


«K.Kulazhanov Kazakh University of Technology and Business» JSC	EP 27/02-18-2025	
Educational program	Edition 4	

EDUCATIONAL PROGRAM

6B07116 Automation and control

code and name of the educational program

Level: *Bachelor's*

Approved

by the Board of Directors of JSC

«K.Kulazhanov KazUTB» "02" 04 20 25
protocol No. 3




Recommended

by the Academic Council of JSC

«K.Kulazhanov KazUTB» "28" 03 20 25
protocol No. 8


Astana–2025

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Preface

The educational program "6B07116 Automation and control" was developed in accordance with the requirements of the State Mandatory Standard of Higher and Postgraduate Education, approved by Order No. 2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022, as well as on the basis of professional standards "Development of IoT Systems" dated 05/12/2022. "Development of technical documentation" dated 03.12.2022 Monitoring equipment reliability and mechanical integrity dated 06.12.2022

The educational program «6B07116 Automation and Control» was approved at the meeting of the Council on Academic Quality on "27" 03 2025, protocol No. 4
Chairman Baibolova L.K. 

The educational program "6B07116 Automation and Control" was approved at the meeting of the Commission on Academic Quality of the Faculty on "29" 11 2024, protocol No. 2
Chairman Zhunusova G.S. 















The educational program "6B07116 "Automation and Control" was developed and discussed at the meeting of the Department of Information Technology on "19" 11 2024, protocol No. 4
Head of the department Serimbetov B.A. 


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Approval sheet

Educational program "6B07116 - Automation and Control "

AGREED:

Vice-Rector for Administrative Affairs		E. Askarbekov	" 27 " 03 2025 year
Head of Educational Programs Department	 	B. Bayadilova	" 24 " 03 2025 year
General manager WesCo Group LLP	 	T. Murzabekov	" 19 " 11 2024 year
Chief Engineer of Astana ceramic LLP;	 	A. Ibrashev	" 19 " 11 2024 year
Chief Engineer «ADAL SISTEM» LLP;	 	Yu. Lavrentyev	" 19 " 11 2024 year
Director of «ZHOBA LTD» LLP	 	R. Bersinkulov	" 19 " 11 2024 year
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AC 2 students-241/1		A. Almazova	" 19 " 11 2024 year


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1 Passport of the educational program

International Classification of Education (ISCED) level	Standard of Education	6
National Qualification Framework (NQF) level		6
Sectoral Qualifications Framework (SQF) level		6
Code and name of the field of education		6B07 Engineering, manufacturing and construction industries
Direction of training		6B071 Engineering and Engineering affairs
Number and name of the group of educational programs		B063 Electrical engineering and automation
Code and name of the educational program (EP)		6B07116- Automation and control
Educational program profile		Higher engineering education in the field of Automation and Control
Goal of the educational program		Training of highly qualified specialists in the field of automation and control, who know programming in high-level languages; computing and microprocessor technology; automation equipment and instrumentation, mathematical modeling and optimal process control, methods of development and creation of automation and control systems.
Completion criterion of an educational program		240 academic credits
Language of instruction of the educational program		Russian, kazakh
Distinctive features of the educational program		-
Partner University		-

2 Qualification characteristics of a graduate of an educational program

Degree awarded	Bachelor of Engineering and Technology in the educational program "6B07116- Automation and control"
Field of professional activity	Automation, informatization and management in technical systems related to the use of information processing tools and methods for management in all areas of production
Types of professional activities	Types of professional activity:
Object of professional activity	Types of professional activity: -service and operational activities; -production and technological activities; -organization and managerial activities; -design and engineering activities;

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Functions of professional activity	-experimental and research activities; The objects of professional activity of graduates are automated process control systems of various industries, automated information and control systems for various purposes, automated systems for receiving, processing and transmitting data for various purposes, automated systems for designing systems, facilities, devices, automated systems for complex testing of parts, products, assemblies, devices in various industries.
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3 Requirements for the content of the educational program

Name of cycles and disciplines	Workload in academic credits
Cycle of general education disciplines (GED)	56
Required component	51
University component	5
Cycle of basic disciplines (BD)	89
University component	25
Component of choice	62
Professional practice	2
Cycle of major disciplines (MD)	87
University component	15
Component of choice	55
Professional practice	17
Final assessment	8
Total	240

4 Additional educational programs (minor)

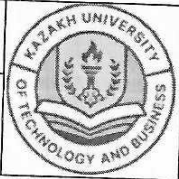
4.1 Minor

Name of disciplines	Workload in academic credits
Introduction to Artificial Intelligence	5
Development of artificial neural networks	5
Artificial intelligence in object management	5
Total	15


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5 Competence map of the educational program "6B07116 - Automation and control"

Competence map of the educational program	Learning outcome code	Learning Outcome (according to Bloom's Taxonomy)
Behavioral skills and personality traits (Softskills)	LO _{GEK1}	Forms a system of general competencies that ensure the socio-cultural development of the future specialist's personality, based on the formation of their worldview, civic, and moral stance, oriented towards a healthy lifestyle.
	LO _{GEK2}	Capable of communication in both oral and written forms in Kazakh, Russian, and foreign languages to solve tasks related to interpersonal, intercultural, and professional communication
	LO _{GEK3}	Promotes the development of information literacy through the mastery and use of modern information and communication technologies in all areas of activity.
Digital competencies (Digital skills)	LO1	He applies economic, legal, and financial literacy, sustainable development, and life safety principles in his professional activities, using key economic and legal principles, analyzing financial risks and their impact on quality of life, demonstrating civic responsibility and responsible behavior.
Professional skills (Hardskills)	LO2	Designs automated technological processes in accordance with the technical schedule, taking into account their reliability and efficiency
	LO3	Develops and interprets drawings for the production of industrial robots
	LO4	Develops technical specifications and projects for the automation of technological processes and productions and mathematical models for the management of technological processes and productions.
	LO5	Has the skills to develop design and operational documentation in accordance with the requirements of regulatory documentation.
	LO6	Develops circuit design solutions and performs calculations of elements of robotic systems using microelectronics and digital technologies.
	LO7	Calculates operations based on the theory of automatic control, theoretical mechanics, hydraulics and pneumatics using modern methods of measurement, control and control of technological processes
	LO8	Solves applied engineering tasks related to the design, development and implementation of SCADA systems and automation startups, including the selection of hardware and software solutions, as well as integration with industrial

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		controllers
	LO9	Uses artificial intelligence in the development of iOS devices to optimize intelligent systems, automated processes, and devices that can adapt to changes in the external environment and interact effectively with users and other devices.
	LO10	Manages complex technological facilities using the fundamentals of scientific research and methods to improve the efficiency of analysis and solve specific information problems.

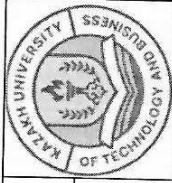
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6 Learning outcomes of the educational program and modules

Key competencies	Learning Outcomes (LO) for the educational program	Name of module	Learning outcomes for the module	Name of disciplines that form learning outcomes
Soft skills	LO _{GEX1} LO _{GEX2} LO _{GEX3}	Man and Society – the foundation of worldview and socio-political knowledge.	Applies the fundamental laws of history, philosophy, and socio-political knowledge for effective socialization and adaptation in changing socio-cultural conditions, shaping a personality capable of mobility in the modern world, critical thinking, and physical self-improvement.	Module of socio-political knowledge (political science, sociology, cultural studies, psychology) The history of Kazakhstan Philosophy Physical Culture Russian language Foreign language
Digital skills	LO1	Information and Communication Module	Possesses various types of information and communication technologies for searching, storing, processing, protecting, and disseminating information. Demonstrates knowledge and understanding of facts, phenomena and complex dependencies in the field of economics, law, the peculiarities of interaction between nature and society to ensure the safety of life	Information and communication technologies Module of Economics, Entrepreneurship, Law and financial literacy (fundamentals of economics and entrepreneurship, fundamentals of law and anti-corruption culture, fundamentals of financial literacy) Sustainable development, ecology and life safety

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LO2	Designing	<p>He has the skills to perform technical tasks in the development of course projects, is able to use digital tools in the design of nodes and elements of automated production. He has programming skills of digital equipment and controllers, reads functional automation schemes and structural control schemes of production processes..</p>	<p>Engineering graphics and 3D modeling Introduction to the specialty Engineering design Automated control system design Computer-aided design system Reliability of automation systems Design of automation equipment Pre-graduate practice Automation of technological processes and productions Automation of production processes Automation and management systems of renewable energy sources</p>
LO3	Control and diagnostics of automation devices	<p>They study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency.</p> <p>He has the skills of designing automated production and technological processes. Accepts the acquired knowledge in the development and design of automation facilities. He is able to correctly perform functional automation schemes. He knows the basic designations of automation devices in diagrams and uses the skills to complete coursework.</p> <p>He has the skills to perform technical tasks in the development of course projects, is able to use digital tools in the design of nodes and elements of automated production. He has programming skills of digital equipment and controllers, reads</p>	<p>Automatic control, registration and accounting equipment Automated control system design Design of automation equipment Computer-aided design system Kinematics and dynamics of industrial robots Industrial practice 1</p>
	Designing		

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Educational program	Edition 4	<p>functional automation schemes and structural control schemes of production processes</p> <p>The use of Internet of Things (IoT) technologies and mechatronic systems in industrial automation. The principles of building intelligent devices, the integration of sensors and actuators, real-time data transmission, as well as the creation of adaptive control systems to increase productivity and sustainability of industrial processes are being studied.</p> <p>Applies fundamental concepts and laws of mathematics, methods of formalization of reasoning, performs the proof of mathematical statements, builds mathematical methods and algorithms in solving professional problems in the field of information systems and technologies</p> <p>He has the skills to perform technical tasks in the development of course projects, is able to use digital tools in the design of nodes and elements of automated production. He has the skills of programming digital equipment and controllers, reads functional automation schemes and structural control schemes of production processes.</p>

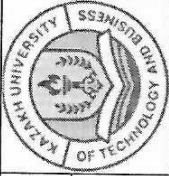
Industrial practice 2	Fundamentals of robotics and microcontrollers
Mathematical models of management objects Educational practice	<p>Applies fundamental concepts and laws of mathematics, methods of formalization of reasoning, performs the proof of mathematical statements, builds mathematical methods and algorithms in solving professional problems in the field of information systems and technologies</p> <p>He has the skills to perform technical tasks in the development of course projects, is able to use digital tools in the design of nodes and elements of automated production. He has the skills of programming digital equipment and controllers, reads functional automation schemes and structural control schemes of production processes.</p>
Engineering graphics and 3D modeling	Designing
Engineering design	Physics and Mathematics, algorithms and software
Computer-aided design system Design of automation equipment	<p>IoT and mechatronic systems in industrial automation</p> <p>LO4</p>

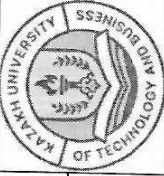
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	Integrated digital solutions: modeling, automation, controllers	They study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency.	Modeling of sensor equipment
	LO5	Intelligent automation and standardization of digital processes	Standardization and conformity assessment
Hardskills		Designing	Standardization, certification, and measuring instruments.
			Introduction to the specialty
Hardskills	LO6	Physics and Mathematics, algorithms and software	Physics
		Electronics and control theory	Industrial automation
			Microelectronics

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	<p>assemblies, knows how to use and apply control and regulation devices, knows the basic laws of mechanics, and has the skills to use modern digital design tools and engineering calculations.</p> <p>Study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency</p> <p>Uses the acquired theoretical knowledge according to market conditions, with an assessment of the impact of intelligent devices on the psychophysical and emotional state of technical personnel</p> <p>Performs calculations of industrial robot assemblies, knows how to use and apply control and regulation devices, knows the basic laws of mechanics, and has the skills to use modern digital design tools and engineering calculations.</p> <p>Possesses the skills of designing automated production and technological processes. Accepts the acquired knowledge in the development and design of automation facilities. Knows how to correctly perform functional automation schemes. Knows the basic designations of automation devices in diagrams and uses the skills to complete coursework</p> <p>The use of Internet of Things (IoT) technologies and</p>	<p>Industrial Electronics</p> <p>Digital and microprocessor technology</p> <p>Digital automation elements</p> <p>Fundamentals of robotics and microcontrollers</p> <p>Theory of automatic control</p> <p>Automation control and measuring devices</p> <p>Basics of automation</p> <p>Hydraulics and pneumatic systems</p>
LO7	<p>Integrated digital solutions: modeling, automation, controllers.</p> <p>IoT and mechatronic systems in industrial automation</p> <p>Electronics and control theory</p> <p>Control and diagnostics of automation devices</p> <p>IoT and mechatronic systems in</p>	
Hardskills		

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	industrial automation	mechatronic systems in industrial automation. The principles of building intelligent devices, the integration of sensors and actuators, real-time data transmission, as well as the creation of adaptive control systems to increase productivity and sustainability of industrial processes are being studied.	The Object-oriented programming (Java)	
	Integrated digital solutions: modeling, automation, controllers.	Study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency	Fundamentals of theoretical mechanics	Automation and management systems of renewable energy sources
LO8	Physics and Mathematics, algorithms and software	Applies fundamental concepts and laws of mathematics, methods of formalization of reasoning, performs the proof of mathematical statements, builds mathematical methods and algorithms in solving professional problems in the field of information systems and technologies	Operating systems	
	Physics and Mathematics, algorithms and software	Applies fundamental concepts and laws of mathematics, methods of formalization of reasoning, performs the proof of mathematical statements, builds mathematical methods and algorithms in solving professional problems in the field of information systems and technologies	Higher Mathematics	Physics
	IoT and mechatronic systems in industrial automation	The use of Internet of Things (IoT) technologies and mechatronic systems in industrial automation.	Algorithms, Data Structures, and Programming (C)	Production automation software
			Operating systems	Object-oriented programming (Java)

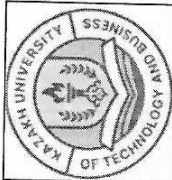
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		<p>The principles of building intelligent devices, the integration of sensors and actuators, real-time data transmission, as well as the creation of adaptive control systems to increase productivity and sustainability of industrial processes are being studied.</p>	<p>Fundamentals of mechanics</p> <p>The basics of SMART technologies</p>	
	<p>Integrated digital solutions: modeling, automation, controllers.</p>	<p>Study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency</p>	<p>Building SCADA systems</p>	
	<p>Intelligent automation and standardization of digital processes</p>	<p>Uses the theoretical knowledge gained according to market conditions, with an assessment of the impact of intelligent devices on the psychophysical and emotional state of technical personnel</p>	<p>Programming controllers in automation systems</p>	
LO9	<p>Control and diagnostics of automation devices</p>	<p>He has the skills of designing automated production and technological processes. Accepts the acquired knowledge in the development and design of automation facilities. Knows how to correctly perform functional automation schemes. He knows the basic designations of automation devices in diagrams and uses new ones when completing coursework.</p>	<p>Internet technology design</p> <p>Wireless networks and mobile systems</p>	
	<p>IoT and Mechatronic systems in industrial automation</p>	<p>Apply Internet of Things (IoT) technologies and mechatronic systems in industrial automation. The principles of building intelligent devices, the integration of sensors and actuators, real-time data</p>	<p>The basics of SMART technologies</p> <p>The architecture of computer systems is an IoT device</p> <p>Artificial intelligence in object</p>	

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	transmission, as well as the creation of adaptive control systems to increase productivity and sustainability of industrial processes are being studied.		management
Intelligent automation and standardization of digital processes	Uses the theoretical knowledge gained according to market conditions, with an assessment of the impact of intelligent devices on the psychophysical and emotional state of technical personnel		Computing systems, networks, and telecommunications Designing IoT applications Programming controllers in automation systems
Physics and Mathematics, algorithms and software	Applies fundamental concepts and laws of mathematics, methods of formalization of reasoning, performs the proof of mathematical statements, builds mathematical methods and algorithms in solving professional problems in the field of information systems and technologies		Introduction to Artificial Intelligence The Industrial Internet of Things
Integrated digital solutions: modeling, automation, controllers.	Study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency		Artificial intelligence methods in management
LO10 Module of economic, legal, scientific and environmental knowledge	Demonstrates knowledge and understanding of facts, phenomena and complex dependencies in the field of economics, law, the peculiarities of interaction between nature and society to ensure the safety of life		Methods of protection of automated systems equipment Startups in the automation industry Modern science-technological production

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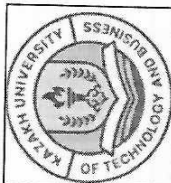
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			Scientific approaches for information analysis
		Uses the theoretical knowledge gained according to market conditions, with an assessment of the impact of intelligent devices on the psychophysical and emotional state of technical personnel	Fundamentals of scientific research Development of artificial neural networks
	IoT and mechatronic systems in industrial automation	The use of Internet of Things (IoT) technologies and mechatronic systems in industrial automation. The principles of building intelligent devices, the integration of sensors and actuators, real-time data transmission, as well as the creation of adaptive control systems to increase productivity and sustainability of industrial processes are being studied.	Programming controllers in automation systems The architecture of computer systems is an IoT device Object-oriented programming (Java)
	Integrated digital solutions: modeling, automation, controllers.	They study the principles of modeling technological processes, working with industrial controllers (PLC) and the implementation of control systems. Special attention is paid to the design and integration of SCADA systems, digital counterparts and modern controls to improve production efficiency.	Automation of production processes Automation of technological processes and productions Engineering modeling of complex technological systems Cryptographic methods of information protection
	Physics and Mathematics, algorithms and software	Applies fundamental concepts and laws of mathematics, methods of formalization of reasoning, performs the proof of mathematical statements, builds mathematical methods and algorithms in solving professional problems in the field of information systems and technologies	Algorithms, Data Structures, and Programming (C) The Industrial Internet of Things Operating systems
		The purpose of the final assessment is to evaluate	Final assessment

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the learning outcomes and key competencies achieved upon completion of the study of the higher education program.

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field of information systems and technologies	

7 The relationship between the attainability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Formed learning outcomes (codes)														
				L O G E K 2	LO GE K3	LO 1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10			
Cycle of general education disciplines																		
1.	Module of socio-political knowledge (political science, sociology, cultural studies, psychology)	This program involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; commonality of result-oriented teaching methodology; a single systematic representation of the typology of learning outcomes as formed abilities. Within the disciplines of sociology and psychology, special attention is paid to	8	+														

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	inclusion as a key social and humanistic value. It is considered as an integral part of modern social and psychological knowledge, contributing to the formation of students' respect for social and individual diversity, recognition of human rights and principles of equality.								
2. Physical education	This program is aimed at teaching the general education discipline "physical culture", which provides physical culture in accordance with world educational standards. The program determines the joint cooperation of the teacher and the student in the context of the requirements for the level of assimilation of the discipline at all stages of training in the course of physical education.	8	+						
3. History of Kazakhstan	The program consists of five thematic blocks: ancient people, the formation of nomadic civilization, Turkic civilization and the Great Steppe, Kazakhstan in the new era (XVIII – early XX centuries), Kazakhstan in the Soviet period, independent Kazakhstan. The discipline provides objective knowledge of the main stages of the development of students – the history of Kazakhstan from ancient times to the present.	5	+						
4. Philosophy	This program is aimed at studying the updated content of the general educational	5	+						

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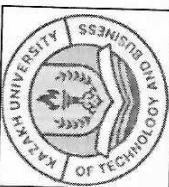
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	<p>discipline "philosophy", the formation of students' qualities of openness of consciousness, their own national code, national consciousness, spiritual revival, competitiveness, realism and pragmatism, critical thinking, the desire for knowledge, their assimilation of worldview concepts of Justice, honor, freedom and others, as well as strengthening and developing the values of tolerance, intercultural dialogue and a culture of peaceful life.</p>			
<p>5. Kazakh (Russian) language</p>	<p>The program of the general education discipline "Kazakh language" is aimed at a new format of language learning and the formation of socio-cultural knowledge, improving the student's communicative competence, developing his personal potential. This program is designed to develop the linguistic personality of a student capable of carrying out cognitive and communicative activities in the Russian language in the fields of interpersonal, social, professional, intercultural communication in the context of the implementation of state programs of trilingualism and spiritual modernization of national consciousness.</p>	<p>10</p>	<p>+</p>	
<p>6. Foreign language</p>	<p>This program is designed to provide training in the discipline "foreign language", which is one of the mandatory</p>	<p>10</p>	<p>+</p>	

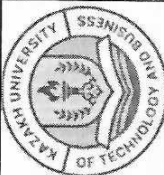
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	<p>disciplines of the general education cycle. The main goal of the program is the formation of intercultural and communicative competencies of students at sufficient levels (A2, pan-European competencies) and basic (B1, pan-European competencies) in the process of foreign education. If the student's language level is higher than the pan-European level of competence B1 before entering a university, depending on his / her training, he / she can reach the pan-European level of competence B2 at the end of the course.</p>	5	+	
7. Information and communication technologies	<p>The program is aimed at studying the updated content of the general education discipline " information and communication technologies "(hereinafter referred to as the discipline), the formation of the ability to critically understand the role and importance of modern information and communication technologies in the era of digital globalization, the formation of new " digital " thinking, knowledge and skills in the use of modern information and communication technologies in various</p>	5	+	
8. Information and communication technologies	<p>The program is aimed at studying the updated content of the general education discipline" information and communication technologies "(hereinafter referred to as the discipline), the formation</p>	5	+	

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11	Theoretical foundations of electrical engineering	<p>The course examines the basic concepts and methods in the field of electrical engineering, gives students the opportunity to understand electrical and magnetic phenomena, choose the right elements of electrical circuits and use them effectively. The course also examines the principles of electrical circuits, circuit design, conversion methods, as well as the processes of production and distribution of electrical energy.</p>	5					+	
12	Sustainable development, ecology and life safety	<p>The course is aimed at forming a systemic understanding of the principles of ensuring balance between economy, social development of society, preservation of environment, protection of life and human health. Develops skills of effective management of energy and waste in the circular economy in the development of national strategies and implementation of business processes; analysis, forecasting and minimization of technological, natural and social risks; Sustainable lifestyle and responsible attitude to one's own security.</p>	5		+				
13	Physics	<p>The discipline studies fundamental physical laws and their application in technology. The sections of physics such as mechanics, molecular physics, thermodynamics, electromagnetism and optics are</p>	6					+	


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28	Operating systems	and Java packages. The discipline is aimed at the formation of theoretical knowledge in the field of building modern operating systems, methods of organizing computing processes, methods of developing algorithms for the interaction of application programs with the operating system and mechanisms for their implementation. Studies the purpose and functions of operating systems, the architecture of operating systems, the management of processes, threads, memory in operating systems and I/O management and file systems.	5										
29	Fundamentals of automation	The discipline studies automatic control systems, their elements and principles of operation. Sensors, regulators, actuators, mathematical modeling, transfer functions and stability criteria are considered. Control methods (P, PI, PID controllers) and feedback principles are studied. Modern technologies are also affected.: PLCs, microprocessors, integration with information systems. Discipline is important for the design and operation of automated systems.	5										
30	Fundamentals of Theoretical	The discipline ensures that students master the basic principles of theoretical	5										


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	mechanics, teaches them to correctly classify the types of ongoing processes and apply appropriate theoretical recommendations, as well as forms scientific and engineering thinking, that is, the ability to see each mechanical system as its computational model.											
31 Fundamentals of SMART technologies	The discipline covers core technologies such as the Internet of Things (IoT), artificial intelligence, big data, and cloud computing, which underpin the creation of smart solutions for various fields, including cities, buildings, and manufacturing. Special attention is paid to safety, energy efficiency and the integration of these technologies into existing systems.	5									+	
32 Program provision for production automation	The discipline determines the tools and technologies for the development of programs for the management of production processes. It includes the principles of SCADA system, programmable logical controllers (PLC), human-machine interfaces (HMI) and system management databases. The languages of programming, automation algorithms, process modeling and integration of the program with the organization are considered.	4								+		
33 Automated	The discipline is devoted to the methods of	5								+		


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	control system design	development, design and implementation of automated control systems (ACS), including process automation systems (APCS). The main stages of design are considered, starting from requirements analysis and hardware selection to software development and system configuration							
34	Industrial automation	The discipline studies the methods of designing and implementing automated production process management systems. It includes work with sensors, controllers, robots, monitoring and data transmission systems. Special attention is paid to programming, optimization, energy saving and integration of Industry 4.0 technologies to improve the efficiency, quality and environmental friendliness of production facilities.	4			+			
35	Industrial electronics	The discipline studies the basics of electronics used in industry. It includes the principles of operation of semiconductor devices, power electronics, converters, power supplies and sensors. Examines circuit design, control of electric drives, and protection of electrical equipment.	5			+			
36	Modern materials in technical production	The course covers a wide range of modern materials, including metals, polymers, composites, nanomaterials, and new alloys, as well as their physico-chemical properties	5			+			

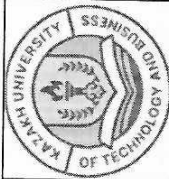
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37	Digital elements of automation	<p>that enable the creation of more efficient, stable, and durable components for complex engineering systems.</p> <p>The discipline introduces the basics of digital devices used in automation systems. Logical elements, their functional features, as well as the principles of operation of digital circuits such as triggers, registers and counters are considered. As a result of mastering the discipline, students acquire the knowledge and skills necessary for the development and application of digital devices in automation systems, which allows them to develop and modernize digital control systems.</p>	5							
Cycle of major disciplines										
University component/ Elective component										
38	Artificial intelligence in object management	<p>The discipline studies the basic concepts and principles of artificial intelligence systems, as well as their application in object management. Methods and technologies of artificial intelligence for effective management of objects. Upon completion of the course, students receive the skills and knowledge necessary for successful management of facilities using modern artificial intelligence technologies.</p>	5							+
39	Fundamentals of scientific	<p>The discipline is aimed at studying the scientific method, methods of data</p>	5							+


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51	Basics of robotics and microcontrollers	approaches to data analysis in various fields of science and technology are considered.	5							
52	Building SCADA systems	The discipline covers the basics of designing, programming, and controlling robotic circuits. It covers the operation of microcontrollers, sensors, drives, integration components, control and automation algorithms. Attention is paid to practical application in industry and solving operational management problems	5							
53	Programming controllers in automation systems	The discipline is aimed at studying the processes of designing and developing SCADA systems (dispatch control and data collection systems), which are used for monitoring, controlling and automating technological processes in real time. The architecture of SCADA systems, the main components (controllers, sensors, servers), as well as methods of data collection and processing are considered.	5							

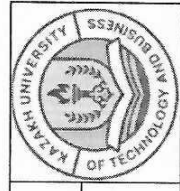
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	application for process control are considered.		5							
54 Designing IoT applications	The discipline covers the basics of designing applications for the Internet of Things (IoT), including the creation and integration of devices and sensors into a network for data exchange and process management. The architectures of IoT systems, communication protocols, methods of data collection, processing and storage, as well as the security and energy efficiency of such systems are considered.		5							+
55 Design of automation equipment	The discipline studies methods and approaches of designing technical means used for automation of various technological processes and productions. The key components of automated systems, including sensors, actuators, controllers, and communication interfaces, are considered. The course teaches students how to design systems that ensure data collection, processing, and process management with minimal cost and maximum reliability.		5		+	+	+			
56 Computer-aided design system	The purpose of the discipline is to form the knowledge and skills necessary for students to successfully apply computer-aided design systems in engineering practice. It includes working with modern		5		+	+	+			

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57	Modern scientific and technological production	<p>software products, creating and analyzing projects, as well as the effective use of automated tools to optimize design processes and improve the quality of finished products. The student can learn the principles of software operation, which allow creating and analyzing various projects in engineering practice.</p> <p>The discipline covers modern principles and technologies of high-tech production organization. Advanced methods of automation, digitalization and robotization of industrial processes, as well as the use of artificial intelligence, the Internet of Things (IoT) and additive technologies (3D printing) are considered.</p>	5								+
58	Standardization and conformity assessment	<p>The discipline covers key principles and methods of standardization, technical regulation and conformity assessment in the field of automation and control. Students study international and national standards and compliance assessment processes. Practical aspects of the application of standards at various stages of development and operation of automated systems are considered.</p>	5								+
59	Standardization, certification and measuring	<p>The discipline covers certification processes of equipment and technologies that ensure compliance with established</p>	5								+



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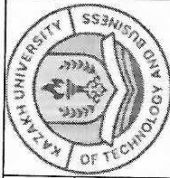
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<p>instruments</p> <p>requirements and standards, is studied in order to understand the principles of development, implementation and control of standards governing the quality, safety and compatibility of automated systems.</p>	<p>5</p>	<p>+</p>																																																																																															
<p>60</p> <p>Startups in the automation industry</p> <p>The discipline is aimed at developing entrepreneurial skills and creating innovative start-ups in the field of industrial process automation. Students will gain comprehensive knowledge about the development and implementation of advanced technologies, including the Internet of Things (IoT), artificial intelligence (AI), and robotics.</p>	<p>5</p>	<p>+</p>																																																																																															
<p>61</p> <p>Digital and microprocessor technology</p> <p>The discipline is devoted to the study of the principles of operation of digital and microprocessor systems, as well as their application in various fields of automation and control. The basics of digital logic, architecture of microprocessors and microcontrollers, their interaction with peripheral devices, as well as the principles of digital device development are considered.</p>	<p>5</p>	<p>+</p>																																																																																															

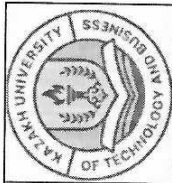
Minor

<p>62</p> <p>Introduction to Artificial Intelligence</p> <p>The discipline is aimed at studying the basic concepts, methods and technologies used in modern artificial intelligence systems. Looks at artificial neural</p>	<p>5</p>	<p>+</p>																																															
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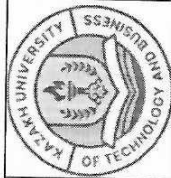
63	Development of artificial neural networks	<p>networks, machine learning, deep learning, and applied algorithms and models used in various fields such as computer vision, natural language processing, robotics, and Game Art. Able to analyze and solve problems using artificial intelligence methods.</p> <p>The discipline focuses on the study of methods for creating and training neural networks, which are mathematical models that mimic the work of the human brain. During the course of studying this discipline, students will learn about various types of neural networks, their structures and learning algorithms. Upon completion of the course, students will be able to create, train and apply neural networks to solve various tasks in the field of artificial intelligence and machine learning.</p>	5											
64	Methods of artificial intelligence in management	<p>The discipline studies the principles and methods of applying artificial intelligence (AI) in the management of organizations, production and business processes. Machine learning methods, neural networks, optimization and data processing algorithms are considered, which can be used to improve the decision-making process, optimize the operation of systems and predict their behavior.</p>	5											

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8 Alignment of planned learning outcomes with assessment technologies and teaching methods within the module

Learning Outcomes (LO) Number	Planned learning outcomes for the module	Assessment technologies (tools)	Methods of learning and teaching
LO1	He applies economic, legal, and financial literacy, sustainable development, and life safety principles in his professional activities, using key economic and legal principles, analyzing financial risks and their impact on quality of life, demonstrating civic responsibility and responsible behavior.	Interactive lecture, brainstorming, game methods, case study method.	A test, Solving situational problems. Reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.
LO2	Designs automated technological processes in accordance with the technical schedule, taking into account their reliability and efficiency	Project method, case analysis, brainstorming, game methods, case study method.	Project defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.
LO3	Develops and interprets drawings for the production of industrial robots	Project method, case analysis, brainstorming, game methods, case study method.	Project defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.
LO4	Develops technical specifications and projects for the automation of technological processes and productions, as well as mathematical models for process control.	Project method, case analysis, brainstorming, game methods, case study method.	Project defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.

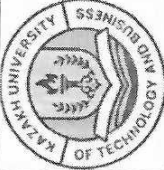



			combined exercises, etc.	method,
LO5	Has the skills to develop design and operational documentation in accordance with the requirements of regulatory documentation.	Project method, case analysis, brainstorming, game methods, case study method.	Project reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.	defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.
LO6	Develops circuit design solutions and performs calculations of elements of robotic systems using microelectronics and digital technologies.	Project method, case analysis, brainstorming, game methods, case study method.	Project reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.	defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.
LO7	Calculates operations based on the theory of automatic control, theoretical mechanics, hydraulics and pneumatics using modern methods of measurement, control and control of technological processes	Project method, case analysis, brainstorming, game methods, case study method.	Project reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.	defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.
LO8	Solves applied engineering tasks related to the design, development and implementation of SCADA systems and automation startups, including the selection of hardware and software solutions, as well as integration with industrial controllers	Project method, case analysis, brainstorming, game methods, case study method.	Project reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.	defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.

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LO9	Uses artificial intelligence in the development of IoT devices to optimize intelligent systems, automated processes, and devices that can adapt to changes in the external environment and interact effectively with users and other devices.	Project method, case analysis, brainstorming, game methods, case study method.	Project defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.	
LO10	Manages complex technological facilities, using the fundamentals of scientific research and methods to improve the efficiency of analysis to solve specific information problems.	Project method, case analysis, brainstorming, game methods, case study method.	Project defense, reconstructive work, flip class, interactive method, thematic discussions, combined method, exercises, etc.	

9 Correlation of learning outcomes of the educational program with the labor functions of professional standards (if any)

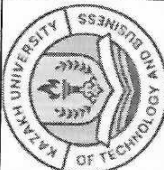
Name of the professional standards used	Professions at level 6 and/or 7 of the SQF	Labor functions	Tasks	Learning outcomes for the educational program
Development of IoT systems	Cloud IoT Systems Engineer	Labor function 1: Ensuring performance at the physical level	Task 1: Managing IoT devices Task 2: Analysis and monitoring of IoT devices	LO6 Develops circuit design solutions and performs calculations of elements of robotic systems using microelectronics and digital technologies.

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Professional standard "Development of technical documentation"	"Database Administrator"	Labor function 2: Technical Documentation Specialist (technical writer)	Labor function 3: Ensuring operability at the application level	Task 1: Designing software for iOS devices	LO7 Calculates operations based on the theory of automatic control, theoretical mechanics, hydraulics and pneumatics using modern methods of measurement, control and control of technological processes LO8 Solves applied engineering tasks related to the design, development and implementation of SCADA systems and automation startups, including the selection of hardware and software solutions, as well as integration with industrial controllers LO9 Uses artificial intelligence in the development of IoT devices to optimize intelligent systems, automated processes, and devices that can adapt to changes in the external environment and interact effectively with users and other devices.
Professional standard "Development of technical documentation"	"Database Administrator"	Labor function 2: Technical Documentation Specialist (technical writer)	Labor function 3: Development of technical documentation	The task is not described in the professional standard	LO4 Develops technical specifications and projects for the automation of technological processes and productions, as well as mathematical models for process control. LO5 Has the skills to develop design and operational documentation in accordance with the requirements of regulatory documentation.

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Educational program		Edition 4		Labor function 1: Ensuring reliable operation of dynamic equipment Task 1: Ensuring reliable operation of dynamic equipment	
Professional standard "Ensuring the reliability and integrity of mechanical equipment"		Labor function 1: Ensuring reliable operation of dynamic equipment		Task 1: Ensuring reliable operation of dynamic equipment	
LO10 -Is able to correctly formulate the task of managing complex technological objects					

10 Graduate Model

GRADUATE MODEL			
Competencies (soft skills, digital skills)			
Attributes of a graduate		Knowledge	Skills
-High professionalism in the field of Automation and management; -Emotional intelligence; -Adaptability to global challenges; -Leadership; -Skill in creating documentation for IoT and AI systems, including user instructions and technical descriptions -Knowledge of the methods of drawing up technical specifications and project documentation in accordance with GOST, ESCD, SPDS -The skill of preparing documentation for SCADA systems and other integration projects		1. Configure and install sensors and readers to transmit information for verification and analysis of the transmitted data. 2. Select and describe the characteristics of sensors and readers for the required project 3. Methods of collecting information (questionnaires, interviews, Internet searches). 4. General requirements for the structure of sections of technical documentation. 5. Standards for the development and execution of technical documentation 6. Standards for the development and execution of technical documentation.	1. Characteristics of devices and their application in industries. 2. Software tools for IoT systems 3. Methodology of machine-to-machine interaction 4. Technology of working with embedded systems 5. Standards for the development and execution of technical documentation. 6. General requirements for the structure of sections of the technical document. 7. Terminology used to describe the user interface of technical documentation.
Professional skills (hard skills)			
"Development of an IoT system"			

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Educational program	Edition 4	<ul style="list-style-type: none"> - Defines the essence and content of the processes of management, management, entrepreneurship and management; - Has the ability to establish communication and decision-making processes; has the ability to choose an effective leadership style and leadership, methods of managing groups, conflicts, and stress; - Possesses communication skills to communicate with colleagues and customers in the process of project development, as well as participates in the organization and management of projects

Формы-матрицы, интегрирующие базовые дисциплины / Формы-матрицы, интегрирующие базовые дисциплины, обеспечивающие / Формы и программы обеспечения / Формы и программы обеспечения / Формы и программы обеспечения

Модуль / Module № 4	Наименование дисциплины / Discipline Name	Коды / Codes	Семестр / Semester	Число часов / Number of hours	Лекции / Lectures	Семинары / Seminars	Лабораторные работы / Laboratory works	СРС / Independent work	Итого / Total	Формы обеспечения / Provision forms									
											1	2	3	4	5	6	7	8	9
Модуль / Module № 4	1. Жесткие матрицы / Rigid matrices / Жесткие матрицы / Rigid matrices	ВЛ (VK)	VM1201-25	1	5				5	15	30	15	90	1+2+0	Без аудиторных занятий / By student's option				
		ВЛ (VK)	VM1201-25																
		БС (UC)	VM1201-25																
	2. Алгоритмы, методы сортировки / Algorithms, data structures, and programming (SI)	ВЛ (VK)	ASDP 1204-25												Без аудиторных занятий / By student's option				
		ВЛ (VK)	ASDP 1204-25	1	4	120	45	30	15	60	15	60	1+2+0	Без аудиторных занятий / By student's option					
		БС (ES)	ASDP 1204-25																
	3. Промышленные автоматизации / Industrial automation	ВЛ (VK)	PA 1204-25																
		ВЛ (VK)	PA 1204-25																
		БС (ES)	PA 1204-25																
4. Физика / Physics	ВЛ (VK)	Ph 1205-25																	
	ВЛ (VK)	Ph 1205-25	2	6	180	60	15	30	15	105	1+1+2								
	БС (ES)	Ph 1205-25																	
5. Основы программирования / Basic programming / Основы программирования / Basic programming	ВЛ (VK)	UP 1206-25																	
	ВЛ (VK)	UP 1206-25	2	2	60	0					2 нед./неделя / weeks								
	БС (ES)	UP 1206-25																	
6. Моделирование объектов управления / National model of object management / Моделирование объектов управления / National model of object management	ВЛ (VK)	MSOU 2208-25																	
	ВЛ (VK)	MSOU 2208-25	1	5	150	45	15	30	15	90	1+2+0								
	БС (ES)	MSOU 2208-25																	
7. Операционные системы / Operating systems / Операционные системы / Operating systems	ВЛ (VK)	OS 2208-25																	
	ВЛ (VK)	OS 2208-25																	
	БС (ES)	OS 2208-25																	
8. Программное обеспечение для автоматизации производства / Software revision for production automation / Программное обеспечение для автоматизации производства / Software revision for production automation	ВЛ (VK)	POAP 2215-25																	
	ВЛ (VK)	POAP 2215-25	2	4	120	45	15	30	15	60	1+2+0								
	БС (ES)	POAP 2215-25																	
9. Интеллектуальный инжиниринг / Intelligent Engineering / Интеллектуальный инжиниринг / Intelligent Engineering	ВЛ (VK)	IV2215-25																	
	ВЛ (VK)	IV2215-25																	
	БС (ES)	IV2215-25																	
Барышки модуль / Итого по модулю / Total for module										780	240	75	135	30	75	405			

Модуль / Module № 5	Наименование дисциплины / Discipline Name	Коды / Codes	Семестр / Semester	Число часов / Number of hours	Лекции / Lectures	Семинары / Seminars	Лабораторные работы / Laboratory works	СРС / Independent work	Итого / Total	Формы обеспечения / Provision forms									
											1	2	3	4	5	6	7	8	9
Модуль / Module № 5	1. Матрицы жесткости / Stiffness matrices / Матрицы жесткости / Stiffness matrices	ВЛ (VK)	VS 1202-25																
		ВЛ (VK)	VS 1202-25	1	4	120	45	15	30	15	60	1+2+0							
		БС (UC)	VS 1202-25																
	2. Инженерная графика / Engineering graphics / Инженерная графика / Engineering graphics	ВЛ (VK)	IP 2112-25																
		ВЛ (VK)	IP 2112-25																
		БС (ES)	IP 2112-25																
	3. Инженерная графика / Engineering graphics and 3D modeling / Инженерная графика и 3D моделирование / Engineering graphics and 3D modeling	ВЛ (VK)	IG 3 DM 2212-25																
		ВЛ (VK)	IG 3 DM 2212-25	2	4	120	45	15	30	15	60	1+2+0							
		БС (ES)	IG 3 DM 2212-25																
	4. Кинематика и динамика промышленных роботов / Kinematics and dynamics of industrial robots / Кинематика и динамика промышленных роботов / Kinematics and dynamics of industrial robots	ВЛ (VK)	KIDPR 4331-25																
		ВЛ (VK)	KIDPR 4331-25	1	5	150	45	15	30	15	90	1+2+0							
		БС (ES)	KIDPR 4331-25																
	5. Системы автоматизированного проектирования / Computer-aided design system / Системы автоматизированного проектирования / Computer-aided design system	ВЛ (VK)	SAP 4307-25																
		ВЛ (VK)	SAP 4307-25																
БС (ES)		SAP 4307-25																	
6. Автоматизация инженерных систем / Reliability of automation systems / Автоматизация инженерных систем / Reliability of automation systems	ВЛ (VK)	NSA 4332-25																	
	ВЛ (VK)	NSA 4332-25	2	5	150	45	15	30	15	90	1+2+0								
	БС (ES)	NSA 4332-25																	
7. Проектирование систем автоматизации / Design of automation system / Проектирование систем автоматизации / Design of automation system	ВЛ (VK)	PTSA 4332-25																	
	ВЛ (VK)	PTSA 4332-25																	
	БС (ES)	PTSA 4332-25																	
Барышки модуль / Итого по модулю / Total for module										540	180	60	120	0	60	360			

Электроника және басқару теориясы / Электроника в теории управления / Electronics and management theory													
1	Электроникалық теориялық негіздер / Теоретические основы электротехники / Theoretical foundations of electrical engineering	БП (КК) / БП (КК) / BS (UC)	ТОЕ 2206-25 / ТОЕ 2206-25 / ТОЕ 2206-25	1	5	150	45	15	30	15	90	1+2+0	Талақталатын тақырым бойынша / По выбору обучающихся/
2	Өнеркәсіптік электроника / Промышленная электроника	БП (КК) / БП (КК) / BS (ES)	МЕ 2207-25 / МЕ 2207-25 / МЕ 2207-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
3	Микроэлектроника / Микроэлектроника	БП (КК) / БП (КК) / BS (ES)	МЕ 2207-25 / МЕ 2207-25 / МЕ 2207-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
4	Автоматтық басқару теориясы / Теория автоматического управления / Theory of automatic control	БП (КК) / БП (КК) / BS (UC)	ТАУ 3322-25 / ТАУ 3322-25 / ТАУ 3322-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
Барлығы модуль бойынша / Итого по модулю / Total for module				15	450	135	45	90	0	45	270		

Автоматтық құрылымдар бақылау және диагностика / Контроль и диагностика устройств автоматизации / Monitoring and diagnostics of automation devices													
1	Автоматтық басқарушы жүйелерді бақылау және диагностикалық құрылымдар / Контроль-диагностические приборы автоматизации / Control and measuring devices of automation	БП (КК) / БП (КК) / BS (ES)	КІПА 2209-25 / КІПА 2209-25 / КІПА 2209-25	1	5	150	45	15	30	15	90 <th rowspan="2">1+2+0</th> <th rowspan="2">Білім алушының тақырымы бойынша / По выбору обучающихся/</th>	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
2	Интернет-технологиялар жобалау / Проектирование систем интернет-технологий / Internet technology design	БП (КК) / БП (КК) / BS (ES)	ИТ 2209-25 / ИТ 2209-25 / ИТ 2209-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
3	Автоматтық негіздер / Основы автоматизации / Fundamentals of automation	БП (КК) / БП (КК) / BS (ES)	ОА 2211-25 / ОА 2211-25 / ОА 2211-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
4	Сымалы желілер және мобилді желілер / Беспроводные сети и мобильные системы / Wireless networks and mobile systems	БП (КК) / БП (КК) / BS (ES)	БСМС 2211-25 / БСМС 2211-25 / БСМС 2211-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
5	Автоматтық бақылау, түрлендіру және есептеу аппаратурасы / Аппаратура автоматического контроля, регистрации и учета / Automatic control, registration and accounting devices	БП (КК) / БП (КК) / BS (ES)	ААККУ 3219-25 / ААККУ 3219-25 / ААККУ 3219-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
6	Бақылау және автоматтық жүйелердің автоматтық бақылау және есептеу аппаратурасы / Автоматизированные системы контроля и учета / Automated control system design	БП (КК) / БП (КК) / BS (ES)	ПАСУ 3219-25 / ПАСУ 3219-25 / ПАСУ 3219-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
7	Өндірістік практика 1 / Производственная практика 1 / Production practice 1	БП (КК) / БП (КК) / BS (UC)	ПП 3227-25 / ПП 3227-25 / ПП 3227-25	2	5	150	0	0	0	0	0	5 аяма / недела / weeks	Білім алушының тақырымы бойынша / По выбору обучающихся/
8	Өндірістік практика 2 / Производственная практика 2 / Production practice 2	БП (КК) / БП (КК) / BS (UC)	ПП 3227-25 / ПП 3227-25 / ПП 3227-25	2	5	150	0	0	0	0	0	5 аяма / недела / weeks	Білім алушының тақырымы бойынша / По выбору обучающихся/
Барлығы модуль бойынша / Итого по модулю / Total for module				25	750	135	45	90	0	45	270		

Модуль № 6													
Электроника және басқару теориясы / Электроника в теории управления / Electronics and management theory													
1	Электроникалық теориялық негіздер / Теоретические основы электротехники / Theoretical foundations of electrical engineering	БП (КК) / БП (КК) / BS (UC)	ТОЕ 2206-25 / ТОЕ 2206-25 / ТОЕ 2206-25	1	5	150	45	15	30	15	90	1+2+0	Талақталатын тақырым бойынша / По выбору обучающихся/
2	Өнеркәсіптік электроника / Промышленная электроника	БП (КК) / БП (КК) / BS (ES)	МЕ 2207-25 / МЕ 2207-25 / МЕ 2207-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
3	Микроэлектроника / Микроэлектроника	БП (КК) / БП (КК) / BS (ES)	МЕ 2207-25 / МЕ 2207-25 / МЕ 2207-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
4	Автоматтық басқару теориясы / Теория автоматического управления / Theory of automatic control	БП (КК) / БП (КК) / BS (UC)	ТАУ 3322-25 / ТАУ 3322-25 / ТАУ 3322-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
Барлығы модуль бойынша / Итого по модулю / Total for module				15	450	135	45	90	0	45	270		

Модуль № 7													
Автоматтық құрылымдар бақылау және диагностика / Контроль и диагностика устройств автоматизации / Monitoring and diagnostics of automation devices													
1	Автоматтық басқарушы жүйелерді бақылау және диагностикалық құрылымдар / Контроль-диагностические приборы автоматизации / Control and measuring devices of automation	БП (КК) / БП (КК) / BS (ES)	КІПА 2209-25 / КІПА 2209-25 / КІПА 2209-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
2	Интернет-технологиялар жобалау / Проектирование систем интернет-технологий / Internet technology design	БП (КК) / БП (КК) / BS (ES)	ИТ 2209-25 / ИТ 2209-25 / ИТ 2209-25	1	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
3	Автоматтық негіздер / Основы автоматизации / Fundamentals of automation	БП (КК) / БП (КК) / BS (ES)	ОА 2211-25 / ОА 2211-25 / ОА 2211-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
4	Сымалы желілер және мобилді желілер / Беспроводные сети и мобильные системы / Wireless networks and mobile systems	БП (КК) / БП (КК) / BS (ES)	БСМС 2211-25 / БСМС 2211-25 / БСМС 2211-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
5	Автоматтық бақылау, түрлендіру және есептеу аппаратурасы / Аппаратура автоматического контроля, регистрации и учета / Automatic control, registration and accounting devices	БП (КК) / БП (КК) / BS (ES)	ААККУ 3219-25 / ААККУ 3219-25 / ААККУ 3219-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
6	Бақылау және автоматтық жүйелердің автоматтық бақылау және есептеу аппаратурасы / Автоматизированные системы контроля и учета / Automated control system design	БП (КК) / БП (КК) / BS (ES)	ПАСУ 3219-25 / ПАСУ 3219-25 / ПАСУ 3219-25	2	5	150	45	15	30	15	90	1+2+0	Білім алушының тақырымы бойынша / По выбору обучающихся/
7	Өндірістік практика 1 / Производственная практика 1 / Production practice 1	БП (КК) / БП (КК) / BS (UC)	ПП 3227-25 / ПП 3227-25 / ПП 3227-25	2	5	150	0	0	0	0	0	5 аяма / недела / weeks	Білім алушының тақырымы бойынша / По выбору обучающихся/
8	Өндірістік практика 2 / Производственная практика 2 / Production practice 2	БП (КК) / БП (КК) / BS (UC)	ПП 3227-25 / ПП 3227-25 / ПП 3227-25	2	5	150	0	0	0	0	0	5 аяма / недела / weeks	Білім алушының тақырымы бойынша / По выбору обучающихся/
Барлығы модуль бойынша / Итого по модулю / Total for module				25	750	135	45	90	0	45	270		

Ключевые навыки: инженер-механик, автоматизатор, контроллер / Комплексные навыки: решение задач, программирование, автоматизация, интеграция, контроль / Integrated skills: problem-solving, programming, automation, control / Integrated

№	Тема / Topic	Содержание / Content	Семестр / Semester	Часы / Hours	Экспертные навыки / Expertise	Интегрированные навыки / Integrated Skills	Формы контроля / Assessment	Итого по модулю / Total for module			
Модуль № 8	1	Технология производства алюминия / Technology of aluminum production	SMPT 2213-25	2	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option
			БП (ТК) / БП (КБ) / БС (ЕС)	SMPT 2213-25	15	90					
	2	Автоматизация систем управления / Automation of control systems	CEA 2211-25	1	5	90	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option
			БП (ТК) / БП (КБ) / БС (ЕС)	CEA 2211-25	15	90					
			CEA 2211-25	1	5	90	45	15	30		
			БП (ТК) / БП (КБ) / БС (ЕС)	CEA 2211-25	15	90					
	3	Процесс производства алюминия / Aluminum production process	ТЭМРТ 3225-25	1	5	90	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option
			БП (ТК) / БП (КБ) / БС (ЕС)	ТЭМРТ 3225-25	15	90					
	4	Автоматизация систем управления / Automation of control systems	КМЗТ 3225-25	1	5	90	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option
			БП (ТК) / БП (КБ) / БС (ЕС)	КМЗТ 3225-25	15	90					
5	Безопасность эксплуатации оборудования / Equipment operation safety	МНУ 3225-25	2	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	МНУ 3225-25	15	90						
6	SCADA-системы / SCADA systems	РSCADA-3324-25	2	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	РSCADA-3324-25	15	90						
7	Автоматизация систем управления / Automation of control systems	АСУТПЕ 3324-25	2	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	АСУТПЕ 3324-25	15	90						
8	Датчики температуры / Temperature sensors	МДА 4327-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	МДА 4327-25	15	90						
9	Моделирование литейной аппаратуры / Casting equipment modeling	ММСТS 4327-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	ММСТS 4327-25	15	90						
10	Технология производства алюминия / Aluminum production technology	АТРР430-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	АТРР430-25	15	90						
11	Автоматизация производственных процессов / Automation of production processes	АРР 4330-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	АРР 4330-25	15	90						
12	Дипломная работа / Graduation project	РР 4335-25	2	7	210	0	0	0	7 недель / weeks	Безмашинный тестирование / По выбору обучающегося / By student's option	
		БП (ТК) / БП (КБ) / БС (ЕС)	РР 4335-25	15	90						
				37	1686	270	180	0	90	480	

Образовательные технологии / Educational technologies / Итого по модулю / Total for module

№	Тема / Topic	Содержание / Content	Семестр / Semester	Часы / Hours	Экспертные навыки / Expertise	Интегрированные навыки / Integrated Skills	Формы контроля / Assessment	Итого по модулю / Total for module				
Модуль № 9	1	Основы SMART-технологий / Fundamentals of SMART technologies	OST 3214-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
			БП (ТК) / БП (КБ) / БС (ЕС)	OST 3214-25	15	90						
	2	Облачные вычисления / Cloud computing	OOP 3214-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
			БП (ТК) / БП (КБ) / БС (ЕС)	OOP 3214-25	15	90						
			OOP 3214-25	1	5	150	45	15	30			
			БП (ТК) / БП (КБ) / БС (ЕС)	OOP 3214-25	15	90						
	3	Архитектура компьютерных систем / Computer system architecture	AKS 3217-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
			БП (ТК) / БП (КБ) / БС (ЕС)	AKS 3217-25	15	90						
	4	Интернет вещей / Internet of Things	VSSST 3217-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option	
			БП (ТК) / БП (КБ) / БС (ЕС)	VSSST 3217-25	15	90						
5	Сети / Networks	OTM 3218-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option		
		БП (ТК) / БП (КБ) / БС (ЕС)	OTM 3218-25	15	90							
6	Гидравлика и пневматика / Hydraulics and pneumatics	GF 3218-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option		
		БП (ТК) / БП (КБ) / БС (ЕС)	GF 3218-25	15	90							
7	Проектирование приложений / Application design	PPROT 4328-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option		
		БП (ТК) / БП (КБ) / БС (ЕС)	PPROT 4328-25	15	90							
8	Робототехника / Robotics	ORM 4328-25	1	5	150	45	15	30	1 + 2 + 0	Безмашинный тестирование / По выбору обучающегося / By student's option		
		БП (ТК) / БП (КБ) / БС (ЕС)	ORM 4328-25	15	90							
				20	660	180	60	120	0	60	360	

Модуль № / Module №	Содержание модуля / Module content	Корзина аттестации / Final assessment										Итого по модулю / Total for module	Итого по модулям / TOTAL FOR MODULES	6 недель / weeks			
		1	2	3	4	5	6	7	8	9	10						
1	Введение в искусственный интеллект / Introduction to Artificial Intelligence	БП (ПК) БП (КБ) БС (БС)	1	5	150	45	15	30	15	90	1+2+0						
2	Облачные базисы искусственного интеллекта в управлении / Cloud intelligence in object management	ИИО (КБ) ИИО (БС)															
3	Живые нейронные сети / Развитие искусственных нейронных сетей / Development of artificial neural networks	БП (ПК) ПД (КБ) АС (БС)	2	5	150	45	15	30	15	90	1+2+0						
4	Адаптивные системы / Программирование контроллеров в системах автоматизации / Programming controllers in automation systems	РСМСА.3323-25 РСМСА.3323-25 РСМСА.3323-25															
5	Стандарты, сертификация, функции и инструменты / Стандартизация, сертификация и моделирование / Standardization, certification and modeling	СБП (ПК) ПД (КБ) АС (БС)	2	5	150	45	15	30	15	90	1+2+0						
6	Стандарты, сертификация, функции и инструменты / Стандартизация и сертификация / Standardization and certification	СБП (ПК) ПД (КБ) АС (БС)															
Итого по модулю / Total for module			15	450	135	45	90	0	45	270							
11	Корзина аттестации / Final assessment		2	8	240												
Итого по модулям / TOTAL FOR MODULES			240	7140	2165	630	1565	60	735	3540							

Рецензия/Отзыв

ТОО "ЭкостройНИИ-ПВ", Республика Казахстан, г. Павлодар

Название, предприятие, страна, город

Образовательная программа 6В07116 «Автоматизация и управление» разработана кафедрой «Автоматизация и управление» КазУТБ имени К. Кулажанова в соответствии с национальными и отраслевыми квалификационными требованиями, а также профессиональными стандартами.

Актуальность подготовки специалистов в области автоматизации и управления обусловлена следующими факторами:

Рост спроса на специалистов по автоматизации. Согласно данным HeadHunter Казахстан, в 2024 году на платформе hh.kz было размещено около 650 тысяч активных вакансий, что на 16% больше, чем в предыдущем году.

Это свидетельствует о повышенной потребности в квалифицированных кадрах, включая специалистов по автоматизации и управлению.

Цифровизация экономики. Государственная программа «Цифровой Казахстан» направлена на повсеместную цифровизацию услуг и процессов, что требует подготовки специалистов, способных внедрять и обслуживать автоматизированные системы.

Нехватка высококвалифицированных кадров. Текущее состояние рынка труда характеризуется тем, что только 37% рабочих мест в Казахстане требуют высокого уровня навыков, что указывает на необходимость подготовки специалистов в области автоматизации для повышения сложности экономики.

Структура образовательной программы включает:

Общеобразовательные дисциплины – 56 кредитов

Базовые дисциплины – 84 кредита

Профилирующие дисциплины – 70 кредитов

Профессиональная практика – 22 кредита

Итоговая аттестация – 8 кредитов

Общий объем составляет 240 кредитов.

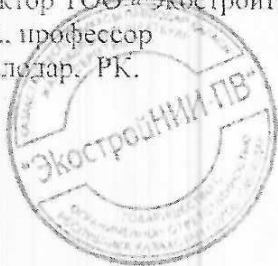
Программа ориентирована на практическую подготовку студентов через дуальное обучение в сотрудничестве с промышленными предприятиями. Это обеспечивает выпускников необходимыми навыками для эффективной работы в сфере автоматизации и управления.

Общее заключение:

Образовательная программа 6В07116 «Автоматизация и управление» отвечает современным требованиям рынка труда Казахстана и способствует подготовке востребованных специалистов, способных внести значительный вклад в цифровую трансформацию экономики страны.

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К.т.н., профессор
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К. Ш. Арынгазин К.Ш. Арынгазин



ОТЗЫВ/РЕЦЕНЗИЯ

на образовательную программу 6В07116 «Автоматизация и управление» по направлению подготовки 6В071 Инженерия и инженерное дело.

ТОО "ZHOVA LTD", Республика Казахстан, г. Тараз

Название предприятия, страна, город

Общая характеристика образовательной программы:

Представленная на рецензию образовательная программа (ОП) 6В07116 «Автоматизация и управление» разработана на кафедре «Информационные технологии» КазУТБ имени К. Кулажанова в соответствии с требованиями национальной и отраслевой системы квалификаций, а также профессиональных стандартов.

Актуальность подготовки специалистов в области «Автоматизации и управления» обусловлена следующими факторами:

Казахстанский рынок труда испытывает значительный спрос на специалистов по автоматизации, поскольку более 60% предприятий различных отраслей промышленности находятся в процессе цифровой трансформации.

Внедрение технологий Индустрии 4.0 требует подготовки специалистов, обладающих знаниями в области промышленного интернета вещей (IIoT), робототехники, цифровых двойников и искусственного интеллекта.

Согласно прогнозам Министерства индустрии и инфраструктурного развития РК, потребность в специалистах по автоматизации возрастает на 12-18% ежегодно, особенно в таких сферах, как нефтегазовая отрасль, электроэнергетика и производство.

Использование автоматизированных систем управления (АСУ ТП, SCADA, PLC, DCS) позволяет предприятиям сокращать производственные издержки на 20-30%, повышать качество продукции и снижать аварийность на объектах.

В рамках стратегии «Цифровой Казахстан» реализуется модернизация промышленных предприятий, что требует подготовки не менее 4 500 специалистов в сфере автоматизации до 2030 года.

Крупные предприятия Казахстана, включая "КазМунайГаз", "ERG", "Казатомпром" и "Казахмыс", уже внедряют автоматизированные системы управления технологическими процессами, что создает дополнительный спрос на квалифицированных специалистов в данной сфере.

Описание и оценка структуры образовательной программы.

Структура ОП включает следующие компоненты:

цикл общеобразовательных дисциплин (56 кредитов);

цикл базовых дисциплин (84 кредита);

цикл профилирующих дисциплин (70 кредитов);

профессиональную практику (22 кредита);

итоговую аттестацию (8 кредитов);

общее количество кредитов составляет 240.

Практические занятия и самостоятельная работа обучающихся ориентированы на решение актуальных задач автоматизации и управления технологическими процессами. В программу включены кейсы из реальной практики ведущих отечественных и международных компаний, что способствует приобретению практических навыков и повышает конкурентоспособность выпускников.

Профессиональная практика и дуальное обучение направлены на развитие навыков работы с промышленными контроллерами, системами автоматического управления, роботизированными комплексами, а также на изучение вопросов технического обслуживания, диагностики неисправностей и обеспечения надежности автоматизированных систем. По данным анализа трудоустройства выпускников аналогичных программ, не менее 90% выпускников находят работу в профильных компаниях в течение первого года после окончания обучения.

Общее заключение

Образовательная программа 6B07116 «Автоматизация и управление» соответствует современным требованиям рынка, стратегии цифровизации Казахстана и международным трендам развития промышленной автоматизации. Программа позволяет готовить востребованных специалистов, способных обеспечивать эффективное управление технологическими процессами, внедрение современных цифровых решений и повышение конкурентоспособности предприятий. В связи с этим ОП рекомендуется к внедрению в учебный процесс КазУТБ имени К. Кулажанова.

Директор ТОО "ZHOBALTD"
Берсинкулов Р.К.

Республика Казахстан, г. Тараз
ул. Ерденбека Ниеткалиева, д. 10

