Institute of Automation and Information Technologies
Department of Automation and Control

EDUCATIONAL PROGRAM
6B07103–AUTOMATION AND ROBOTIZATION

code and name of the educational program

Code and classification of the field of education: **6B07 Engineering, manufacturing and construction industries**
Code and classification of areas of study: **6B071 Engineering and Engineering affairs**
Education Program Group: **B063 Electrical engineering and automation**
NQF level: **6**
ORC level: **6**
Duration of study: **4 years**
Volume of credits: **240 credits**

Almaty 2025

The education program **"6B07103 – Automation and robotization"** was approved at a meeting of the Academic Council of KazNITU named after K. I. Satbayev.

Protocol №10 «06» March 2025 y.

Reviewed and recommended for approval at the meeting of the Teaching and Methodological Council of KazNITU named after K. I. Satbayev.

Protocol №3 «20» December 2024 y.

The educational program **«6B07103 – Automation and robotization»** has been developed by the academic committee of **«6B071 Engineering and Technology».**

Full name	Scientific degree / Academic title	Position	Workplace	Caption
Chairman of the academic committee:				
Sarsenbayev Nurlan	Candidate of technical sciences	Associate professor, head of the department	NAO «Kazakh National Research Technical University named after K. I. Satbayev»	
Teaching staff:				
Suleymenov Batyrkbek	Doctor of technical sciences	Professor	NAO «Kazakh National Research Technical University named after K. I. Satbayev»	
Beisembayev Akhambay	Candidate of technical sciences	Associate professor	NAO «Kazakh National Research Technical University named after K. I. Satbayev»	
Shiryayeva Olga	Candidate of technical sciences	Associate professor	NAO «Kazakh National Research Technical University named after K. I. Satbayev»	
Omirbekova Zhanar	Doctor PhD	Associate professor	NAO «Kazakh National Research Technical University named after K. I. Satbayev»	
Employers:				
Abdigaliyev Serik	APCS engineer	General director	LLP «АСУТП-Honeywell»	
Saurambayev Zhiger	APCS engineer	Head of Industrial Automation and Solutions for Kazakhstan and Central Asia	Schneider Electric Kazakhstan	
Yunatanov Yurii	APCS engineer	General director	Process Automation LLP, Kazakhstan	
Students:				
Rakhimbetov Askar	Bachelor	2nd year student	-	

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List of abbreviations and symbols

EP	Educational program
APCS	Automated process control system
ACS	Automatic control systems
CAD	Computer-aided design system
DAC	D/A Converter
ADC	Analog to digital converter

1. Description of the educational program

The educational program (here in after EP) is a set of documents developed by the Kazakh National Research Technical University named after K.I. Satpayev and approved by the Ministry of Education and Science of the Republic of Kazakhstan.

The educational program 6B07103 - Automation and robotics in the direction of personnel training 6B071- "Engineering and Engineering" involves the training of highly qualified specialists in the field of operation, maintenance, development and implementation of automated process control systems (APCS), robotic technological complexes (RTC) in various industries.

A bachelor who graduates from this program acquires the following competencies: operation and maintenance of automated process control systems and RTK in various industries, development and implementation of technical, information and software for industrial production process control systems and RTK, conducting scientific research in the field of integrated automation and robotization of production processes , using modern software for designing and modeling production processes.

The objects of professional activity of the bachelor are: subdivisions of industrial enterprises for the operation and maintenance of APCS and RTK of various industries, subdivisions of state institutions for the operation and maintenance of automated information and control systems for various purposes, subdivisions of design organizations for the development, implementation and technical support of APCS and RTK of various industries, subdivisions of scientific organizations for research in the field of automation of technological processes, robotization of technological operations.

The types of professional activity are:

In the field of organizational and managerial activities: to be the head of the group of the unit for the operation, maintenance of elements,APCS and RTK in various industries;

In the field of experimental research activities: to be a specialist in conducting experimental research on objects of automation and robotization of industrial production;

In the field of research activities: to be an engineer in a scientific laboratory for the research and development of modern APCS and RTK in various industries;

In the field of design and development: to be a development and design engineer APCS and RTK in various industries.

2. Purposes and objectives of the educational program

Purpose of the EP:

The purpose of the educational program 6B07103 "Automation and Robotics" is to create conditions for the development of personal, socio-cultural, engineering and professional competencies in the field of automation and robotics, meeting the needs for intellectual and creative development, taking into account the goals of

sustainable development, promoting innovation and efficient use of resources.

Tasks of the EP:

- providing social and humanitarian education based on knowledge of the laws of socio-economic development of society, the history of Kazakhstan, modern information technologies, the state language, foreign and Russian languages as a means of interethnic communication;
- providing in-depth knowledge of a natural-science, general technical nature, as the foundation of vocational education;
- providing deep theoretical knowledge and practical skills in the fieldautomation, robotization, artificial intelligence and automated control;
- ensuring the adaptation of professionally oriented skills to the changing needs of society.

3. Requirements for evaluating the learning outcomes of an educational program

EP 6B07103 - "Automation and robotization" ensures that all students achieve the learning outcomes necessary for professional activities. Upon completion of the program, students must:

- possess the knowledge, skills and abilities to implement a systematic approach to the development and implementation of automation systems and robotization of production processes.
- to be able to make a choice of measuring instruments and automation equipment, measure technological parameters, configure and operate automation elements and devices.
- demonstrate knowledge of sections of higher mathematics, physics and other natural sciences and apply them to solve engineering problems in the field of automation and control.
- own modern computer, information, communication technologies and software used in the creation and operation of automation systems.
- be able to put into practice knowledge on the main types of linear and non-linear automatic control systems, their mathematical description and modeling, perform calculations on the analysis and synthesis of control systems.
- have programming skills in high-level languages, tools and programming languages for microcontrollers, software for modeling and researching process control systems.
- be able to navigate the current economic, political and corruption situation.
- own methods of information processing and synthesis of automation systems, methods of designing and programming data management systems. Use in practice the functionality of Scada-systems.
- develop structural, functional and other automation schemes, analyze reference and regulatory literature, draw up technical documentation. Develop technical, software, mathematical, algorithmic, informational and other support for process control systems.

- use the technical capabilities of microprocessor technology, means of receiving and transmitting information and software products to solve automation problems.
- analyze and evaluate the state of automation objects, technological processes and industries. Make qualified decisions on the use of automation elements and systems, their installation, commissioning and operation.
- use modern tools and information and communication technologies in the design and implementation of process and production control systems.

4. Passport of the educational program

4.1. General intelligence

No.	Field name	Note
1	Code and classification of the field of education	6B07 Engineering, manufacturing and construction industries
2	Code and classification of areas of study	6B071 Engineering and engineering affairs
3	Group of educational programs	B063 Electrical Engineering and Automation
4	Name of the educational program	6B07103 Automation and robotization
5	Brief description of the educational program	The educational program 6B07103 - Automation and robotics in the direction of personnel training 6B071- "Engineering and engineering" involves the training of highly qualified specialists in the field of automation, robotics, artificial intelligence and automated control.
6	Purpose of the EP	The purpose of the educational program 6B07103 "Automation and Robotics" is to create conditions for the development of personal, socio-cultural, engineering and professional competencies in the field of automation and robotics, meeting the needs for intellectual and creative development, taking into account the goals of sustainable development, promoting innovation and efficient use of resources.
7	EP type	New EP
8	NQF level	6
9	ORC level	6
10	Distinctive features of the EP	No
11	List of competencies of the educational program:	A bachelor who graduates from this program acquires the following competencies: operation and maintenance of automated process control systems and RTK in various industries, development and implementation of technical, information and software for industrial production process control systems and RTK, conducting scientific research in the field of integrated automation and robotization of production processes , using modern software for designing and modeling production processes.
12	Learning outcomes of the educational program:	LO1 – Develop mathematical, algorithmic, information, software, technical support for automated process control systems and industrial control systems for industrial production. LO2 – Demonstrate knowledge of sections of higher mathematics, physics, theoretical foundations of electrical engineering and other natural sciences for solving engineering problems in the field of automated process control systems and industrial control systems.

		LO3 – Demonstrate knowledge of higher mathematics, physics, and other natural sciences, and apply them to solve engineering problems in the field of automation and control, considering the principles of sustainable development. LO4 – Possess modern computer, information, communication technologies and software used in the creation and operation of automated process control systems and industrial control systems. LO5 – Use the technical capabilities of microprocessor technology, means of receiving and transmitting information and software products to solve problems of automation and robotization of technological processes. LO6 – Be able to apply in practice knowledge of the main types of electronic devices, power converters of electrical energy in automatic control systems, their mathematical description and modeling, perform calculations for the analysis and synthesis of control systems for electronic devices. LO7 – Be able to navigate the modern economic, political, and social situation, taking into account the principles of sustainable development, transparency, and ethics, as well as the ability to consider issues of social responsibility and anti-corruption activities. LO8 – Master the methods of information processing and automation system synthesis, methods of designing and programming data control systems. Use the functional capabilities of SCADA systems in practice. LO9 – Possess programming skills in high-level languages, microcontroller programming tools and languages, software for modeling and researching automated process control systems and control systems. LO10 – Analyze and evaluate the state of continuous technological processes as objects of automation and discrete production processes as objects of robotization. Make qualified decisions on the use of elements and devices, their installation, adjustment and operation of automated process control systems and industrial control systems. LO11 – Analyze and assess the condition of robotics, automation, technological processes, and production facilities, taking into account ecological, social, and economic aspects, with special attention to inclusivity and equality. Make informed decisions on the use of

		automation and robotics elements and systems, their installation, adjustment, and operation, focusing on the principles of sustainable development, energy efficiency, and ensuring accessibility of technologies and opportunities for all, including vulnerable groups, in accordance with the Sustainable Development Goals. LO12 – Use modern tools and information and communication technologies in the design and implementation of technological process and production control systems, considering the principles of sustainable development, energy efficiency improvement, resource optimization, and minimizing environmental impact.
13	Form of study	full-time
14	Training period	4 years
12	Volume of credits	240 credits
16	Languages of instruction	Kazakh, Russian, English
17	Awarded Academic Degree	Bachelor of Engineering and Technology
18	Developer(s) and authors:	Aldiyarov N.U., Manatov K. A.

4.2. The relationship between the achievability of the formed learning outcomes in the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Amount of credits	Formed learning outcomes (codes)											
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12
Cycle of general education disciplines Required Component															
1	English language	English is a discipline of the general education cycle. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and disciplines. The name of the discipline corresponds to the level of English proficiency. When moving from level to level, prerequisites and postrequisites of disciplines are observed.	10	V											
2	Kazakh (Russian) language	The socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language are considered. The course covers the specifics of the scientific style in order to develop and activate the professional communication skills and abilities of students, allows students to practically master the basics of the scientific style and develop the ability to perform structural and semantic analysis of the text.	10	V											
3	Information and Communication Technologies (in English)	Required component. The task of studying the discipline is to acquire theoretical knowledge about information processes, new information technologies, local and global computer networks, methods of information protection; obtaining skills in the use of text editors and spreadsheet processors; creation of databases and various categories of application programs.	5					V							
4	History of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place	5		V										

		on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: the steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan in the period of the Mongol conquest (XIII century), medieval states in the XIV-XV centuries. The era of the Kazakh Khanate XV-XVIII centuries. Kazakhstan as part of the Russian Empire, Kazakhstan during the Great Patriotic War, in the period of independence and at the present stage.													
5	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of being and endows them with a methodology for solving various theoretical practical issues. Philosophy expands the horizon of vision of the modern world, forms citizenship and patriotism, contributes to the education of self-esteem, awareness of the value of human existence. It teaches to think and act correctly, develops the skills of practical and cognitive activity, helps to seek and find ways and means of life in harmony with oneself, society, and the world around.	5							**V**					
6	Socio-political knowledge module (sociology, politology)	Studying the course contributes to the formation of students' theoretical knowledge about society as an integral system, provides the political aspect of training a highly qualified specialist on the basis of modern world and domestic political thought. The discipline is designed to improve the quality of both general humanitarian and professional training of students. Knowledge in the field of sociology and political science is necessary for understanding political processes, for forming a political culture, developing a personal position and a clearer understanding of the measure of one's	3	**V**											

		responsibility.													
7	Socio-political knowledge module (culturology, psychology)	The module of socio-political knowledge (culturology, psychology) is designed to acquaint students with the cultural achievements of mankind, for their understanding and assimilation of the main forms and universal patterns of the formation and development of culture. During the course of cultural studies, general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms for the formation and development of culture, the main historical stages of the formation and development of Kazakhstani culture are considered. It also studies the laws of the emergence, development and functioning of mental processes, states, properties of a person engaged in a particular activity, the laws of development and functioning of the psyche as a special form of life.	5		**V**										
Cycle of general education disciplines University component															
8	Fundamentals of anti-corruption culture and law	Purpose: to increase the public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Contents: improvement of socio-economic relations of the Kazakh society, psychological features of corrupt behavior, formation of an anti-corruption culture, legal responsibility for acts of corruption in various fields.	5	**V**		**V**		**V**							
9	Fundamentals of scientific research methods	Purpose: to form knowledge about scientific research, methods and methodology of scientific research, methods of collecting and processing	5							**V**				**V**	**V**

		scientific data in modern science. Contents: fundamentals of the theory of solving inventive problems, with algorithmic methods of searching for technical solutions and their optimization, basic mathematical optimization methods, the use of artificial intelligence capabilities to solve optimization problems, issues of search, accumulation and processing of scientific information.													
10	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	5							**V**					**V**
11	Fundamentals of economics and entrepreneurship	Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the basics of creating and managing a business, developing business plans, risk assessment, and strategic decision-making.	5							**V**					**V**
12	Ecology and life safety	Purpose: formation of ecological knowledge and consciousness, obtaining theoretical and practical knowledge on	5							**V**					**V**

		modern methods of rational use of natural resources and environmental protection. Contents: the study of the tasks of ecology as a science, the laws of the functioning of natural systems and aspects of environmental safety in working conditions, environmental monitoring and management in the field of its safety, ways to solve environmental problems; life safety in the technosphere, emergencies of a natural and man-made nature.													
Cycle of basic disciplines University component															
13	Introduction to the specialty and engineering ethics	The study of the discipline is the assimilation of the theoretical foundations of the ethics of business communication and the principles of ethics of business relations; features and problems associated with professional and in particular engineering ethics; The purpose of the course is to master the basics of automation, robotization, the ethical code of an engineer. As a result of studying the discipline, the student must know automation and process control; industrial robotics.	4	**V**									**V**		**V**
14	Engineering and computer graphics	Purpose: To develop students' knowledge of drawing construction and skills in developing graphical and textual design documentation in accordance with standards. Content: Students will study ESKD standards, graphic primitives, geometric constructions, methods and properties of orthogonal projection, Monge's projection, axonometric projections, metric tasks, types and	5		**V**	**V**	**V**	**V**							

		features of connections, creating part sketches and assembly drawings, detailing, and creating complex 3D solid objects in AutoCAD.													
15	Intelligent process control systems	The discipline is designed to form students' knowledge of the theoretical foundations and practical skills in building process control systems using intelligent fuzzy logic technologies. The purpose of the course is to train a specialist who is able to use in practice the theory, methods and means of synthesis of intelligent control systems. As a result of studying the discipline, the student must know the basics of the theory of fuzzy sets; the basics of creating fuzzy inference systems for control purposes.	5			**V**	**V**								
16	Computer modeling and programming in MatLab	The discipline is designed to develop students' skills in programming and mathematical modeling in the MATLAB environment. The purpose of the course is programming and standard MATLAB functions, such packages (applications) as Control System Toolbox, Simulink, Stateflow, Deep Learning Toolbox and Fuzzy Logic Toolbox are studied. As a result of mastering the discipline, students have full tools for analysis, synthesis of control systems and development of intelligent algorithms.	6	**V**			**V**								
17	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline. Contents_ Elements of linear	5		**V**							**V**			

		algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.													
18	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations	5			**V**						**V**			
19	Mathematical Foundations of control theory	This discipline is intended to study the methods of development of object models , control systems. The following sections are studied: the concept of the set, set operations, relations and mapping of sets, the concept of graph, adjacency and incidence matrices , graph operations, the concept of logic variable, function, operations on logical variables, basic logic functions, notations of logical functions, the concept of matrix , matrices operations, types of matrices, eigenvalues, Cayley-Hamilton theorem, matrix function, the concept of system, the description of the systems. This course is intended for formation of the	5			**V**							**V**		

		mathematical foundations of the development of models of control systems among students. . As a result of the acquirement of the discipline the will be able to formulate mathematical problems, develop mathematical models, select mathematical methods and algorithms for solution of the problem.													
20	Optimization methods	The discipline is designed to form students' systematized knowledge of modern methods of optimization and their application in the field of process control. Objective: To train students to apply optimization methods to find the extrema of functions in various ways. As a result, students master the formulation of optimization problems for: the synthesis of systems for optimal control of technological processes, the reduction of material balances in MES systems, etc.	5			**V**					**V**		**V**		
21	Programming and algorithmization	The goals and objectives of the discipline Programming and algorithmization - to teach students structural programming, to acquire knowledge and skills of algorithmization in its structural version, to master all kinds of methods for solving problems implemented in a programming language, to develop logical and algorithmic thinking of students, to form the skills of competent program development, to deepen knowledge, skills and abilities to solve problems in programming and algorithmization.	5	**V**									**V**		**V**
22	Power electronics automation	The discipline is one of the basic special courses for the specialty of automation and robotics. The purpose of this course is to give students a fairly complete	4		**V**	**V**	**V**								

		understanding of the electrical energy converters, their components, topology, mathematical descriptions, basic methods of analysis. As a result, students master the principles of operation of power electronic devices of automation; knowledge of the correct choice of elements and automation devices, calculate their characteristics.													
23	Theoretical Foundations of Electrical Engineering	Purpose: to master modern methods of modeling electromagnetic processes, methods of analysis and synthesis of electrical circuits, to master the basic concepts and laws of electrical circuits and their connections with general philosophical, mathematical and logical concepts Content: automation processes of various production equipment, in which electrical and electronic devices are widely used. Linear DC electrical circuits. Equivalent transformations of electrical circuits. Power. The balance of capacities.	5								**V**			**V**	
24	Process automation facilities	The content of the discipline "Process automation facilities" includes the study of mathematical methods of software control of robots, the basics of the development of algorithms and cyclograms of robot control. The structure and composition of cyclic, positional and contour systems of software control of robots, systems of digital software control of machines, machines are considered.	5		**V**								**V**		
25	Technology of robotic production	The discipline "Technology of robotic production" sets as the purpose to teach students of methodology of design of	6			**V**	**V**								

		technological processes in the conditions of the automated production, independent development of technological processes of assembly of cars and production of their details. Questions of scientific bases of technology of mechanical engineering, preparation of robotic production, choice of preparations, the principles of design of technological processes in the conditions of automation are considered. Problems of studying of discipline is acquisition of knowledge of ensuring accuracy, control and tests of machine-building production. As a result of studying of discipline the trainee, has to know: design stages of the production technology of cars, standard technological processes of production of details of cars; the used equipment and the equipment in the conditions of robotic production. To be able: to put and solve problems of technical training of production; to develop technological processes of production of cars and details of the required quality in the conditions of robotic production.													
26	Physics I	Purpose: to study the basic physical phenomena and laws of classical and modern physics; methods of physical research; the influence of physics on the development of technology; the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty. Contents: mechanics, dynamics of rotational motion of a solid body, mechanical harmonic waves,	5						**V**				**V**		

		fundamentals of molecular-kinetic theory and thermodynamics, transfer phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell's equations.													
27	Physics II	Purpose: to form students' knowledge and skills in using fundamental laws, theories of classical and modern physics, as well as methods of physical research as the basis of a system of professional activity. Contents: harmonic oscillations, damped oscillations, alternating current, wave motion, laws of refraction and reflection of light, quantum optics, laws of thermal radiation, photons, their characteristics, wave function, electrical conductivity of metals, atomic nucleus, its structure and properties, binding energy, radioactivity.	5			**V**	**V**								
28	Electrical and Electronic Engineering	The purpose of the discipline is to acquire theoretical and practical knowledge on the basics of electrical engineering and electronics. The basic laws of the processes occurring in electromagnetic and electronic circuits and methods for determining the electrical quantities characterizing these processes are studied. Methods of calculation of DC electric circuits are studied; analysis and calculation of linear AC circuits; analysis and calculation of magnetic circuits. Electromagnetic devices and electrical machines. Fundamentals of electronics and electrical measurements. The element base of modern electronic devices. Fundamentals of digital and microelectronics, microprocessor tools.	5			**V**					**V**				
29	Automatics	The main purpose of studying this	6				**V**							**V**	

	elements and devices	discipline is to teach students the ability to choose the right installation devices in automation systems. The content of the discipline deals with the fundamentals of the theory and principle of operation of actuators, the issues of correct and effective selection and calculation of actuators of automation systems. The main definitions and explanations concerning the use of setting devices in industrial automation are given.													
Cycle of basic disciplines Optional component															
30	Actuators of Automation Systems	The discipline presents basic knowledge and skills in the field of actuators of automation, industrial electronics, as well as methods for studying the operating modes of electromechanical energy converters. The purpose of the course is to teach students to correctly calculate and select the actuators of automation, as it is a mandatory element of the control system. As part of the course, the student will master the practical use of automation actuators: electromechanical devices, electromagnetic devices.	5							**V**				**V**	
31	Metrology and measurement	Discipline covering a wide range of methods and tools for measuring and presenting information about the state of technological processes. The purpose of the course is the necessary amount of knowledge in the study of basic concepts, goals and principles, the ability to analyze metrological indicators and physical principles of measurement. As part of the course, the student will learn to choose measuring instruments depending on the	5		**V**								**V**			

		purpose and tasks of automation, to develop and design measuring instruments and measuring systems.													
32	Microelectronics	The principles of operation, parameters, characteristics and features of the use of semiconductor devices are considered. Designing various circuits of amplifiers of electrical signals and generators based on diodes, bipolar and field-effect transistors and testing the features of their functioning. Operational amplifiers. Differential amplifiers. Feedback. The influence of feedback on the main indicators and characteristics of amplifiers. Power amplifiers. Filter classification and composition	5		**V**							**V**			
33	Fiber optic sensors and systems	The course "Fiber Optic Sensors and Systems" discusses the principle of operation, design and parameters of modern optoelectronic and fiber optic sensors for various purposes, basic circuit and technical solutions that determine the structure and functionality of modern sensors, especially in industrial technologies.	5				**V**						**V**		
34	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic	5		**V**				**V**						

		processing of linguistic information, semantic models, natural language processing systems.													
35	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	5			**V**				**V**						
36	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.	5				**V**							**V**		
37	Industrial robots and manipulator drives	In the course of studying the discipline, students must master the principle of operation, the main units and elements, advantages and disadvantages, a mathematical description of industrial robot drives. As a result of studying the	5			**V**									**V**	

		discipline, students should know the operation of a pneumatic drive, a hydraulic drive and an electric drive of industrial robots. To be able to analyze the operation of control systems for drives of industrial robots.														
38	Microcontroller programming	Microcontroller Programming This course is intended for students to study the current state of microprocessor and microcontroller control systems. The purpose of the course is the formation of bachelor's knowledge on the principles of building digital data processing tools, the features of the organization of the work of microprocessor devices and the use of microprocessors in control systems of technical objects. As part of the course, the student will master the microcontrollers of the AVR family. AVR command system. Means of input/output in microprocessor systems. Programming of microprocessor systems.	5				**V**				**V**					
39	Microcontroller programming for robotic systems	This discipline is designed to study the methods of programming robotic systems. The purpose of the course: the classification of microcontrollers used in robotic systems, the structure of the microcontroller, the organization of the interruption of the microcontroller, programming languages. As a result of mastering the discipline, the student will be able to work in the environment for developing application software for RTS, connect peripheral devices to microcontrollers, perform remote control of the robot, and implement the terms of reference. build and analyze algorithms	5				**V**					**V**	**V**			

		for solving typical problems.													
40	Design of Robotic Systems	This course covers the types and definitions of robots, areas of knowledge for robotic design, design systems, simulation tools in CAD, elements of robotic structures, robotic actuators, types of control for robotic systems, sensors, and the features of designing control systems for intelligent robots. Special attention is given to introducing students to the ethical aspects of inclusion in robotics: how to design technologies that can be beneficial for all groups of people, including those with disabilities. The goal of the course is to equip students with the knowledge, skills, and abilities necessary for engineering work in the field of automation and robotics design for industrial objects, taking into account the principles of sustainable development, social inclusion, and equality, as well as ensuring the accessibility and safety of technologies in the context of sustainable development goals.	4				**V**							**V**	
41	Telecommunication networks of industrial enterprises	The discipline "Telecommunication networks of industrial enterprises" provides for the study of the main parameters and characteristics of telecommunication networks of industrial enterprises, the basics of their structural construction, taking into account modern trends in the development of communication networks, in-depth study of functional diagrams, design methods and integration of telecommunication networks and systems.	5	**V**								**V**			

42	Technological measurements and devices	The discipline covers a wide range of methods and tools for measuring and presenting information about the state of technological processes, ensuring their high-performance, economic and safe operation. The purpose of the course is to give the future specialist the necessary amount of knowledge in studying the basic concepts, goals and principles, the ability to analyze metrological indicators and physical principles of measurement. Analyze the operation of the system based on the quality indicators of measuring instruments and systems.	5			**V**								**V**	
43	Functional units of digital automation.	The course deals with the main functional units of digital automatics: triggers, registers, counters, multiplexers, adders, control circuits, studying the principle of operation, variants of functional schemes. As a result of studying this discipline, students should: have an idea of: - about the logical and arithmetic foundations of the construction of digital devices; - about the main functional units of digital automatics; know: - principles of functioning of logical devices; be able to: choose the appropriate digital control system; be able to - choose a suitable digital control system; - get an idea of the realized functions of the digital control system.	5	**V**					**V**			**V**		**V**	
44	Electrical measuring instruments	This discipline is intended for theoretical and practical training of engineers profile in the field of electrical engineering. This course deals with tasks related to the measurement of process parameters in the field of automation and control. The	5			**V**						**V**			

		course content provides a classification of methods for converting and converting non-electric and electrical, specific types of measuring instruments used to measure technological parameters in various areas of production.														
Cycle of major disciplines University component																
45	Linear System of Automatic Control	The aim of the course is to teach students the basics of the theory of linear automatic control systems, methods of mathematical description of systems, methods of stability and quality research. The content covers the following topics: Basic principles and diagrams of automatic control systems. Typical links of automatic control systems. Time and frequency characteristics of links and systems. Rules for transforming structural schemes. Algebraic and frequency methods of analyzing the stability of linear automatic control systems. Direct and indirect methods of assessing the quality of linear automatic control systems.	5	**V**		**V**		**V**								
46	Nonlinear system of the automatic control	The aim of the course is to teach students methods of modeling and analysis of nonlinear systems of automatic regulation, NSAR. The discipline studies the basics of the theory of the NSAR. Methods of mathematical description and modeling of the NSAR. Precise methods of research of stability and self-oscillation. Phase plane methods. Qualitative study of the NSAR. Lyapunov's second method. The criterion of absolute stability of V.M. Popov.	5	**V**				**V**								

		Approximate methods for the study of stability and self-oscillations. Implementation of typical elements of the NSAR for process control.														
Cycle of major disciplines Selectable Component																
47	Capstone research project 1	The Capstone Project is a project-based course that final year students take to demonstrate what they have learned from their first year to the final year of the 6B07103 - Automation and Robotics curriculum. Applying it in a specific idea to create something new and solve a specific problem. The Capstone Project aims to improve the quality of student graduate work through the formation and development of students' critical thinking skills, as well as planning, organizing and conducting scientific research.	6												**V**	**V**
48	Capstone research project 2	The Capstone Project 2 course is a continuation of the Capstone Project 1 course. The course "Capstone Project 2" is a self-made development related to the solution of theoretical issues and experimental research or to the solution of applied problems that are part of the research work carried out by the department or enterprise.	5												**V**	**V**
49	SCADA-system	This course is intended for students to study the principles of building software and hardware complexes (STC), choosing hardware, learning the principles of building and choosing SCADA systems when solving problems of automation of technological processes and industries. As a result of mastering the discipline, the student will be able to	5				**V**		**V**							

		develop a justification and choice of automated tasks, to make the most appropriate choice of hardware and software. The study of the SCADA-system gives a visual representation of the process and provides, as a rule, a graphical interface to the operator for monitoring and control.													
50	Automation of typical technological processes and production	This discipline is designed to study the methodology for analyzing typical technological objects as control objects, as well as setting control tasks, the structure of modern process control systems, their varieties and composition. The purpose of studying the discipline is to give students a fairly complete understanding of the concepts of Automation of process control systems. As a result of mastering the discipline, the student must know the basic constructions and architecture of control systems, be able to reasonably choose technical means of automation.	5		**V**								**V**		**V**
51	Local control systems	The aim of the course is to train specialists possessing the theoretical apparatus underlying the theory of local control systems (LCS). Course objectives - the study of modern methods of local control systems analysis. The course includes sections of the theory of automatic control associated with the tasks of analysis and synthesis of local control systems. Competencies, acquired during the course - Theoretical skills in the analysis and design of LSCs; - practical skills in the calculation of typical regulators of automation systems	4					**V**				**V**			

		of technological processes.													
52	Mathematical modeling and identification of control objects	Purpose: To teach students modern methods of developing models that can describe the behavior of real objects and control systems of technical systems and technological processes based on experimental data. Content: The course includes the study of various methods of mathematical modeling, such as analytical and numerical approaches, and methods for identifying parameters of control and automation objects using statistical and optimization methods. Methods for estimating the parameters of mathematical models based on data obtained from real experiments or measurements are considered in order to determine the structure and parameters of the model in such a way that it accurately reflects the dynamics of a real system and can be used to solve control and optimization problems. Studying this discipline allows students to acquire skills in modeling and designing control system simulators, which is a key element in various fields of automation and robotics.	4											**V**	**V**
53	Microprocessor-based systems in the control systems	This course is designed for students to build distributed and concentrated control systems, the principles of building industrial controllers, programming tools and programming languages of industrial controllers. The following sections are studied: the principles of organization and application of different classes of microprocessor systems, the acquisition of programming skills of embedded	6				**V**		**V**						

		systems, at the stages of system, structural and logical design a certain place is given to the design of hardware and software of microprocessor systems, methodology of selection of microprocessor sets, features of development and debugging of hardware and software systems.														
54	Installation and adjustment of electrical devices of control systems	This discipline is designed to study the implementation of installation work, training in the organization and methods of installation and adjustment of automation control equipment. The purpose of the course is to give students the necessary amount of theoretical knowledge on the technology of installation, adjustment and safe operation of measuring and control instruments. As a result of mastering the discipline, the student must teach modern methods of installation and adjustment of automation systems, to adjust automation systems.	4								**V**				**V**
55	Installation and adjustment of robotic systems	The discipline studies general information about the organization and conduct of installation works of robotic systems. Installation and commissioning and testing of mechatronic systems. Principle structural diagrams, automation diagrams, connection and wiring diagrams of mechatronic systems, control algorithms of mechatronic systems. Safety measures during installation and commissioning of mechatronic systems. Types of technical documentation during installation works. The aim of the course is to form a comprehensive knowledge of	4								**V**		**V**		

		the processes and relationships between mechanical and electrical elements in microprocessor-controlled electromechanical systems.													
56	Reliability of automation systems	The purpose of studying the discipline is to study methods for assessing the reliability of automated systems at the design stage, to study methods for assessing the reliability of systems in operation, to apply probability theory to predict and prevent equipment failures, to study methods for diagnosing existing equipment. The course examines the issues of determining reliability indicators, the physical nature and causes of failures, their types and classification. Special attention is paid to the issues of monitoring the operability of automated systems, troubleshooting and ensuring operational reliability.	5		**V**						**V**				
57	Neural network automation technologies	The purpose of the discipline is to study and master the skills of creating intelligent control systems based on expert systems and neural networks. The objectives of the discipline is to master the theoretical foundations and acquire practical skills in the field of creating control systems using methods of artificial intelligence. This course is designed for students to create control systems based on the methods of artificial intelligence is preceded by a description and study based on the application of knowledge models that reflect the different properties and patterns of functioning of the control object.	4		**V**						**V**				**V**
58	Design of	The course is designed to instill in	5						**V**		**V**				

	automation systems	students the methods of designing automated control systems. The student will master practical skills and abilities in the field of automation systems design; get acquainted with the trends in the development of science and technology and their impact on automation; study regulatory documents, state standards for the design of automation systems, the essence of a systematic approach to design, requirements for modern control systems; the structure and purpose of the state system of devices; various structural and functional schemes of control systems; basic algorithms that ensure the operation of typical industrial regulators; technical means of automation systems; modern technical and software tools of computer technology.													
59	Design of robotization systems	This course covers the types and definitions of robots, areas of knowledge for robotic design, design systems, simulation tools in CAD, elements of robotic structures, robotic actuators, types of control for robotic systems, sensors, and the features of designing control systems for intelligent robots. Special attention is given to introducing students to the ethical aspects of inclusion in robotics: how to design technologies that can be beneficial for all groups of people, including those with disabilities. The goal of the course is to equip students with the knowledge, skills, and abilities necessary for engineering work in the field of automation and robotics design for industrial objects, taking into account	5						**V**						**V**

		the principles of sustainable development, social inclusion, and equality, as well as ensuring the accessibility and safety of technologies in the context of sustainable development goals.													
60	Industrial Regulators	The aim and objectives of the course is to give students the skills to work with industrial regulators, familiarization with the features of real regulators, mastering the knowledge and skills necessary to configure and implement industrial regulators. The course includes sections. Methods of tuning industrial regulators. Features of real industrial regulators, noise and integral saturation. Discrete form of industrial regulators. Modifications of regulators, types and structures of industrial regulators, methods of their tuning.	5									**V**		**V**	**V**
61	Industrial networks and interfaces	Purpose:To teach students the basic principles and specifics of network technologies used in industrial automation in order to integrate network technologies with industrial controllers, I/O devices and other components of control systems. Content: The course includes the basics of network technologies: introduction to data transmission networks; basic concepts and protocols in networks; network architecture. Students also study industrial networks: features of industrial networks; industrial automation and industrial communication protocols (Modbus, Profibus, DeviceNet, CANopen, etc.); requirements for	5									**V**		**V**	**V**

		reliability and stability of industrial networks. In practical classes, students learn practical skills in setting up, testing and managing industrial networks and devices.													
62	Robotic automation of production processes	The disciplines "Robotization of production processes" are aimed at preparing students for independent theoretical, experimental, design and implementation work in the field of robotization of industries in various industries. Issues related to the appointment, the device, and the process of functioning of robots and robotic technological complexes used in various technological processes in engineering are considered. The objectives of the study of discipline is the assimilation of theoretical foundations and the acquisition of practical skills necessary for the development of robotic systems and complexes for the robotization of technological operations and processes in various fields of engineering. As a result of studying the discipline, the trainee must know: the device of robotic systems and complexes for various purposes used in various industries and industries; content and work on the creation of robotic technological complexes in various industries. To be able: to set and solve scientific and practical tasks on robotization, to develop systems and complexes of robotization.	5	**V**										**V**	
63	Industrial robot control systems	The discipline studies industrial programming languages for controllers STL, LAD, FBD and programming	5						**V**		**V**				

		languages for microprocessors C, Python. Methods for creating variables, working with logical, mathematical operators. Processing discrete and analog signals and interfaces SPI, I2C, CAN, UART. Implementation of PID / PI / PD regulators													
64	Theory and practice of project management	Purpose: for students to master the basic principles and methods of project management, as well as develop the necessary skills for the successful implementation of projects in various fields of activity. Contents: Students learn the theoretical foundations of project management, including the concepts, principles, methods of planning, organizing, controlling, and completing projects.	5						**V**					**V**	
65	Internet of Things (IoT) technologies	The discipline Technology of Internet of Things is designed to familiarize students with the principles of construction and operation of digital devices for further application of the acquired knowledge in the development and design of automated systems based on IoT. By the end of the training students will know: - rules of safe work and requirements for the organization of the workplace; - basics of programming microcontrollers for controlled technical systems; - basics of sensors application; - basics of the creation of controlled systems. By the end of the training the students will be able to: - observe the rules of safe work; - program microcontrollers for controlled technical systems; - select, connect and configure sensors; - develop controlled	6			**V**			**V**						

		systems on the Internet of Things technology.													
66	Typical controllers of automation systems	The aim of the course is to study the methods, means of tuning and practical implementation of typical regulators of automation systems. Course objectives - mastering the knowledge necessary for empirical and analytical tuning of typical regulators of automation systems. The course includes sections: typical laws of regulation, empirical and analytical methods of tuning of typical automation controllers, types and structures of typical controllers. By the end of the course students will be able to solve applied problems in the synthesis of various automation systems. They will acquire the skills to configure typical controllers of automation systems.	4	**V**			**V**								

5. Curriculum of the educational program

NON-PROFIT JOINT STOCK COMPANY
"KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY NAMED AFTER K.I. SATBAYEV"

SATBAYEV UNIVERSITY

«APPROVED»
Decision of the Academic Council
NPJSC«KazNRTU
named after K.Satbayev»
dated 06.03.2025 Minutes № 10

WORKING CURRICULUM

Academic year	**2025-2026 (Autumn, Spring)**
Group of educational programs	**B063 - "Electrical engineering and automation"**
Educational program	**6B07103 - "Automation and robotization"**
The awarded academic degree	**Bachelor of engineering and technology**
Form and duration of study	**full time - 4 years**

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters								Prerequisites
									1 course		2 course		3 course		4 course		
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	7 sem	8 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)																	
M-1. Module of language training																	
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E	5								
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E	5								
LNG108	Foreign language		GED, RC	5	150	0/0/45	105	E		5							
LNG104	Kazakh (russian) language		GED, RC	5	150	0/0/45	105	E		5							
M-2. Module of physical training																	
KFK101	Physical culture I		GED, RC	2	60	0/0/30	30	E	2								
KFK102	Physical culture II		GED, RC	2	60	0/0/30	30	E		2							
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E			2						
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E				2					
M-3. Module of information technology																	
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E				5					
M-4. Module of socio-cultural development																	
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE	5								
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E			5						
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E			3						
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E				5					
M-5. Module of anti-corruption culture, ecology and life safety base																	
HUM136	Fundamentals of anti-corruption culture and law	1	GED, CCH	5	150	30/0/15	105	E				5					
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E				5					
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E				5					
CHE656	Ecology and life safety	1	GED, CCH	5	150	30/0/15	105	E				5					
ELC577	Fundamentals of scientific research methods	1	GED, CCH	5	150	30/0/15	105	E				5					
CYCLE OF BASIC DISCIPLINES (BD)																	
M-6. Module of physical and mathematical training																	
MAT101	Mathematics I		BD, UC	5	150	15/0/30	105	E	5								
PHY111	Physics I		BD, UC	5	150	15/15/15	105	E	5								

MAT102	Mathematics II		BD, UC	5	150	15/0/30	105	E		5							MAT101
PHY112	Physics II		BD, UC	5	150	15/15/15	105	E		5							PHY111
M-7. Module of basic and general technical training																	
AUT426	Introduction to the specialty and engineering ethics		BD, UC	4	120	30/0/15	75	E	4								
GEN429	Engineering and computer graphics		BD, UC	5	150	15/0/30	105	E			5						
ELC541	Theoretical Foundations of Electrical Engineering		BD, UC	5	150	30/15/0	105	E			5						
ELC101	Electrical and Electronic Engineering		BD, UC	5	150	15/15/15	105	E				5					
CHE198	Process automation facilities		BD, UC	5	150	30/0/15	105	E					5				PHY111, MAT103
ELC500	Microelectronics	1	BD, CCH	5	150	30/15/0	105	E					5				
AUT447	Functional units of digital automation.	1	BD, CCH	5	150	30/15/0	105	E					5				
AUT430	Power electronics automation		BD, UC	4	120	30/15/0	75	E						4			
AUT431	Technology of robotic production		BD, UC	6	180	30/0/30	120	E							6		
M-8. Module of theoretical foundations of management																	
AUT413	Mathematical Foundations of control theory		BD, UC	5	150	30/0/15	105	E				5					
AUT415	Optimization methods		BD, UC	5	150	15/15/15	105	E					5				
AUT446	Intelligent process control systems		BD, UC	5	150	15/30/0	105	E							5		
M-9. Module of software and hardware automation																	
AUT428	Programming and algorithmization		BD, UC	5	150	30/15/0	105	E		5							
AUT429	Computer modeling and programming in MatLab		BD, UC	6	180	30/30/0	120	E			6						
AUT184	Microcontroller programming	1	BD, CCH	5	150	30/15/0	105	E						5			
AUT183	Microcontroller programming for robotic systems	1	BD, CCH	5	150	30/15/0	105	E						5			
AUT450	Automatics elements and devices		BD, UC	6	180	30/15/15	120	E							6		
M-10. Module of control and measuring devices																	
AUT181	Metrology and measurement	1	BD, CCH	5	150	30/15/0	105	E				5					
AUT193	Electrical measuring instruments	1	BD, CCH	5	150	15/15/15	105	E				5					
AUT420	Technological measurements and devices	1	BD, CCH	5	150	15/15/15	105	E					5				
MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E					5				
ELC440	Telecommunication networks of industrial enterprises	2	BD, CCH	5	150	30/0/15	105	E					5				
ELC428	Fiber optic sensors and systems	2	BD, CCH	5	150	30/15/0	105	E					5				
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	2	BD, CCH	5	150	30/0/15	105	E					5				
M-12. Module of professional disciplines																	
AUT409	Actuators of Automation Systems	1	BD, CCH	5	150	30/15/0	105	E						5			
AUT188	Industrial robots and manipulator drives	1	BD, CCH	5	150	15/15/15	105	E						5			
CSE831	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	15/0/30	105	E						5			
M-13. Practice-oriented module																	
AAP173	Practical training		BD, UC	2				R		2							
CYCLE OF PROFILE DISCIPLINES (PD)																	
M-8. Module of theoretical foundations of management																	
AUT411	Linear System of Automatic Control		PD, UC	5	150	15/15/15	105	E					5				
AUT416	Nonlinear system of the automatic control		PD, UC	5	150	15/15/15	105	E						5			
AUT448	Local control systems	1	PD, CCH	4	120	15/15/15	75	E						4			
AUT449	Typical controllers of automation systems	1	PD, CCH	4	120	15/15/15	75	E						4			
M-9. Module of software and hardware automation																	
AUT436	Neural network automation technologies	2	PD, CCH	4	120	30/15/0	75	E						4			
AUT453	Mathematical modeling and identification of control objects	2	PD, CCH	4	120	30/15/0	75	E						4			
M-11. Module for development and design of automation and control systems																	

AUT404	Reliability of automation systems	1	PD, CCH	5	150	30/0/15	105	E							5		
AUT454	Industrial networks and interfaces	1	PD, CCH	5	150	30/0/15	105	E							5		
AUT162	Industrial Regulators	2	PD, CCH	5	150	30/15/0	105	E							5		AUT111
AUT167	Robotic automation of production processes	2	PD, CCH	5	150	15/15/15	105	E							5		
NSE185	Theory and practice of project management	2	PD, CCH	5	150	30/0/15	105	E							5		
AUT440	Microprocessor-based systems in the control systems	3	PD, CCH	6	180	30/30/0	120	E							6		
AUT452	Internet of Things (IoT) technologies	3	PD, CCH	6	180	30/15/15	135	E							6		
AUT444	Capstone research project 1	3	PD, CCH	6	180	0/0/60	120	P							6		
AUT173	Design of robotization systems	1	PD, CCH	5	150	30/0/15	105	E								5	
AUT419	Design of automation systems	1	PD, CCH	5	150	30/0/15	105	E								5	
AUT402	SCADA-system	2	PD, CCH	5	150	30/15/0	105	E								5	
AUT445	Capstone research project 2	2	PD, CCH	5	150	0/0/45	105	P								5	
M-12. Module of professional disciplines																	
AUT438	Installation and adjustment of electrical devices of control systems	1	PD, CCH	4	120	15/15/15	75	E								4	
AUT439	Installation and adjustment of robotic systems	1	PD, CCH	4	120	30/0/15	75	E								4	
AUT168	Automation of typical technological processes and production	2	PD, CCH	5	150	15/15/15	105	E								5	
AUT180	Industrial robot control systems	2	PD, CCH	5	150	30/15/0	105	E								5	
M-13. Practice-oriented module																	
AAP102	Production practice I		PD, UC	2				R				2					
AAP183	Production practice II		PD, UC	3				R						3			
M-14. Module of final attestation																	
ECA103	Final examination		FA	8												8	
Additional type of training (ATT)																	
AAP500	Military training																
Total based on UNIVERSITY:									31	29	26	34	30	30	33	27	
									60		**60**		**60**		**60**		

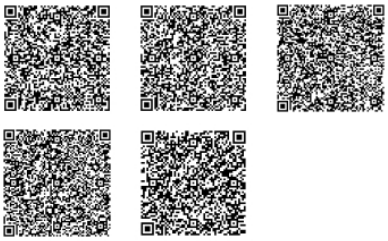
Number of credits for the entire period of study

Cycle code	Cycles of disciplines	Credits			
		Required component (RC)	University component (UC)	Component of choice (CCH)	Total
GED	Cycle of general education disciplines	51	0	5	56
BD	Cycle of basic disciplines	0	88	30	118
PD	Cycle of profile disciplines	0	15	43	58
Total for theoretical training:		**51**	**103**	**78**	**232**
FA	Final attestation				8
TOTAL:					**240**

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 3 dated 20.12.2024

Decision of the Academic Council of the Institute. Minutes № 4 dated 22.11.2024

Signed:	
Governing Board member - Vice-Rector for Academic Affairs	Uskenbayeva R. K.
Approved:	
Vice Provost on academic development	Kalpeyeva Z. Б.
Head of Department - Department of Educational Program Management and Academic-Methodological Work	Zhumagaliyeva A. S.
acting Director of Institute - Institute of Automation and Information Technologies	Chinibayev Y. Г.
Department Chair - Automation and control	Sarsenbayev N. .
Representative of the Academic Committee from Employers ____Acknowledged____	Sayrambaev Z.



6. Additional educational programs (Minor)

Name of additional educational programs (Minor) with disciplines	Total number of credits	Recommended semesters of study	Documents on the results of development additional educational programs (Minor)