационных технологий”

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

_____ Mustafina A.
«20» February 2026 Protocol of the EMC № 4

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

_____ Kolesnikova K.
«24» February 2026 Protocol of the AC № 11

EDUCATIONAL PROGRAM

6B06106 Computer Systems and Software Engineering

(the code and name of the educational program)

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
(Employer 1)

_____ Full name
«__» _____ 2026

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(Employer 1)

_____ Full name
«__» _____ 2026

Almaty, 2026

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

The educational program has been developed by the Academic Committee of the Department of Computer engineering.

Coordinator _____ Primzhanov Z.G.

Chairperson of the Academic Committee _____ Chinibaeva T.T.

Chairperson of the Faculty Academic Quality Council _____ Seilova N.A.

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List of abbreviations and acronyms

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

1. Description of the educational program

The educational program 6B06106 “Computer Engineering and Software” is aimed at training highly qualified specialists in the field of computer engineering, focused on the design, development, and operation of modern computing systems, embedded devices, and hardware-software complexes. The program is based on the principles of academic freedom, flexibility of educational trajectories, and adaptability to rapidly changing labor market demands, ensuring the integration of education, science, and industry.

The flexibility of the educational program allows for consideration of individual learning needs of students, as well as current demands of the digital economy and industry. The program implements a student-centered approach, aimed at developing independence, engineering thinking, and practical skills, as well as transforming professional standards into specific learning outcomes and graduate competencies.

A distinctive feature of the program is its strong engineering orientation and emphasis on hardware-software integration. The curriculum includes modern disciplines such as system programming, embedded systems design, IoT engineering, high-performance computing architecture, and digital hardware design, ensuring the preparation of specialists in the development of microprocessor systems, digital devices, and intelligent technologies.

The program develops key professional competencies in students, including the design of computer system architectures, development of embedded and microprocessor-based solutions, creation of hardware-software systems, integration of hardware and software solutions, as well as testing, debugging, and operation of engineering systems. Special attention is given to the development of cyber-physical systems, IoT solutions, and intelligent devices in line with modern technological trends.

The educational program is aligned with global trends, including the advancement of embedded systems, high-performance computing, cloud technologies, artificial intelligence, data analytics, and digital transformation. This ensures the competitiveness of graduates in both national and international labor markets.

The professional activity domain of graduates includes public and private organizations engaged in the development, implementation, and operation of computing equipment, embedded and intelligent systems, as well as hardware-software complexes across various sectors: telecommunications, industry, energy, transport, healthcare, education, agriculture, the IT industry, and the digital economy. Graduates may pursue careers as computer engineers, system developers, computer system architects, IoT engineers, DevOps specialists, and hardware-software solution developers.

2. Aim and objectives of the educational program

The purpose of the EP - providing practice-oriented training of highly qualified specialists in the field of computer engineering and computing systems, capable of designing, developing, and operating modern computing systems, embedded and microprocessor-based devices, as well as hardware-software complexes. The program is aimed at developing competencies in computer system architecture, system programming, digital design, IoT technologies, and the integration of hardware and software solutions for the creation of intelligent and cyber-physical systems.

AP objectives:

1. To prepare a versatile engineer in the field of computer engineering with fundamental knowledge in mathematics, electronics, computer science, and ICT, capable of applying modern technologies in professional activities
2. To develop students’ skills in analyzing and formalizing problem domains of engineering and hardware-software systems, as well as in developing technical specifications and requirements.

3. To build competencies in designing the architecture of computing systems and hardware-software complexes with ensured reliability, scalability, and efficiency.
4. To train students in the design and development of embedded and microprocessor-based systems, digital devices, as well as software components interacting with hardware.
5. To familiarize students with methods of testing, debugging, and verification of software and hardware-software systems, including error detection and resolution.
6. To develop skills in designing and developing databases and information systems using modern data models and storage technologies.
7. To train students in applying data analysis methods, as well as elements of artificial intelligence and machine learning, in engineering and applied tasks.
8. To develop skills in designing and developing intelligent systems, including IoT devices, robotic systems, and cyber-physical systems.
9. To train students in the principles of building and administering computer networks, ensuring their security, reliability, and resilience to threats.
10. To form competencies in the field of high-performance computing, digital design, and modern engineering technologies.

3. General Information on the Educational Program

№	Name	Description
1.	**Name of the Educational Program**	6B06 Information and Communication Technology
2.	**Group of Educational Programs**	B057 Information Technology
3.	**Code and Classification of the Field of Study**	6B061 Information and Communication Technology
4.	**Code and Classification of the Education Area**	6B06 Information and Communication Technology
5.	**Type of the educational program**	Current Educational Program
6.	**Level according to the National Classifications Framework**	6
7.	**Level according to the Sectoral Qualifications Framework**	6
8.	**Distinctive features of the program**	Two-degree program
8.1	**Partner University**	University of Applied Sciences Hof, Satbayev University, Almaty University of Power Engineering and Telecommunications (AUPET)
9.	**Academic degree awarded**	Bachelor in Information and Communication Technology in educational program 6B06106 «Computer Systems and Software Engineering»
10.	**Duration of study**	4 years
11.	**Volume of credits**	240
12.	**Language of education**	English
13.	**License number for the training area**	KZ81LAM00001263
14.	**An appendix to the license for the field of training**	provided
15.	**Availability of program accreditation**	ASIIN

4. Learning Outcomes of the Educational Program (LO)

LO	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.

5. Program Competencies

Competency Categories		**Program Competencies**
Universal Competencies	**UC1**	Knowledge of social and ethical values, legal norms, culture, and societal traditions, with the ability to apply them in professional activities while adhering to the principles of academic integrity and professional ethics.
	UC2	Proficiency in written and oral communication in the state, Russian, and English languages, with the ability to present professional ideas clearly, logically, and persuasively.
General Professional Competencies	**GPC1**	Proficiency in fundamental knowledge of mathematics, electronics, physics, and computer science for solving engineering problems in the field of computer engineering.
	GPC2	Use of modern information and communication technologies, as well as modeling and analysis methods, in the design and study of computing systems.
	GPC3	Analysis of the architecture of computing systems, as well as the operating principles of microprocessors, digital devices, and their components.
Professional Competencies	**PC1**	Formalization of the problem domain and development of technical specifications and requirements for software and hardware-software systems.
	PC2	Design and development of embedded and microprocessor-based systems, digital devices, and hardware-software complexes.
	PC3	Integration of hardware and software solutions in the development of intelligent, IoT, and cyber-physical systems.
	PC4	Selection and application of programming languages, tools, database management systems, and development technologies depending on project requirements.
	PC5	Design, configuration, and operation of computing systems, computer networks, and their infrastructure.
	PC6	Application of data analysis methods, elements of artificial intelligence, and information processing techniques in engineering tasks.
	PC7	Testing, debugging, and ensuring the reliability of software and hardware-software systems.

Research Competencies	**RC1**	Conducting analysis, modeling, and research of computing systems, embedded devices, and engineering solutions.
	RC2	Applying modern scientific methods, tools, and technologies to solve research and applied problems in the field of computer engineering.

6. Matrix of Alignment of Educational Program Learning Outcomes with Developed Competencies (V)

Alignment	UC1	UC2	GPC1	GPC2	GPC3	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	RC1	RC2
LO1			V											
LO2			V	V	V		V							
LO3			V	V		V			V					
LO4				V		V			V					
LO5				V		V	V		V					
LO6								V			V		V	
LO7										V		V		
LO8							V	V					V	
LO9								V			V		V	
LO10	V	V											V	V
LO11											V			

7. Matrix of Alignment of Educational Program Courses with Learning Outcomes (V)

№	Course Title	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11
1.	HK6002 History of Kazakhstan										V	
2.	SPS6001 Philosophy										V	
3.	LAN6001A Foreign language										V	
4.	LAN6002A Foreign Language 2										V	
5.	ICT6001 Information and communication technologies	V										
6.	PhC6005 Physical Education										V	
7.	PhC6006 Physical Education 2										V	
8.	LAN6001KR Kazakh (Russian) language										V	
9.	LAN6002KR Kazakh (Russian) language 2										V	
10.	SPS6006 Cultural Studies-Psychology										V	
11.	SPS6007 Sociology-Political Science										V	
12.	PHY6001 Physics	V										
13.	SFT6301 Algorithmization and programming			V								
14.	MAT6001_1 Algebra and Geometry	V										
15.	NET6312 Computer networks								V			
16.	MAT6002 Mathematical analysis	V										
17.	EP6301 Educational practice						V					
18.	EEC6001 Theory of electrical circuits	V										
19.	ANL6311 Database Theory				V							
20.	HRD6303 Basics of Electronics	V										
21.	MAT6005 Discrete mathematics	V										
22.	HRD6302 Architecture and organization of computer systems		V									
23.	EGR6301 Operating systems		V									
24.	EGR6302 Information theory	V										

25.	EEC6004 Fundamentals of Logical Design				V							
26.	MAT6006 Probability theory and mathematical statistics							V				
27.	HRD6314 Digital circuit design				V							
28.	SFT6308 Systems programming			V								
29.	HRD6304 Sensory technologies					V						
30.	NET6313 Digital design of hardware systems				V							
31.	NET6314 Embedded Systems Design			V		V						
32.	HRD6326 Design and modeling of electronic devices		V									
33.	SFT6315 DevOps									V		
34.	RM6301 Fundamentals of scientific research										V	
35.	SEC6301 Fundamentals of Information Security								V			
36.	NET6304 Cloud computing and virtualization									V		
37.	NET6308 Network consolidation								V			
38.	SFT6343 Implementation of IT projects					V						
39.	HRD6317 High-performance computing architecture									V		
40.	NET6303 Network programming								V			
41.	IP6302 Industrial practice						V					
42.	IP6303 Industrial practice 2						V					
43.	PP6304 Pre-graduation practice										V	
44.	MGT6706 Startups and entrepreneurship										V	
45.	LAW6007 Fundamentals of Law and Anti-Corruption Culture										V	
46.	JUR6413 Fundamentals of Life Safety										V	
47.	RM6001 Research methodology										V	
48.	ESG6001 Ecology, sustainable development and life safety										V	

	principles											
49.	HUM6400 Inclusive education and service to society										V	
50.	PHY6601 Quantum physics	V										
51.	CUM3255 Digital devices and microprocessors		V									
52.	NET6300 Basics of Routing and Switching								V			
53.	MIN601 Minor - Discipline 1											V
54.	MIN602 Minor Discipline 2											V
55.	NET6311 Systems and network administration								V			
56.	HRD6316 Digital Device Design (FPGA)				V							
57.	PHY6300 Fundamentals of quantum computing									V		
58.	MIN603 Minor Discipline 3											V
59.	HRD6325 Digital signal processing							V				
60.	HRD6324 IoT Device Engineering					V						
61.	PHY6301 Advanced quantum computing									V		

8. Professional Standards (PS), Occupation Cards, and Labor Functions

№	Name of the Professional Standard (PS)	Occupation Card	Labor Functions	LO
1.	Embedded Systems Design	Embedded Systems Engineer	Development of embedded systems, microcontroller programming, hardware/software integration	LO2, LO3, LO8
2.	Software Development	Software Developer	Software design, development, testing, and maintenance	LO3, LO4, LO5
3.	Digital Systems Design	Digital Systems Engineer (FPGA)	Design of digital circuits, HDL development, FPGA-based system implementation	LO2, LO8
4.	Systems and Network Administration	System Administrator	Network configuration, cybersecurity, server maintenance, and infrastructure support	LO7
5.	Data Analysis and Artificial Intelligence	Data Engineer	Data processing, machine learning model development, data pipeline implementation	LO6
6.	High-Performance Computing	Data Engineer / HPC Engineer	Optimization of computing processes, parallel and distributed systems management	LO9
7.	IT Project Management	IT Project Manager	Project planning, technical documentation, team coordination, and project lifecycle management	LO5, LO10

9. Atlas of New Professions

№	Name of the New Profession	Disciplines
1.	Embedded and Intelligent Systems Engineer	Electronics; Electrical Circuit Theory; Computer Systems Architecture and Organization; System Programming; Embedded Systems Design; Sensor Technologies; Digital Devices and Microprocessors; Design and Modeling of Electronic Devices
2.	Digital Hardware Engineer / FPGA Engineer	Fundamentals of Logic Design; Digital Circuit Design; Digital Hardware Design; FPGA-Based Digital System Design; Information Theory; Discrete Mathematics
3.	IoT Systems Engineer / Cyber-Physical Systems Developer	Embedded Systems Design; Sensor Technologies; IoT Engineering; Computer Networks; Network Interconnection; Network Programming; DevOps
4.	Computer Systems Architect / HPC Engineer	Computer Systems Architecture and Organization; Operating Systems; High-Performance Computing Architecture; Cloud Computing and Virtualization; System Programming
5.	DevOps Engineer / Cloud Infrastructure Engineer	DevOps; Cloud Computing and Virtualization; Operating Systems; Network Programming; System and Network Administration; Fundamentals of Information Security
6.	Cybersecurity Engineer	Fundamentals of Information Security; Computer Networks; Network Interconnection; Operating Systems; Network Programming

7.	Data and Intelligent Systems Engineer	Probability Theory and Mathematical Statistics; Discrete Mathematics; Algorithms and Programming; Digital Signal Processing; Information and Communication Technologies
8.	Robotics and Sensor Systems Engineer	Sensor Technologies; Embedded Systems Design; Digital Devices and Microprocessors; Electrical Circuit Theory; Electronic

10. Key Disciplines of the Educational Program

№	Code and Name of the Discipline	Workload of the Discipline in Credits
1.	HRD6302 – Computer Systems Architecture and Organization	4
2.	SFT6308 – System Programming	4
3.	HRD6314 – Digital Circuit Design	4
4.	HRD6303 – Electronics	4
5.	EEC6004 – Fundamentals of Logic Design	4
6.	NET6313 – Digital Hardware Design	5
7.	NET6314 – Embedded Systems Design	5
8.	CUM3255 – Digital Devices and Microprocessors	5
9.	HRD6316 – FPGA-Based Digital System Design	4
10.	HRD6324 – IoT Engineering	5
11.	HRD6304 – Sensor Technologies	6
12.	HRD6317 – High-Performance Computing Architecture	6
13.	NET6304 – Cloud Computing and Virtualization	5
14.	NET6312 – Computer Networks	4
15.	NET6303 – Network Programming	6
16.	SFT6315 – DevOps	4

11. Content of Educational Program Modules

Module Code and Title	Module Description	Course Code and Title	Course Semester (in sequence)
GENERAL EDUCATION MODULES			
OOM6001 Social and Cultural Development Module (18 cr.)	Development of social and humanitarian knowledge, legal and cultural competence	HK6002 History of Kazakhstan; SPS6001 Philosophy; SPS6006 Cultural Studies–Psychology; SPS6007 Sociology–Political Science	2–6
OOM6003 Physical Education Module (4 cr.)	Formation of a healthy lifestyle	PhC6005 Physical Education	1–4
OOM6002 Language and ICT Skills Module (15 cr.)	Development of communication and digital skills	LAN6001A Foreign Language; ICT6001 Information and Communication Technologies; LAN6001KR Kazakh (Russian) Language	1–4
OOM6004 Personal Development Module (15 кр)	Developing soft skills and civic responsibility	LAW6007 Fundamentals of Law and Anti-Corruption Culture; ESG6001 Ecology and Sustainable Development; MGT6706 Startups and Entrepreneurship	5–6
CORE MODULES			
BM6301 Basic Mathematics and Science Module (20 cr.)	Application of fundamental knowledge	MAT6001_1 Algebra and Geometry; MAT6002 Mathematical Analysis; MAT6006 Probability Theory and Mathematical Statistics; PHY6001 Physics	1–4
BM6302 Programming, Algorithms, and Architecture Module (22 cr.)	Development of algorithmic and systemic thinking	SFT6301 Algorithmization and Programming; EGR6302 Information Theory; MAT6005 Discrete Mathematics; HRD6302 Computer Architecture and	1–4

		Organization; EGR6301 Operating Systems	
BM6303 Modern Technologies and Professional Skills Module (13 cr.)	Application of modern IT technologies	NET6312 Computer Networks; ANL6311 Database Theory; SFT6315 DevOps	2–6
BM6304 Microprocessor and Electronic Systems Module (16 cr.)	Understanding the hardware basis of computing systems	HRD6303 Fundamentals of Electronics; EEC6001 Electrical Circuit Theory; EEC6004 Fundamentals of Logic Design; HRD6314 Digital Circuit Engineering	2–4
PROFESSIONAL MODULES			
PM6301 Embedded and Sensor Systems Module (16 cr.)	IoT systems development	NET6314 Embedded Systems Design; HRD6304 Sensor Technologies; HRD6324 IoT Device Engineering	5–7
PM6302 Networking and System Integration Module (15 cr.)	Integration of systems and networks	NET6308 Network Integration; NET6303 Network Programming; NET6311 Systems and Network Administration	6–8
PM6303 Professional Training and Internship Module (11 cr.)	Practical training	EP6301 Educational Practice; IP6302 Industrial Practice; PP6304 Pre-Diploma Practice	2–8
PM6304 Minor Component Module (15 cr.)	Interdisciplinary competencies	MIN601 Minor 1; MIN602 Minor 2; MIN603 Minor 3	5–8
PM6305 Digital Design and HPC Module (15 cr.)	Design of complex systems	NET6313 Digital Hardware Systems Design; HRD6316 FPGA; HRD6317 High-Performance Computing Architecture	5–8

12. Information about the modules of the educational program

№	Code and Name of the Discipline	Brief Description of the Discipline (30–50 words)	Workload of the Discipline in Credits	Learning Outcomes Developed (Codes)	Prerequisites	Postrequisites
REQUIRED COMPONENT (RC)						
Cycle of general education disciplines (GED)						
1.	HK6002 History of Kazakhstan	This course develops knowledge about the historical development of Kazakhstan, key stages in the development of statehood, and the cultural characteristics of society. It also develops civic engagement and an understanding of socio-political processes.	5	LO10	–	SPS6001 Philosophy
2.	SPS6001 Philosophy	Study of philosophical concepts, categories, and methods of cognition. Develops critical thinking and the ability to analyze and interpret social and scientific processes.	5	LO10	HK6002 History of Kazakhstan	RM6001 Research Methodology
3.	LAN6001A Foreign language	Developing professional communication skills in a foreign language. This course covers reading technical literature, oral and written communication in the professional field.	5	LO10	–	LAN6002A Foreign Language 2
4.	LAN6002A Foreign Language 2	Developing professional communication skills in the IT environment.	4	LO10	LAN6001A Foreign Language	–
5.	ICT6001 Information and communication technologies	Study of basic ICT principles, software, network services, and digital tools. Develops digital literacy.	5	LO1	–	SFT6301 Algorithms and Programming, ANL6311 Database Theory, NET6312 Computer

						Networks
6.	PhC6005 Physical Education	Formation of a healthy lifestyle, development of physical activity and endurance, understanding of the principles of physical development.	4	LO10	–	PhC6006 Physical Education 2
7.	PhC6006 Physical Education 2	Formation of a healthy lifestyle, development of physical activity and endurance, understanding of the principles of physical development.	4	LO10	PhC6005 Physical Education	–
8.	LAN6001KR Kazakh (Russian) language	Development of business and academic communication skills in the state and Russian languages, including written and oral speech.	5	LO10	–	LAN6002KR Kazakh (Russian) Language 2
9.	LAN6002KR Kazakh (Russian) language 2	Development of business and academic communication skills in the state and Russian languages, including written and oral speech.	5	LO10	LAN6001KR Kazakh (Russian) Language	–
10.	SPS6006 Cultural Studies-Psychology	Develops an understanding of culture and human behavior.	4	LO10	–	SPS6007 Sociology-Political Science, RM6001 Research Methodology
11.	SPS6007 Sociology-Political Science	Study of social and political processes, development of analytical thinking.	4	LO10	SPS6006 Cultural Studies-Psychology	–
UNIVERSITY COMPONENT (UC)						
Cycle of basic disciplines(BD)						

12.	PHY6001 Physics	Study of the fundamental laws of mechanics, electricity, and magnetism that underlie modern engineering and computing systems. Develops an understanding of the physical processes used in electronics and computing.	6	LO1	–	EEC6001 Electrical Circuits Theory, HRD6303 Fundamentals of Electronics
13.	SFT6301 Algorithmization and programming	Mastering the basic principles of algorithms and programming. Develops skills in program development, data structures, and logical thinking for solving engineering problems.	6	LO3	ICT6001 Information and communication technologies	SFT6308 System Programming, ANL6311 Database Theory, NET6303 Network Programming
14.	MAT6001_1 Algebra and Geometry	Study of linear algebra and analytic geometry for solving applied problems. Develops mathematical thinking and a foundation for further engineering disciplines.	4	LO1	–	MAT6005 Discrete Mathematics, MAT6006 Probability and Statistics
15.	NET6312 Computer networks	Study of network architectures, data transmission protocols, and network infrastructure design principles. Develops skills in configuring and analyzing network systems.	4	LO8	ICT6001 Information and communication technologies	NET6303 Network Programming, NET6308 Network Integration, NET6311 System Administration
16.	MAT6002 Mathematical analysis	Study of differential and integral calculus. Develops skills in applying mathematical methods to engineering and computational problems.	6	LO1	MAT6001_1 Algebra and Geometry	MAT6006 Probability and Statistics, HRD6325 Digital Signal Processing

17.	EP6301 Educational practice	Development of basic professional skills, application of theoretical knowledge in practice, and completion of simple engineering and programming tasks.	2	LO6	SFT6301 Algorithmization and programming	IP6302 Industrial Practice
18.	EEC6001 Theory of electrical circuits	Study of Kirchhoff's laws and methods for analyzing electrical circuits and signals. Develops engineering skills in analyzing electrical processes.	4	LO1	PHY6001 Physics	HRD6303 Electronics, HRD6314 Digital Circuit Design
19.	ANL6311 Database Theory	Study of data models, SQL, and database design principles. Develops skills in working with information systems.	5	LO4	SFT6301 Algorithmization and programming	SFT6343 IT Project Implementation
20.	HRD6303 Basics of Electronics	Study of electronic components and the operating principles of circuits and devices. Forms the basis for understanding the hardware of computing systems.	4	LO1	PHY6001 Physics	HRD6314 Digital Circuit Design, HRD6304 Sensor Technologies, NET6314 Embedded Systems
21.	MAT6005 Discrete mathematics	The study of logic, graphs, combinatorics, and Boolean algebra. Forms the foundation for the development of algorithms and digital devices.	4	LO1	MAT6001_1 Algebra and Geometry	HRD6302 Computer Systems Architecture, EEC6004 Logic Design Fundamentals, EGR6302 Information Theory
22.	HRD6302 Architecture and organization of computer systems	Study of computer structure, processors, and memory. Develops an understanding of how computing systems work.	4	LO2	MAT6005 Discrete Mathematics	CUM3255 Digital Devices and Microprocessors, NET6314 Embedded Systems, HRD6317 High-Performance Computing Architecture

23.	EGR6301 Operating systems	Study of operating system principles, process and memory management. Develops system analysis and administration skills.	4	LO2	SFT6301 Algorithmization and programming	SFT6315 DevOps, NET6304 Cloud Computing and Virtualization, NET6311 System and Network Administration
24.	EGR6302 Information theory	The study of methods for coding, transmitting, and processing information. Forms the foundations for the operation of modern information systems.	4	LO1	MAT6002 Mathematical Analysis	NET6300 Routing and Switching Fundamentals
25.	EEC6004 Fundamentals of Logical Design	Study of logic elements and digital circuits. Forms the basis for designing digital devices and FPGAs.	4	LO4	MAT6005 Discrete Mathematics	HRD6314 Digital Circuit Design, HRD6316 FPGA Design
26.	MAT6006 Probability theory and mathematical statistics	Study of probabilistic models and statistical methods. Develops skills in data analysis and process modeling.	4	LO7	MAT6002 Mathematical Analysis	HRD6325 Digital Signal Processing
27.	HRD6314 Digital circuit design	Design of digital devices and logic circuits. Develops skills in hardware system development.	4	LO4	EEC6004 Logic Design Fundamentals	HRD6316 FPGA Design, NET6313 Digital Hardware Systems Design
28.	SFT6308 Systems programming	Developing programs that interact with the operating system and hardware. Develops low-level programming skills.	4	LO3	SFT6301 Algorithmization and programming	NET6314 Embedded Systems, SFT6315 DevOps
29.	HRD6304 Sensory technologies	Studying the operating principles of sensors and their application in IoT and engineering systems. Developing skills in working with data and devices.	6	LO5	HRD6303 Electronics Fundamentals	HRD6324 IoT Systems Engineering

30.	NET6313 Digital design of hardware systems	Designing digital devices using HDL and FPGA. Develops hardware development skills.	5	LO4	HRD6314 Digital Circuit Design	HRD6316 FPGA Design, HRD6317 High-Performance Computing Architecture
31.	NET6314 Embedded Systems Design	Developing embedded systems using microcontrollers. Develops skills in hardware and software integration.	5	LO3, LO5	HRD6302 Computer Systems Architecture, SFT6308 System Programming	HRD6324 IoT Systems Engineering
32.	HRD6326 Design and modeling of electronic devices	Study of methods for modeling electronic circuits and devices. Develops hardware system design skills.	4	LO2	HRD6303 Electronics Fundamentals	NET6314 Embedded Systems Design
33.	SFT6315 DevOps	Study of CI/CD, development automation, and containerization. Develops software lifecycle management skills.	4	LO9	EGR6301 Operating Systems	NET6304 Cloud Computing, SFT6343 IT Project Implementation
34.	RM6301 Fundamentals of scientific research	Develops skills in scientific analysis, research preparation and diploma project.	5	LO10	SPS6001 Philosophy	PP6304 Pre-Diploma Practice
35.	SEC6301 Fundamentals of Information Security	Study of information security methods, threats, and cryptography. Develops skills in ensuring system security.	5	LO8	ICT6001 Information and communication technologies	NET6311 System and Network Administration
36.	NET6304 Cloud computing and virtualization	Study of cloud technologies and virtualization. Develops skills in working with distributed systems.	5	LO9	SFT6315 DevOps	HRD6317 High-Performance Computing Architecture
37.	NET6308 Network consolidation	Study of network construction and integration methods. Develops network infrastructure design skills.	5	LO8	NET6312 Computer Networks	NET6311 System and Network Administration

38.	SFT6343 Implementation of IT projects	Studying IT project management and software development methods. Developing team and project management skills.	5	LO5	SFT6315 DevOps	PP6304 Pre-Diploma Practice
39.	HRD6317 High-performance computing architecture	Study of parallel and distributed computing. Develops skills in working with HPC systems.	6	LO9	EGR6301 Operating Systems	–
40.	NET6303 Network programming	Network application and protocol development. Develops skills in creating distributed systems.	6	LO8	NET6312 Computer Networks, SFT6301 Algorithmization and programming	SFT6315 DevOps, NET6304 Cloud Computing
Cycle of major disciplines (MD)						
41.	IP6302 Industrial practice	Industrial internships are aimed at reinforcing theoretical knowledge and developing professional skills in a real-world enterprise setting. Students complete practical tasks and become familiar with production processes, software and hardware systems development and operation technologies.	4	LO6	EP6301 Educational Practice	IP6303 Industrial Practice
42.	IP6303 Industrial practice 2	In-depth industrial training is aimed at developing professional competencies, independently completing engineering tasks, and participating in real-world projects. Students analyze the processes of system development, testing, and implementation.	4	LO6	IP6302 Industrial Practice	PP6304 Pre-Diploma Practice

43.	PP6304 Pre-graduation practice	Pre-graduation internships focus on collecting, analyzing, and systematizing materials for the final project. Students develop skills in research, design, and justifying engineering solutions.	5	LO10	IP6303 Industrial Practice 2, RM6301 Research Methodology	–
ELECTIVE COMPONENT (EC)						
Cycle of general education disciplines (GED)						
44.	MGT6706 Startups and entrepreneurship	This course is aimed at developing entrepreneurial thinking and startup development skills. It examines the stages of business creation, business models, project management, and investment. Students master the fundamentals of innovation and the commercializatio n of IT solutions.	5	LO10	–	SFT6343 IT Project Implementation
45.	LAW6007 Fundamentals of Law and Anti-Corruption Culture	Study of the legal framework for business activities, legislation, and anti-corruption policy. Develops legal literacy, an understanding of responsibility, and skills in analyzing legal situations in the professional sphere.	5	LO10	–	SFT6343 IT Project Implementation
46.	JUR6413 Fundamentals of Life Safety	Study of principles of safe human interaction with the environment, emergency prevention, and risk protection. Skills for ensuring safety in professional and everyday activities are developed.	5	LO10	–	–

47.	RM6001 Research methodology	This course develops skills in scientific inquiry, information analysis, and research. It covers research methods, presentation of results, and preparation of a thesis project.	5	LO10	SPS6001 Philosophy	PP6304 Pre-Diploma Practice
48.	ESG6001 Ecology, sustainable development and life safety principles	Study of environmental issues, principles of sustainable development, and the impact of human activity on the environment. Develops environmental awareness and responsibility for natural resources.	5	LO10	–	–
49.	HUM6400 Inclusive education and service to society	This course is aimed at fostering social responsibility, understanding the principles of inclusive education, and interaction with various social groups. It also develops communication skills and ethical behavior.	5	LO10	–	–
Cycle of basic disciplines (BD)						
Cycle of major disciplines (MD)						
50.	PHY6601 Quantum physics	This course focuses on the study of quantum phenomena, the principles of quantum mechanics, and their application to modern technologies. It examines wave functions, quantum states, energy levels, and the fundamentals of quantum processes in computing systems.	5	LO1	PHY6001 Physics	PHY6300 Fundamentals of Quantum Computing

51.	CUM3255 Digital devices and microprocessors	Study of the principles of digital device and microprocessor construction, their architecture, and operation. Skills in the analysis and design of digital systems and computing devices are developed.	5	LO2	HRD6302 Computer Architecture, EEC6001 Electrical Circuits	NET6314 Embedded Systems
52.	NET6300 Basics of Routing and Switching	Study of the principles of routing, switching, and data transmission in networks. Skills in configuring network equipment and analyzing network protocols are developed.	5	LO8	NET6312 Computer Networks	NET6308 Network Integration
53.	MIN601 Minor - Discipline 1	This course is aimed at developing additional competencies in the chosen field. It allows for the expansion of professional knowledge and skills beyond those covered by the core curriculum.	5	LO11	–	MIN602 Minor Course 2
54.	MIN602 Minor Discipline 2	Continued study of minor disciplines aimed at developing interdisciplinary competencies and expanding professional horizons.	5	LO11	MIN601 Minor Course 1	MIN603 Minor Course 3
55.	NET6311 Systems and network administration	Learn the principles of operating system and network infrastructure administration. Develop skills in server configuration, user management, and security.	4	LO8	EGR6301 Operating Systems, NET6312 Computer Networks	SFT6315 DevOps

56.	HRD6316 Digital Device Design (FPGA)	Study of digital system design methods using FPGAs and hardware description languages. Developing skills in hardware development.	4	LO4	HRD6314 Digital Circuit Design	NET6313 Digital Hardware Systems Design
57.	PHY6300 Fundamentals of quantum computing	An introduction to quantum computing, exploring qubits, quantum algorithms, and the operating principles of quantum computers. This course provides a basic understanding of quantum technologies.	4	LO9	PHY6601 Quantum Physics	PHY6301 Advanced Quantum Computing
58.	MIN603 Minor Discipline 3	Completion of a cycle of minor disciplines aimed at developing additional competencies and expanding professional training.	5	LO11	MIN602 Minor Course 2	–
59.	HRD6325 Digital signal processing	Study of digital signal analysis and processing methods, data filtering and conversion. Skills in applying DSP in engineering systems are developed.	5	LO7	MAT6006 Probability and Statistics	HRD6324 IoT Systems Engineering
60.	HRD6324 IoT Device Engineering	Development of IoT systems, including sensors, networks, and data processing. Skills for creating intelligent devices and systems are developed.	5	LO5	NET6314 Embedded Systems, HRD6304 Sensor Technologies	–
61.	PHY6301 Advanced quantum computing	In-depth study of quantum algorithms, quantum cryptography, and computational models. Skills in applying quantum technologies to engineering	5	LO9	PHY6300 Fundamentals of Quantum Computing	–

		problems are developed.				

13. Curriculum

1 Semester			
Cycle	Comp.	Course code and title	Credits
OOD	OK	LAN6001A Foreign language	5
OOD	OK	ICT6001 Information and communication technologies	5
BD	VK	PHY6001 Physics	6
BD	VK	SFT6301 Algorithmization and programming	6
BD	VK	MAT6001_1 Algebra and Geometry	4
BD	VK	NET6312 Computer networks	4
		TOTAL	**30**

2 Semester			
Cycle	Comp.	Course code and title	Credits
OOD	OK	LAN6002A Foreign Language	5
OOD	OK	PhC6005 Physical Education	4
BD	VK	MAT6002 Mathematical Analysis	6
BD	VK	EP6301 Educational Internship	2
BD	VK	EEC6001 Electrical Circuit Theory	4
BD	VK	ANL6311 Database Theory	5
		TOTAL	**30**

3 Semester			
Cycle	Comp.	Course code and title	Credits
OOD	OK	LAN6001KR Kazakh (Russian) language	5
OOD	OK	PhC6006 Physical Education	4
BD	VK	MAT6005 Discrete Mathematics	4
BD	VK	HRD6302 Architecture and Organization of Computer Systems	4
BD	VK	EGR6301 Operating Systems	4
BD	VK	EGR6302 Information Theory	4
BD	VK	EEC6004 Fundamentals of Logical Design	4
		TOTAL	**29**

4 Semester			
Cycle	Comp.	Course code and title	Credits
OOD	OK	SPS6001 Philosophy	5
OOD	OK	LAN6002KR Kazakh (Russian) language	5
OOD	OK	HK6002 History of Kazakhstan	5
BD	VK	MAT6006 Probability Theory and Mathematical Statistics	4
BD	VK	HRD6314 Digital Circuit Design	4
BD	VK	SFT6308 System Programming	4
PD	VK	IP6302 Industrial Practice	4
		TOTAL	**31**

5 Semester			
Cycle	Comp.	Course code and title	Credits
OOD	OK	SPS6006 Cultural Studies-Psychology	4
BD	VK	HRD6304 Touch Technology	6
BD	VK	NET6313 Digital Hardware Systems Design	5
BD	VK	NET6314 Embedded Systems Design	5

6 Semester			
Cycle	Comp.	Course code and title	Credits
OOD	OK	SPS6007 Sociology-Political Science	4
OOD	KV	MGT6706 Startups and Entrepreneurship/ LAW6007 Fundamentals of Law and Anti-Corruption Culture/ JUR6413 Fundamentals of Life Safety/ RM6001 Research Methodology/ ESG6001 Ecology, Sustainable Development and Fundamentals of Life Safety/ HUM6400 Inclusive Education and Community Service	5
BD	VK	HRD6326 Design and Simulation of Electronic Devices	4
BD	VK	SFT6315 DevOps	4

PD	KV	PHY6601 Quantum Physics/ CUM 3255 Digital Devices and Microprocessors/ NET6300 Fundamentals of Routing and Switching	5		PD	VK	IP6303 Industrial Practice	4
PD	KV	MIN601 Minor - Discipline 1	5		PD	KV	MIN602 Minor Discipline 2	5
					PD	KV	NET6311 Systems and Network Administration/HRD6316 Digital Device Design (FPGA)/PHY6300 Fundamentals of Quantum Computing	4
		TOTAL	**30**				**TOTAL**	**30**
7 Semester					**8 Semester**			
Cycle	Comp.	Course code and title	Credits		Cycle	Comp.	Course code and title	Credits
BD	VK	RM6301 Fundamentals of Scientific Research	5		BD	VK	SFT6343 IT Project Implementation	5
BD	VK	SEC6301 Fundamentals of Information Security	5		BD	VK	HRD6317 High Performance Computing Architecture	6
BD	VK	NET6304 Cloud Computing and Virtualization	5		BD	VK	NET6303 Network Programming	6
BD	VK	NET6308 Network Integration	5		PD	VK	PP6304 Pre-graduation Internship	5
PD	KV	MIN603 Minor Discipline 3	5					
PD	KV	HRD6325 Digital Signal Processing/ HRD6324 IoT Device Engineering/ PHY6301 Advanced Quantum Computing	5					
		TOTAL	**30**				**TOTAL**	**22**