Institute of Automation and Information Technology
Department of Electronics, Telecommunication and Space Technologies

EDUCATIONAL PROGRAM
Electronic and Electrical Engineering

Code and classification of the field of education: 6B071 "Engineering, manufacturing and construction industries"
Code and classification of training areas: 6B071 "Engineering and engineering", B062 "Electrical engineering and power engineering"
NQF level: 6
SQF level: 6
Duration of study: 4 years
Amount of credits:240

Almaty 2025

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

The educational program "6B07112 Electronic and Electrical Engineering" was approved at a meeting of the Academic Council of KazNRTU named after K.I. Satbayev.

Protocol №10 dated "06" March 2025

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of KazNRTU named after K.I. Satbayev.

Protocol №4 dated "20" December 2024

The educational program 6B07112 "Electronic and Electrical Engineering" was developed by the academic committee in the direction B062 "Electrical Engineering and Power Engineering".

Name	Academic degree / academic title	Post	Place of work	Signature
Chairman of the Academic Committee:				
Y. Tashtay	Candidate of Technical Sciences Associate professor	Head of the Department of Electronics, Telecommunications and Space Technologies	"Kazakh National Research Technical University named after K.I. Satbayev". Mobile phone; 87017889799	
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Meshcheryakova Tatiana Yurievna	Candidate of Technical Sciences	Associate professor	Kazakh National Research Technical University named after K.I. Satbayev	
Kassimov Abdurazak Orazgeldievich	Candidate of Technical Sciences	Associate professor	Kazakh National Research Technical University named after K.I. Satbayev	
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Ibadildin Yersultan Zhanatovich		Student of 6B07112 "Electronic and Electrical Engineering"	KazNRTU, Institute of A&IT, Department of ET&ST	

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

Boris Ivanovich Bryzgin		Student of 6B07112 "Electronic and Electrical Engineering"	KazNRTU, Institute of A&IT, Department of ET&ST	

Content

1. Description of the educational program

The educational program (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 professional activities of the program's graduates are aimed at the field of industrial and civil electrical engineering and electronics, basic elements of the Internet of Things and smart technologies.

The training of specialists in electronics and electrical engineering will be carried out according to the new educational program (EP) "Electronic and Electrical Engineering" - "Electronics and Electrical Engineering", which has two specializations: "Electronic Systems" and "Electrotechnical Devices".

The content of the disciplines of the educational program was developed taking into account the relevant educational programs of the world's leading universities and the international classifier of professional activities in the field of electronics and electrical engineering.

The types of professional activity are: production and technological; service and operational; organizational and managerial; installation and adjustment; calculation and design; experimental and research.

The subjects of professional activity are systems that include: development, design of the element base of electronics and electrical engineering, including intelligent systems for the digital economy sectors using programmable logic integrated circuits, sensors and converters.

2. The purpose and objectives of the educational program

The purpose of the EP: The goal of the program is to train highly qualified specialists in the field of digital electronics and electrical engineering, possessing deep knowledge, practical skills and competencies necessary for the effective performance of functional duties in the field of design, installation, adjustment and operation of electrical equipment and automatic control systems. Specialists will be ready for professional mobility, able to apply modern achievements and development prospects of the electronic and energy industries, as well as adapt to changes in the technological and market environment.

Responsibilities of the EP:

- -Mastering a cycle of general education disciplines to ensure social and humanitarian education based on the laws of social and economic development of society, history, state and foreign languages, as well as modern information technologies.
- Study of a cycle of basic disciplines to form the basis of professional training in the field of natural, general technical and economic sciences.
- Developing skills in conducting scientific research in the field of electronics, optoelectronics and nanophotonics, as well as mastering the development of intelligent systems and their application in electronic engineering.

- Acquisition of theoretical knowledge and development of practical skills in microprocessor complexes designed to control processes in engineering automated control systems and information and communication systems.
- Providing students with knowledge of modern engineering technologies, intelligent microprocessor systems, design of analog and digital circuits, their key aspects and applications.
- Formation of competencies necessary for work in research and innovation centers, in high-tech industries, as well as in the field of scientific and pedagogical activities.
- Developing the ability to assess, analyze and solve production problems, monitor and manage technological processes.

The EP allows for the successful implementation of the Bologna Process principles. Based on the students' choice and independent planning of the sequence of studying disciplines, they independently form their individual curriculum (IEP) for each semester with the help of an advisor based on the educational program and the catalog of elective disciplines.

The educational program has increased the volume of mathematical, natural science, basic and language disciplines.

The following disciplines are studied: "Introduction to Electronic Science and Engineering Technologies", "Physical Foundations of Electronics", "Signal Transmission Theories", "Circuitry of Electronic Devices", "Microprocessor and Microcontroller Devices and Systems", "Theoretical Foundations of Electrical Engineering", "Electrotechnical Materials", "Basics of Power Electronics", "Ultraviolet Electronics", "Linear Automatic Control Systems", "Electronic Sensors and Converters", "Optoelectronics", "Programmable logic integrated circuits", "Intelligentnetworks", "Design of electronic means", etc.

In addition, attention is paid to modern trends in the development of electronics and electrical engineering in the field of artificial intelligence, reliability of electrical and electronic devices.

Students will undergo practical training in such companies as JSC Saiman, JSC Transtelecom, JSC ALTEL, JSC KazTransCom, LLP Kar-Tel, ASKB Alatau, branches of LG, Cisco, Rochde&Schwarz, LLP IKTT, LLP Kazakhstan ASELSAN Engineering, etc., as well as at the basic service centers of large international companies in the electronics industry.

Under the academic mobility program, the best students will study at leading foreign universities in the relevant program.

3. Requirements for the assessment of learning outcomes of the educational program

The educational program "Electronic and Electrical Engineering" ensures that all students achieve the learning outcomes necessary for professional activity. Upon completion of the program, students acquire social and humanitarian knowledge based on the laws of socio-economic development, history, state, Russian and foreign languages, as well as modern information technologies. In addition, they study a cycle of basic disciplines to form professional training in the field of natural,

general technical and economic sciences.

Students acquire theoretical knowledge and practical skills necessary for managing and processing information in the field of electronic and electrical engineering. They acquire the ability to perform technical calculations and justify design solutions using modern computer technologies and intelligent programs. Competencies in planning and organizing theoretical and laboratory research are also formed.

As part of practical training, students become familiar with technical processes of organization, planning and production management. They acquire professional skills in the field of microprocessor complexes for automatic control, digital technologies, various types of sensors, information communication systems and information processing using electronic devices.

Graduates of the educational program will be able to work at enterprises using engineering and technological systems, in research and innovation centers, in high-tech production, and in educational institutions. Their professional activities will be related to remote information processing, data conversion using electronic and radio engineering means, as well as with methods and tools for managing technological processes.

4. Passport of the educational program

4.1. General information

No.	Field name	Note
1	Code and classification of the educational field	6B07 "Engineering, manufacturing and construction industries"
2	Code and classification of training areas	6B071 "Engineering and engineering"
3	Group of educational programs	B062 "Electrical Engineering and Power Engineering"
4	Name of the educational program	6B07112Electronic and Electrical Engineering
5	Brief description of the educational program description	The 6B07112 Electronic and Electrical Engineering program is aimed at training highly qualified specialists in the field of modern electronic engineering. Students receive in-depth knowledge in such areas as electronics, optoelectronics, microprocessor systems, intelligent control systems, digital technologies and information and communication systems. In addition, they master the development of automated control systems, monitoring and optimization of production processes using modern engineering tools and software. The program emphasizes the combination of theoretical knowledge with practical experience and the development of research activities. Students conduct laboratory and experimental research, undergo practical training at industrial and innovative enterprises. As part of academic mobility, they have the opportunity to study at leading foreign universities and participate in international scientific projects. Graduates of the program can work at enterprises using engineering and technical systems, in research institutes, high-

		tech production and educational institutions. Their professional activities are related to the development of intelligent systems in the field of electronics and electrical engineering, the implementation of automated control systems and the solution of scientific and engineering problems.
6	Purpose of the EP	The goal of the program is to train highly qualified specialists in the field of digital electronics and electrical engineering, possessing deep knowledge, practical skills and competencies necessary for the effective performance of functional duties in the field of design, installation, adjustment and operation of electrical equipment and automatic control systems. Specialists will be ready for professional mobility, able to apply modern achievements and development prospects of the electronic and energy industries, as well as adapt to changes in the technological and market environment. Students will be able to conduct scientific research in the field of electronics, optoelectronics and nanophotonics, as well as develop intelligent systems in electronic engineering. They will acquire professional competencies in assessing, analyzing and solving production problems, monitoring and managing technological processes. The program provides training of scientific personnel in accordance with international standards, giving graduates the opportunity to work in research and innovation centers, high-tech industries, as well as in the field of scientific and pedagogical activities.
7	Type of EP	new educational program
8	Level according to NQF	6
9	Level according to SQF	6
10	Distinctive features of the EP	has no specific features
11	List of competencies of the educational program:	The duration of study is determined by the volume of academic credits acquired. The educational program is considered fully mastered provided that the expected learning outcomes are achieved and the established volume of academic credits are acquired. The duration of study is 4 years (240 academic credits). Planning of the educational content, methods of organizing and conducting the educational process is carried out by the university and scientific organizations independently on the basis of credit technology of education. The content of the educational program includes: Theoretical training, covering the study of cycles of basic and specialized disciplines; Practical training of students, including various types of practice. Final certification. The content of the educational program "Electronic and Electrical Engineering" is implemented in accordance with the credit technology of education and is carried out in the state, Russian and English languages.
12	Results of the implementation of the educational program:	PO1 – Apply various types of information and communication technologies and software to solve dispatching and operational problems of power systems. Analyze and evaluate their effectiveness in professional activities. Design and model electrical and electronic devices in the energy industry,

		optimizing their functionality and reliability. PO2 – Demonstrate the ability to continuously learn, acquire new knowledge, deepen and expand previously acquired skills and competencies. Work in a team of developers and users of energy systems, apply moral and ethical principles, develop communication, organizational and managerial skills. PO3 – Demonstrate and apply basic mathematical, physical and other natural science knowledge, financial analysis, and the theoretical foundations of electrical engineering to solve general engineering problems. PO4 – Demonstrate the ability to select measuring instruments and automation equipment, configure and operate automation elements and devices at electrical engineering enterprises. PO5 – Demonstrate the ability to continuously learn Apply knowledge of Kazakh, Russian and foreign languages to solve problems of interpersonal, intercultural and professional communication PO6 – Demonstrate a set of skills in managing energy systems, select research methods, techniques and evaluation criteria to obtain the results of production processes in the energy sector. PO7 – Apply and demonstrate knowledge of the electronic and microprocessor base, use the skills of programming microcontrollers for power supply systems. Apply programmable logic integrated circuits to build power supply devices for objects of varying complexity and functionality, and also develop and design these devices. PO8 – Demonstrate skills in developing design and working technical documentation in accordance with energy engineering norms and standards. Apply methods for organizing integrated services for testing, configuration, development and design of new services in the field of electronic devices and instruments in the energy industry. PO9 – Apply in practice knowledge of the main types of installation and adjustment of electrical equipment, as well as maintain linear and nonlinear automatic control systems in power engineering and in intelligent systems. PO10 – Apply basic knowledge in the field of ecology and life safety, the fundamentals of anti-corruption culture, entrepreneurship and leadership, and receptivity to innovation in various types of professional and socio-political activities.
13	Form of study	Full-time
14	Duration of study	4 year
15	Volume of loans	240 credit
16	Languages of instruction	Kazakh, Russian, English
17	Academic degrees awarded	Bachelor of Engineering and Technology
18	Developer and authors:	Y. Tashtay

4.2 The relationship between the attainability of the learning outcomes formed under the educational program and academic disciplines

			Number of credits	Formed learning outcomes (codes)									
				RO1	PO2	PO 3	PO 4	RO 5	RO 6	RO7	RO8	RO9	RO 10
	Cycle of general education disciplines, Required component												
1	Foreign language	English is a general education subject. After determining the level (according to the results of diagnostic testing or IELTS results), students are divided into groups and subjects. The name of the subject corresponds to the level of English proficiency. When moving from level to level, prerequisites and postrequisites of the subjects are observed.	**10**	V									
2	Kazakh (Russian) language	The course examines socio-political, socio-cultural spheres of communication and functional styles of the modern Kazakh (Russian) language. The course covers the specifics of scientific style in order to develop and activate students' professional and communicative skills and abilities. The course allows students to practically master the basics of scientific style and develops the ability to perform structural and semantic analysis of the text.	**10**	V									
3	Physical culture	The aim of the discipline is the practical use of skills in performing the basic elements of track and field techniques, sports games, gymnastics and a set of standards for general physical training, including professional and applied physical training or one of the sports, methods for conducting independent physical exercise classes.	**8**	V		**V**							
4	Information and communication technologies	The objective of studying the discipline is to acquire theoretical knowledge about information processes, new information technologies, local and global computer	**5**	V									

		networks, methods of information protection; to acquire skills in using text editors and spreadsheet processors; to create databases and various categories of application programs.											
5	History of Kazakhstan	The course studies historical events, phenomena, facts, processes that took place on the territory of Kazakhstan from ancient times to the present day. The sections of the discipline include: introduction to the history of Kazakhstan; steppe empire of the Turks; early feudal states on the territory of Kazakhstan; Kazakhstan during the Mongol conquest (13th century); medieval states in the 14th-15th centuries. The main stages of the formation of Kazakh statehood are also considered: the era of the Kazakh Khanate of the 15th-18th centuries; Kazakhstan as part of the Russian Empire; Kazakhstan during the period of civil confrontation and under a totalitarian system; Kazakhstan during the Great Patriotic War; Kazakhstan during the period of independence and at the present stage.	**5**	V									
6	Philosophy	Philosophy forms and develops critical and creative thinking, worldview and culture, provides knowledge about the most general and fundamental problems of existence and provides them with a methodology for solving various theoretical practical issues. Philosophy expands the horizon of vision of the modern world, forms civic consciousness and patriotism, promotes the development of self-esteem, awareness of the value of human existence. It teaches how to think and act correctly, develops 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 us.	**5**	V									
7	Module of socio-political knowledge (sociology,	The discipline is designed to improve the quality of both general humanitarian and professional training of students.	**3**	V									

	political science)	Knowledge in the field of sociology and political science is the key to effective professional activity of a future specialist, as well as for understanding political processes, for the formation of a political culture, development of a personal position and a clearer understanding of the extent of one's responsibility.											
8	Module of socio-political knowledge (cultural studies and psychology)	The socio-political knowledge module (cultural studies, psychology) is designed to familiarize students with the cultural achievements of mankind, to understand and assimilate the basic forms and universal patterns of formation and development of culture, to develop their desire and skills for independent comprehension of the entire wealth of values of world culture for self-improvement and professional growth. During the course of cultural studies, the student will consider general problems of the theory of culture, leading cultural concepts, universal patterns and mechanisms of formation and development of culture, the main historical stages of formation and development of Kazakhstani culture, its most important achievements. During the course, students acquire theoretical knowledge, practical skills and abilities, forming their professional focus from the standpoint of psychological aspects.	**5**	V									
Cycle of general education disciplines, Component of choice													
9	Fundamentals of anti-corruption culture and law	Objective: to increase public and individual legal awareness and legal culture of students, as well as to form a system of knowledge and civic position on combating corruption as an antisocial phenomenon. Contents: improving the socio-economic relations of Kazakhstani society, psychological characteristics of corrupt behavior, forming an anti-corruption culture, legal responsibility for corrupt acts in	**5**		V								V

		various spheres.											
10	Fundamentals of scientific research methods	Objective: to develop knowledge about scientific research, methods and methodology of scientific research, methods of collecting and processing 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 methods of optimization, application of artificial intelligence capabilities to solve optimization problems, issues of searching, accumulating and processing scientific information.	**5**		**V**								V
11	Basics of financial literacy	Objective: developing students' financial literacy based on establishing a direct link between the knowledge they gain and its practical application. Contents: practical use of all kinds of financial management tools, preserving and increasing savings, competent budget planning, acquiring practical skills in calculating and paying taxes and correctly filling out tax reports, analyzing financial information and navigating financial products to select an adequate investment strategy.	**5**		**V**	**V**							V
12	Ecology and life safety	Objective: formation of ecological knowledge and consciousness, acquisition of theoretical and practical knowledge on modern methods of rational use of natural resources and environmental protection. Contents: study of the tasks of ecology as a science, laws of functioning of natural systems and aspects of environmental safety in working conditions, environmental monitoring and management in the field of its safety, ways of solving environmental problems; life safety in the technosphere, emergency situations of natural and man-made nature.	**5**	V	**V**								V
13	Fundamentals of Economics and Entrepreneurship	The purpose of studying the discipline is to familiarize students with the basic principles of economic theory and	**5**	V	**V**								V

		entrepreneurial activity. The course includes the study of basic economic concepts, market mechanisms, management tools and key aspects of entrepreneurship, such as creating and managing a business, analyzing the market environment, financial planning, risk assessment and developing development strategies.											
Cycle of basic disciplines University component													
14	Introduction to Electronic Science and Engineering Technologies	The course provides an idea of the trends in the development of electronic industry technologies, the patterns of their development, determining the relationship between the quality indicators of the element base, performance parameters, and energy consumption indicators of electronic systems. It introduces students to the methods and fundamentals of electronic science and engineering; to the main concepts, models, and principles of building the electronic industry.	**4**	V		V	V						
15	Microelectronics	The principles of operation, parameters, characteristics and application features of semiconductor devices are considered. Design of various circuits of electric signal amplifiers and generators based on diodes, bipolar and field-effect transistors and development of their operating features. Operational amplifiers. Differential amplifiers. Feedback. Effect of feedback on the main indicators and characteristics of amplifiers. Power amplifiers. Classification of filters and their composition.	**5**			V			V			V	
16	Engineering and computer graphics	Objective: To develop students' knowledge of drawing construction and skills in developing graphic and text design documentation in accordance with the requirements of standards. Contents: Students will study the Unified System for Design Documentation (ESKD) standards, graphic primitives, geometric constructions, methods and properties	**5**	V		V							

		of orthogonal projection, Monge diagrams, axonometric projections, metric problems, types and features of connections, creating sketches of parts and assembly drawings, detailing, and creating 3D complex solid objects in AutoCAD.												
17	Mathematics	The purpose of mastering the discipline is to form the theoretical and practical foundations of mathematics and its applications. Based on the study of the section of mathematics, to give students the development of thinking and achievements of mathematical culture, which is necessary for application in future professional activities. The course is based on the study of mathematical analysis in a volume that allows you to study elementary functions and solve the simplest geometric, physical and other applied problems. The main attention is paid to differential and integral calculus. The sections of the course include differential calculus of functions of one variable, derivative and differentials, study of the behavior of functions, complex numbers, polynomials. Indefinite integrals, their properties and methods of calculation. Definite integrals and their applications. Improper integrals.	**5**	V		V								
18	Mathematics I	Objective: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To develop the ability to solve typical and applied problems of the discipline. Contents: Elements of linear algebra, vector algebra and analytical geometry. Introduction to analysis. Differential calculus of a function of one variable. Study of functions using derivatives. Functions of several variables. Partial derivatives. Extremum of a function of two variables.	**5**	V		V								
19	Mathematics II	Objective: To teach students integration methods. To teach how to choose the right method for finding the	**5**	V		V								

		antiderivative. To teach how to apply the definite integral to solving practical problems. Contents: integral calculus of functions of one and two variables, theory of series. Indefinite integrals, methods of their calculation. Definite integrals and applications of definite integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations.											
20	Basics of automation	The discipline studies the main measuring devices, primary converters (sensors) of process parameters, actuators, microcontrollers and automatic control systems of machine tools and process equipment. Describes the elements of automation systems, time and frequency characteristics of typical links, criteria for studying linear systems for stability and methods for assessing the quality of the process.	**5**	V					V	V			
21	Fundamentals of Optoelectronics	Study of the interaction of optical radiation with electrons in matter, mainly in solids, for the creation of optoelectronic devices that convert electrical signals into optical signals (semiconductor lasers, light-emitting diodes) and optical signals into electrical signals (photodetectors of various types). The physical effects, operating principles and design features of the main types of optoelectronic devices are presented. The physical and technical characteristics of such devices are given, and issues of their application in information processing systems are considered.	**5**	V			V				V		
22	Fundamentals of Electronics and Instrumentation	Study of the modern level of electronic engineering, principles of construction and operation of semiconductor devices, areas of their application. Study of measuring technologies that combine a set of methods, approaches, software and logical support for the organization of measurements; trends in the development of measuring instruments and basic methods for measuring the	**5**	V		V							

		characteristics of electronic and electrical circuits and signals, assessment of their accuracy.											
23	TRIZ in solving engineering problems	The content of the discipline "TRIZ in solving engineering problems" includes the main issues on the development of technical systems, methods for solving inventive problems, methods for determining the main functions of technical systems, Su-Field analysis, critical analysis of supersystems and subsystems, methods for applying the information fund and TRIZ standards to solve engineering problems.	**6**	V	V							V	V
24	Theoretical foundations of electrical engineering I	The course covers: basic concepts and definitions used in electrical engineering; modern methods of modeling electromagnetic processes; methods of analyzing electrical and magnetic circuits; numerical methods of analyzing electrical circuits; basic laws and principles of electrical engineering, properties and characteristics of electrical circuits; methods of analyzing electrical circuits in steady-state and transient modes; choosing the optimal calculation method, determining the main parameters and characteristics of electrical circuits.	**6**	V		V				V			
25	Theoretical Foundations of Electrical Engineering II	The course provides an understanding of the basic equations and circuit diagrams; electrical filters and four-terminal networks; transient processes in linear electrical circuits, RL and RC circuits of the first degree; calculation of transient processes in circuits of the second degree. It introduces students to the characteristics of single-type networks, types of long networks, the operator method, nonlinear circuits of sinusoidal currents and methods of their analysis.	**5**	V		V				V			
26	Industrial Network Management	Fundamentals of industrial networks, the most common industrial networks. Basic network topologies. Physical data transmission media in industrial networks. Basic components of industrial networks. Requirements for information transmission networks. Principles underlying	**4**	V				V	V				

		industrial networks Ethernet, Profibus, AS-interface. Practical use of industrial networks, features of their design, configuration and operation.											
27	Physics I	Objective: study of the basic physical phenomena and laws of classical and modern physics; methods of physical research; influence of physics on the development of technology; connection 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, mechanical harmonic waves, fundamentals of molecular-kinetic theory and thermodynamics, transport phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell's equations.	**5**	V							V		V
28	Physics II	Objective: to develop 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		V
29	Physical principles of electronics	The physical processes that determine the principles of construction and operation of semiconductor devices are considered. Electronic circuits of semiconductor devices (diodes, thyristors, dinistors, triacs, transistors) and microcircuits are also considered, the specific area of application of these devices, the main volt-ampere characteristics of electronic devices and the parameters of electronic circuits are indicated.	**5**	V		V		V		V			

30	Electronics and circuitry	The basic principles of constructing electronic circuits, the principles of operation of amplifying and converting cascades, signal generators, electrical filters, the principles of operation of integrated circuits, and various aspects of using the element base of electronics in practical activities are considered. For this purpose, the principles of operation of various transistor amplifiers are considered in detail, as well as integrated versions of amplifiers such as differential cascades and operational amplifiers, and their schematic design.	**5**	V		V		V				
31	Electrical Materials Science	Classification of electrical engineering materials; liquid dielectrics; polymers; inorganic electrical insulating materials; conductive, superconducting and semiconducting materials; magnetic materials and their classification and properties; dielectrics and their electrical conductivity; breakdown of gases, liquid and solid dielectrics; thermal conductivity and radiation resistance of materials.	**5**	V		V	V	V		V		
		Cycle of basic disciplines **Component of choice**										
32	Inclusive technologies and universal design in engineering systems	This course explores the principles of inclusive technology and universal design in engineering systems. Students will learn how to create accessible environments, adaptive technologies, and ergonomic solutions that provide equal opportunities for all users, including people with disabilities. The course covers the integration of assistive technologies, smart systems, and sustainable design approaches to improve accessibility in a variety of engineering applications.	**5**	V		V				V		
33	Dynamics of machines and mechanisms	Objective: to develop an understanding of the fundamental laws of dynamics, the ability to model and analyze mechanical systems to develop effective engineering solutions. Contents: laws and principles of motion of	**5**	V			V		V		V	V

		mechanical systems, as well as their interaction with external forces. Analytical and numerical methods for describing and analyzing the dynamic behavior of mechanical systems include the study of kinematics and kinetics of mechanisms, methods for analyzing dynamic loads, and determining equilibrium parameters.											
34	Intelligent control systems in energy	Objective: formation and training in the field of creation and configuration of intelligent energy systems. Content: study of basic concepts and methods, as well as practical tasks on development and optimization of smart control systems. principles and methods of creation of smart systems capable of adaptation and decision-making based on data analysis and experience. Machine learning, artificial intelligence and neural network technology for development of control systems in various fields, including industry, transport and robotics.	**5**	V			V		V		V	V	
35	Modeling of electronic circuits in MatLab and other software products	The course teaches students the basics of working in the MatLab virtual software environment. Introduction to a set of virtual programs and their applications, libraries and library components; Mastering the skills of creating a MatLab model, processing schemes and properties of model components.	**5**	V		V						V	
36	Fundamentals of Sustainable Development and ESG Projects in Kazakhstan	Objective: to provide students with 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. Content: 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 at enterprises and organizations.	**5**	V									V

37	Legal regulation of intellectual property	Objective: to develop a comprehensive understanding of the system of legal regulation of intellectual property, including the basic principles, mechanisms for protecting intellectual property rights and the specifics of their implementation. Content: the course covers the basics of IP legislation, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and also examine legal disputes and methods for resolving them.	**5**	V		V						V	
38	Embedded Systems Programming	The content of the discipline covers a range of issues related to the development of software and hardware complexes for embedded systems, methods of their programming, development and debugging of control algorithms in the tasks of automation of scientific research and technological processes. Studying the discipline contributes to the goal of training elite highly motivated personnel for scientific research and professional activities in innovative and knowledge-intensive sectors of the economy.	**5**	V		V				V		V	
39	Programming for microcontrollers	The course is aimed at studying the methods of programming microcontrollers and acquiring skills in the practical application of microcontrollers in modern information-measuring and control systems; developing skills in programming microcontrollers to solve various problems, using analog-to-digital and digital-to-analog converters.	**5**	V		V				V			
40	Modeling software	The course teaches students the basics of working in virtual software environments MathLab, Electronics Workbench, etc. Getting to know a set of virtual programs and their applications, libraries and library components. Mastering the skills of creating a model, processing schemes and properties of model components	**5**	V		V				V	V		
41	Digital control of electric	General concepts of digital control systems for electric	**4**	V								V	V

	drives	drives. Digital control systems for electric drive speed and position. Calculation models of digital control systems taking into account discreteness by level. Discrete transfer functions. Structural diagrams of an electric drive control loop. Digital loop synthesis technique. Optimization of a digital current loop for an electric drive with a thyristor converter. Optimization of a digital speed loop. Optimization of a digital position loop. Digital units in electric drive systems.											
42	Frequency control of electric drives	Control object - asynchronous motor. Frequency control - general concepts and terms. Modular control. Vector control. Selection of the equation of electromagnetic torque and coordinate system. Models controlled by stator current. Models controlled by stator voltage. Features of speed controller adjustment. Direct torque control. Pulse-width converters. Modern converters for electric drives of wide application.	**4**	V							V	V	
43	Fundamentals of Artificial Intelligence	Objective: to introduce students to 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 processing of linguistic information, semantic models, natural language processing systems.	**5**	V	V						V	V	
44	Electromagnetic devices and instruments	Objective: The course "Electromagnetic Devices and Instruments" is designed to study the basic principles of electromagnetism and their application in various technical devices and instruments. Contents: studies the laws of electricity and magnetism, the properties of electromagnetic	**5**	V			V		V			V	

		fields, electromagnets, transformers, electromagnetic waves and their technical application, as well as their use in measuring equipment. The course also covers electromagnetic shielding and environmental pollution assessment, engineering solutions.											
45	Fundamentals of Electrical Machines	Objective: to develop an understanding of the basic principles of operation of electrical machines and their relationship with electrical systems. Contents: study of the theory of electrical machines, calculation and design methods, as well as practical tasks on working with machines and equipment, as well as study of the principles of operation and design of electrical machines, including electric motors, generators and transformers, and the use of electrical machines in various industries and transport.	**5**		V					V	V	V	
Cycle of major disciplines University component													
46	Basics of Electric Drives	Functions of electric drive elements. Basics of electric drive mechanics. DC electric drives. AC electric drives. Transient processes. Energy efficiency assessment. Losses in steady-state conditions. Losses in transient conditions. Energy saving by means of electric drive.	**4**		V		V		V	V			
47	Dynamics and control of electric drives	The objective of the course includes studying the principles of operation, dynamic characteristics, control methods and application of various types of electric drives. It is aimed at preparing students to understand and develop electric drive systems for various industrial applications. The main topics that this course usually covers are: Fundamentals of Electric Drives, Principles of Electric Drive Control, Energy Efficiency, etc. The course includes not only theoretical classes, but also practical laboratory work, which allows students to apply the acquired knowledge and skills in practice, develop and analyze electric drive control systems,	**4**		**V**	V		V			V		

		which is important for their future professional activities.											
48	Voltage and energy	Objective: to develop a deep understanding of processes in energy systems and prepare for the design and management of modern energy facilities. The content includes theoretical classes, practical laboratory work and the study of current examples from the energy sector. Content: a comprehensive study of the theoretical and practical aspects of electrical systems and energy. Includes the study of the fundamentals of electrical engineering, distribution and transmission of electricity, as well as analysis of the operation of energy systems.	**6**			V	V		V			V	
49	Electrical devices	Objective: to understand the principles of operation of devices, their characteristics and application in various technical systems. Contents: with the principles of operation and application of electrical devices, including transformers, electric motors, generators, etc. The program studies the design of devices, their parameters, calculation and operation methods, as well as the formation of a deep understanding of the principles of operation of electrical devices and their practical application.	**5**	V						V	V	V	
50	Energy efficiency and system optimization	Objective: developing competencies in the field of rational use of energy and optimization of technical systems. Content: includes analysis of energy processes, development of optimization strategies and application of innovative technologies, includes methods for increasing the energy efficiency of technical systems and processes. Studies the optimization of energy use, energy management and implementation of modern technologies to reduce energy consumption.	**5**							V	V	V	
Cycle of major disciplines Component of choice													
51	Lean manufacturing	The objective of the course is to develop students'	**5**				V	V	V		V		V

		competencies in the application of 3D scanning as an innovative digitalization tool, improving the accuracy of production design, manufacturing and modern industrial activities in accordance with the objectives of SDG 9. Basic 3D scanning methods: principles and opportunities for industry. 3D scanning in the development of sustainable employment and mechanical engineering. Analysis of the economic efficiency of introducing 3D scanning at an enterprise. Understanding the relationship between 3D scanning and the tasks of sustainable industrialization and labor development.												
52	Measuring and control devices in communication systems	The course is aimed at studying the principles of operation of measuring and control devices used in telecommunication systems. Students will study radio frequency spectrum analyzers, fiber optic testing devices, devices for measuring antenna parameters and network monitoring systems. In addition, they will master the methods of testing and diagnostics of communication systems.	**4**	V						V	V	V	
53	Dynamics of electrical systems	Objective: developing skills in analyzing and modeling the dynamic behavior of electrical systems in order to improve their efficiency and reliability. Contents: studying mathematical methods of modeling, analyzing transient processes and stabilizing electrical systems. dynamic behavior of electrical networks and devices. Deepening knowledge of the influence of time and frequency parameters on the operation of electrical systems, analyzing the processes of transient and stationary operating modes.	**6**	V					V		V		
54	Microprocessor systems	The objective of the course is to explain to students the structure and operating principles of microprocessor systems, as well as to develop skills in their design and programming. A course on microprocessor systems typically includes a study of the structure of	**5**	V	V				V	V		V	

		microprocessors, their operating principles, and areas of application. The content of this course may include the following sections: 1. History of Microprocessor Development: This section discusses the emergence of microprocessors, their development, and changes. 2. Architecture of Microprocessor Systems: Explains the structure and functions of major components such as system buses, processor memory, input/output, and control units. 3. Assembly Language: The role of assembly language in working with microprocessors, its syntax, and programming techniques. 4. Programming Microprocessor Systems: Application of programming languages, as well as the processes of translation from high-level languages to assembly language. 5. Interacting with I/O Devices: Methods of interacting with I/O ports, timers, and other peripheral devices.										
55	Programmable logic integrated circuits	Classification and main properties of programmable logic microcircuits. Recommendations for choosing the family and type of FPGA for the device being developed. Creating a schematic description of the designed device. Entering time and topological constraints of the project. Functional modeling of the designed device based on FPGA. Structure and methods of preparing the test module of the project. Creating a test module of the project in text format and in the form of timing diagrams. Stages of modeling digital devices based on FPGA.	**4**	V					V	V	V		
56	Theory and practice of project management	Objective: to help students 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. Content: Students study the theoretical foundations of project management, including concepts, principles, methods of planning,	**5**			V				V	V	V	

		organizing, monitoring and completing projects.											
57	Design of electronic means	Study of design methods for technological processes of electronic equipment production. Structure and classes of electronic equipment, factors determining the construction of electronic equipment. Main stages of development. Modern and advanced designs of electronic equipment – cells, modules, blocks, cabinets. Basics of standardization. Unification of designs. General provisions on quality, on the technical level and on management systems and quality assurance of products.	**5**	V				V		V			
58	Design of electrical devices	Study of the system analysis method in designing electrical devices. Definition of the main features of electrical devices and the basis for searching for technical solutions. Heuristic search methods. Morphological and automated methods for synthesizing technical solutions. Methods and principles for solving inventive problems. Evaluation and consideration of electromagnetic compatibility of electrical devices during design. Methods for solving engineering and economic problems using application software	**5**	V		V					V	V	
59	Electronics and microprocessor technologies	Objective: training and research of modern electronics and microprocessor systems of microcontroller on development and operation. Contents: lectures, practical classes and project tasks, as well as principles of operation and design of electronic structures and microprocessors of electronics, methods of their design, programming of microcontrollers, etc. in microprocessors are used in artistic and technical system.	**6**				V			V	V		
60	Lean system	The Lean system is based on continuous improvement and elimination of all kinds of losses by joint efforts of the company's employees, the main goal is to satisfy consumers. The course covers the most popular tools and methods: Value stream mapping; Pull flow production; Kanban;	**5**	**V**	V			V	V				V

		Kaizen - continuous improvement; 5S System - technology for creating an effective workplace; SMED System - quick changeover of equipment; TPM System - Total Maintenance of Equipment; JIT System; Visualization; U-shaped cells.												
61	Electronic sensors and transducers	Objective: to familiarize students with electronic sensors and converters used in electric power systems at all stages - from production to consumption of electric power. Contents: study of the purpose, main characteristics and areas of application of electronic sensors and converters in electric power systems. Consideration of the principles of their operation, design features and methods of use at various stages of production, transmission, distribution and consumption of electric power.	**4**	V						V	V	V	
62	Electronic engineering	Organization of complex services for testing, for setting up, for development and design of new services in the field of electronic devices and instruments, as well as issues of support and warranty services. Practical application of modern electronic components, means and technologies for information and telecommunication systems, transport and space technology, energy, computing and medical equipment. Modern and promising electronic means, approaches and methods in research, modeling and design of micro- and nanoelectronics products	**5**	V						V	V	V	

"Қ. И. СӘТБАЕВ АТЫНДАҒЫ ҚАЗАҚ ҰЛТТЫҚ ТЕХНИКАЛЫҚ ЗЕРТТЕУ УНИВЕРСИТЕТІ"
КОММЕРЦИЯЛЫҚ ЕМЕС АКЦИОНЕРЛІК ҚОҒАМЫ

SATBAYEV UNIVERSITY

«Қ.И.Сәтбаев атындағы ҚазҰТЗУ» КеАҚ
Ғылыми кеңесінің шешімі
06.03.2025 жылғы № 10 хаттамасымен
«БЕКІТІЛДІ»

ОҚУ ЖҰМЫС ЖОСПАРЫ

Оқу жылы	2025-2026 (Күз, Көктем)
Білім беру бағдарламаларының тобы	B062 - "Электр техникасы және энергетика"
Білім беру бағдарламасы	6B07112 - "Electronic and Electrical Engineering"
Берілетін академиялық дәреже	Техника және технология бакалавры
Оқу мерзімі және формасы	күндізгі - 4 жыл

Пәннің коды	Пәннің атауы	Блок	Цикл	Академиялық кредиттің жалпы көлемі	Барлық сағаттар	дәріс/лаб/пр/ Аудиториялық сағаттар	сағатпен СӨЖ (оның ішінде СОӨЖ)	Бақылау түрі	Аудиториялық сабақтарды курстар мен семестрлер бойынша бөлу								Пререквизиттілік
									1 курс		2 курс		3 курс		4 курс		
									1 сем	2 сем	3 сем	4 сем	5 сем	6 сем	7 сем	8 сем	
ЖАЛПЫ БІЛІМ БЕРЕТІН ПӘНДЕР ЦИКЛІ (ЖБП)																	
М-5. Сыбайлас жемқорлыққа қарсы мәдениет, экология және тіршілік қауіпсіздігі негіздері модулі																	
CHE656	Экология және тіршілік қауіпсіздігі	1	ЖББП, ТК	5	150	30/0/15	105	E			5						
MNG489	Экономика және кәсіпкерлік негіздері	1	ЖББП, ТК	5	150	30/0/15	105	E			5						
ELC577	Ғылыми зерттеу әдістерінің негіздері	1	ЖББП, ТК	5	150	30/0/15	105	E			5						
HUM136	Сыбайлас жемқорлыққа қарсы мәдениет пен құқық негіздері	1	ЖББП, ТК	5	150	30/0/15	105	E			5						
MNG564	Қаржылық сауаттылық негіздері	1	ЖББП, ТК	5	150	30/0/15	105	E			5						
М-1. Тілдік дайындық модулі																	
LNG108	Шетел тілі		ЖББП, МК	5	150	0/0/45	105	E	5								
LNG104	Қазақ (орыс) тілі		ЖББП, МК	5	150	0/0/45	105	E	5								
LNG108	Шетел тілі		ЖББП, МК	5	150	0/0/45	105	E		5							
LNG104	Қазақ (орыс) тілі		ЖББП, МК	5	150	0/0/45	105	E		5							
М-2.Дене шынықтыру модулі																	
KFK101	Дене шынықтыру I		ЖББП, МК	2	60	0/0/30	30	E	2								
KFK102	Дене шынықтыру II		ЖББП, МК	2	60	0/0/30	30	E		2							
KFK103	Дене шынықтыру III		ЖББП, МК	2	60	0/0/30	30	E			2						
KFK104	Дене шынықтыру IV		ЖББП, МК	2	60	0/0/30	30	E				2					
М-3. Ақпараттық технологиялар модулі																	
CSE677	Ақпараттық-коммуникациялық технологиялар		ЖББП, МК	5	150	30/15/0	105	E				5					
М-4. Әлеуметтік-мәдени даму модулі																	
HUM137	Қазақстан тарихы		ЖББП, МК	5	150	15/0/30	105	ME	5								
HUM132	Философия		ЖББП, МК	5	150	15/0/30	105	E			5						
HUM120	Әлеуметтік-саясаттану білім модулі (әлеуметтану, саясаттану)		ЖББП, МК	3	90	15/0/15	60	E			3						
HUM134	Әлеуметтік-саясаттану білім модулі (мәдениеттану, психология)		ЖББП, МК	5	150	30/0/15	105	E				5					
БАЗАЛЫҚ ПӘНДЕР ЦИКЛІ (БП)																	
М-6. Физика-математикалық дайындық модулі																	
MAT101	Математика I		БП, ЖООК	5	150	15/0/30	105	E	5								

PHY111	Физика I		БП, ЖООК	5	150	15/15/15	105	E	5								
MAT102	Математика II		БП, ЖООК	5	150	15/0/30	105	E		5							MAT101
PHY112	Физика II		БП, ЖООК	5	150	15/15/15	105	E		5							PHY111
MAT423	Математика		БП, ЖООК	5	150	15/0/30	105	E			5						
М-7. Базалық дайындық модулі																	
GEN429	Инженерлік және компьютерлік графикасы		БП, ЖООК	5	150	15/0/30	105	E	5								
ELC589	Электротехниканың теориялық негіздері I		БП, ЖООК	6	180	15/15/15	135	E			6						
ELC566	Модельдеуге арналған программалық орта	1	БП, ТК	5	150	30/15/0	105	E			5						
ELC556	MatLab және басқа да бағдарламалық өнімдерінде электрондық сұлбаларды модельдеу	1	БП, ТК	5	150	15/30/0	105	E			5						
MNG563	Қазақстандағы тұрақты даму негіздері және ESG жобалары	1	БП, ТК	5	150	30/0/15	105	E			5						
ELC590	Электротехниканың теориялық негіздері II		БП, ЖООК	5	150	15/15/15	105	E				5					
ELC544	Электрониканың физикалық негіздері		БП, ЖООК	5	150	15/15/15	105	E				5					
М-8.Электроника және электротехника модулі																	
ELC479	Электрондық ғылым технологиясына және инженерияға кіріспе		БП, ЖООК	4	120	30/0/15	75	E		4							
ELC573	Электроника және өлшеу техникасы негіздері		БП, ЖООК	5	150	15/15/15	105	E				5					
ELC591	Электроника және схемотехника		БП, ЖООК	5	150	15/15/15	105	E					5				
ELC500	Микроэлектроника		БП, ЖООК	5	150	30/15/0	105	E					5				
ELC100	Оптоэлектрониканың негіздері		БП, ЖООК	5	150	15/0/30	105	E					5				
ROB411	Ендірілетін жүйелерді бағдарламалау	1	БП, ТК	5	150	15/15/15	105	E						5			
ROB195	Микроконтроллерлер үшін бағдарламалау	1	БП, ТК	5	150	30/15/0	105	E						5			
MNG562	Зияткерлік меншікті құқықтық реттеу	1	БП, ТК	5	150	30/0/15	105	E						5			
ELC802	Инженерлік жүйелердегі инклюзивті технологиялар және әмбебап дизайн	1	БП, ТК	5	150	30/0/15	105	E						5			
CSE831	Жасанды интеллект негіздері	1	БП, ТК	5	150	15/0/30	105	E							5		
М-9. Қазіргі энергетика модулі																	
ELC578	Сандық электр жетегін басқару	1	БП, ТК	4	120	30/0/15	75	E							4		
ELC579	Электр жетегінің жиілігін басқару	1	БП, ТК	4	120	30/0/15	75	E							4		
ERG176	Электр техникалық материалтану		БП, ЖООК	5	150	30/0/15	105	E								5	
М-10. Электр жетектері мен механизмдерінің модулі																	
ELC481	Өнеркәсіптік желіні басқару		БП, ЖООК	4	120	30/0/15	75	E						4			
ELC644	Электр машиналарының негіздері	1	БП, ТК	5	150	30/0/15	105	E						5			
ELC683	Электромагниттік құрылғылар мен аспаптар	1	БП, ТК	5	150	30/0/15	105	E						5			
ELC643	Машиналар мен механизмдердің динамикасы	1	БП, ТК	5	150	15/15/15	105	E								5	
ELC682	Энергетикадағы интеллектуалды басқару жүйелері	1	БП, ТК	5	150	15/15/15	105	E								5	
М-11. Өндірісті автоматтандыру модулі																	
AUT424	Автоматтандыру негіздері		БП, ЖООК	5	150	30/15/0	105	E					5				
М-13. Шығармашылықты дамыту модулі																	
ELC492	ТРИЗ инженерлік есептерді шешуде		БП, ЖООК	6	180	30/0/30	120	E					6				
М-15. Кәсіби қызмет модулі																	
AAP173	Оқу тәжірибесі		БП, ЖООК	2				E		2							
ПРОФИЛЬДІК ПӘНДЕР ЦИКЛІ (ПП)																	
М-8.Электроника және электротехника модулі																	
ELC524	Бағдарламаланатын логикалық интегралды схемалар	1	ПП, ТК	5	150	30/0/15	105	E							5		
ELC634	Микропроцессорлық жүйелер	1	ПП, ТК	5	150	30/15/0	105	E							5		
М-9. Қазіргі энергетика модулі																	

ELC640	Электротехникалық құрылғылар		ПП, ЖООК	5	150	30/0/15	105	К					5				
ELC677	Электрондық сенсорлар мен түрлендіргіштер	1	ПП, ТК	4	120	30/0/15	75	Е					4				
ELC807	Байланыс жүйелеріндегі өлшеу және бақылау құрылғылары	1	ПП, ТК	4	120	15/15/15	75	Е					4				
ELC641	Энергия тиімділігі және жүйелерді оңтайландыру		ПП, ЖООК	5	150	30/15/0	105	Е						5			
М-10. Электр жетектері мен механизмдерінің модулі																	
ELC631	Электр жетегінің динамикасы мен басқаруы		ПП, ЖООК	4	120	30/15/0	75	Е					4				
ELC580	Электр жетегінің негіздері		ПП, ЖООК	4	120	15/15/15	75	Е					4				
ELC642	Кернеу және энергия		ПП, ЖООК	6	180	30/0/30	120	К						6			
ELC645	Электроника және микропроцессорлық технологиялар	1	ПП, ТК	6	180	30/0/30	120	Е						6			
ELC646	Электр жүйелерінің динамикасы	1	ПП, ТК	6	180	30/0/30	120	Е						6			
М-12.Жобаларды басқару және үнемді өндіріс тұжырымдамалары модулі																	
NSE185	Жобаларды басқару теориясы мен практикасы	1	ПП, ТК	5	150	30/0/15	105	Е							5		
ELC565	Электрондық инжиниринг	1	ПП, ТК	5	150	30/0/15	105	Е							5		
IND129	Өндеу өндірісі	2	ПП, ТК	5	150	30/15/0	105	Е							5		
IND128	Lean жүйесі	2	ПП, ТК	5	150	30/15/0	105	Е							5		
М-14."R&D" модулі																	
ELC638	Электротехникалық құрылғыларды жобалау	1	ПП, ТК	6	180	30/15/15	120	К						6			
ELC639	Электрондық құралдарды жобалау	1	ПП, ТК	6	180	30/15/15	120	К						6			
М-15. Кәсіби қызмет модулі																	
AAP102	Өндірістік практика I		ПП, ЖООК	2				Е				2					
AAP183	Өндірістік тәжірибе II		ПП, ЖООК	3				Е					3				
М-16. Қорытынды аттестаттау модулі																	
ECA103	Қорытынды аттестация		ҚА	8											8		
Оқытудың қосымша түрлері (ОҚТ)																	
AAP500	Әскери дайындық																
УНИВЕРСИТЕТ бойынша жиыны:									32	28	31	29	30	30	32	28	
									60		**60**		**60**		**60**		

Барлық оқу кезеңіндегі кредиттер саны

Цикл коды	**Пәндер циклдері**	**Кредиттер**			
		міндетті компонент (МК)	**ЖОО компоненті (ЖООК)**	**таңдау компонент (ТК)**	**Барлығы**
ЖББП	Жалпы білім беретін пәндер циклі	51	0	5	56
БП	Базалық пәндер циклі	0	92	24	116
ПП	Профильдік пәндер циклі	0	29	31	60
Теориялық оқыту бойынша барлығы:		**51**	**121**	**60**	**232**
ҚА	Қорытынды аттестаттау				8
ЖИЫНЫ:					**240**

Қ.И.Сәтбаев атындағы ҚазҰТЗУ Оқу-әдістемелік кеңесінің шешімі 20.12.2024 жылғы № 3 Хаттама

Институт Ғылыми кеңесінің шешімі. 22.11.2024 жылғы № 1 Хаттама

Қол қойылды:

Басқарма мүшесі - Академиялық мәселелер жөніндегі проректор	Ускенбаева Р. К.
Келісілді:	
Академиялық даму жөніндегі Vice- Provost	Кальпеева Ж. Б.
Бөлім басшысы - ББББ басқару және оқу-әдістемелік жұмыс бөлімі	Жумагалиева А. С.
Институт директорының м.а. - Автоматика және ақпараттық технологиялар институты	Чинибаев Е. Г.
Кафедра меңгерушісі - Электроника, телекоммуникация және ғарыштық технологиялар	Таштай Е. Т.
Жұмыс берушілер атынан академиялық комитеттің өкілі ____Таныстым____	Джаникеев М. С.

НЕКОММЕРЧЕСКОЕ АКЦИОНЕРНОЕ ОБЩЕСТВО
«КАЗАХСКИЙ НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ имени К.И.САТПАЕВА»

SATBAYEV UNIVERSITY

«УТВЕРЖДЕНО»
Решением Учёного совета
НАО «КазНИТУ им. К.Сатпаева»
Протокол № 10 от 06.03.2025

РАБОЧИЙ УЧЕБНЫЙ ПЛАН

Учебный год	**2025-2026 (Осень, Весна)**
Группа образовательных программ	**B062 - "Электротехника и энергетика"**
Образовательная программа	**6B07112 - "Electronic and Electrical Engineering"**
Присуждаемая академическая степень	**Бакалавр техники и технологий**
Форма и срок обучения	**очная - 4 года**

Код дисциплины	Наименование дисциплин	Блок	Цикл	Общий объем в академических кредитах	Всего часов	лек/лаб/пр Аудиторные часы	в часах СРО (в том числе СРОП)	Форма контроля	Распределение аудиторных занятий по курсам и семестрам								Пререквизитность
									1 курс		2 курс		3 курс		4 курс		
									1 сем	2 сем	3 сем	4 сем	5 сем	6 сем	7 сем	8 сем	
ЦИКЛ ОБЩЕОБРАЗОВАТЕЛЬНЫХ ДИСЦИПЛИН (ООД)																	
М-5. Модуль основы антикоррупционной культуры, экологии и безопасности жизнедеятельности																	
CHE656	Экология и безопасность жизнедеятельности	1	ООД, КВ	5	150	30/0/15	105	Э			5						
MNG489	Основы экономики и предпринимательства	1	ООД, КВ	5	150	30/0/15	105	Э			5						
ELC577	Основы методов научных исследований	1	ООД, КВ	5	150	30/0/15	105	Э			5						
HUM136	Основы антикоррупционной культуры и права	1	ООД, КВ	5	150	30/0/15	105	Э			5						
MNG564	Основы финансовой грамотности	1	ООД, КВ	5	150	30/0/15	105	Э			5						
М-1.Модуль языковой подготовки																	
LNG108	Иностранный язык		ООД, ОК	5	150	0/0/45	105	Э	5								
LNG104	Казахский (русский) язык		ООД, ОК	5	150	0/0/45	105	Э	5								
LNG108	Иностранный язык		ООД, ОК	5	150	0/0/45	105	Э		5							
LNG104	Казахский (русский) язык		ООД, ОК	5	150	0/0/45	105	Э		5							
М-2. Модуль физической подготовки																	
KFK101	Физическая культура I		ООД, ОК	2	60	0/0/30	30	Э	2								
KFK102	Физическая культура II		ООД, ОК	2	60	0/0/30	30	Э		2							
KFK103	Физическая культура III		ООД, ОК	2	60	0/0/30	30	Э			2						
KFK104	Физическая культура IV		ООД, ОК	2	60	0/0/30	30	Э				2					
М-3. Модуль информационных технологий																	
CSE677	Информационно-коммуникационные технологии		ООД, ОК	5	150	30/15/0	105	Э				5					
М-4. Модуль социально-культурного развития																	
HUM137	История Казахстана		ООД, ОК	5	150	15/0/30	105	ГЭ	5								
HUM132	Философия		ООД, ОК	5	150	15/0/30	105	Э			5						
HUM120	Модуль социально-политических знаний (социология, политология)		ООД, ОК	3	90	15/0/15	60	Э			3						
HUM134	Модуль социально-политических знаний (культурология, психология)		ООД, ОК	5	150	30/0/15	105	Э				5					
ЦИКЛ БАЗОВЫХ ДИСЦИПЛИН (БД)																	
М-6. Модуль физико-математической подготовки																	
MAT101	Математика I		БД, ВК	5	150	15/0/30	105	Э	5								

PHY111	Физика I		БД, ВК	5	150	15/15/15	105	Э	5								
MAT102	Математика II		БД, ВК	5	150	15/0/30	105	Э		5							MAT101
PHY112	Физика II		БД, ВК	5	150	15/15/15	105	Э		5							PHY111
MAT423	Математика		БД, ВК	5	150	15/0/30	105	Э			5						
М-7. Модуль базовой подготовки																	
GEN429	Инженерная и компьютерная графика		БД, ВК	5	150	15/0/30	105	Э	5								
ELC589	Теоретические основы электротехники I		БД, ВК	6	180	15/15/15	135	О			6						
ELC566	Программные средства моделирования	1	БД, КВ	5	150	30/15/0	105	Э			5						
ELC556	Моделирование электронных схем в среде MatLab и других программных продуктах	1	БД, КВ	5	150	15/30/0	105	Э			5						
MNG563	Основы устойчивого развития и ESG проекты в Казахстане	1	БД, КВ	5	150	30/0/15	105	Э			5						
ELC590	Теоретические основы электротехники II		БД, ВК	5	150	15/15/15	105	О				5					
ELC544	Физические основы электроники		БД, ВК	5	150	15/15/15	105	Э				5					
М-8. Модуль электроники и электротехники																	
ELC479	Введение в технологии электронной науки и инженерии		БД, ВК	4	120	30/0/15	75	Э		4							
ELC573	Основы электроники и измерительной техники		БД, ВК	5	150	15/15/15	105	Э				5					
ELC591	Электроника и схемотехника		БД, ВК	5	150	15/15/15	105	О					5				
ELC500	Микроэлектроника		БД, ВК	5	150	30/15/0	105	Э					5				
ELC100	Основы оптоэлектроники		БД, ВК	5	150	15/0/30	105	Э					5				
ROB411	Программирование встраиваемых систем	1	БД, КВ	5	150	15/15/15	105	Э						5			
ROB195	Программирование для микроконтроллеров	1	БД, КВ	5	150	30/15/0	105	Э						5			
MNG562	Правовое регулирование интеллектуальной собственности	1	БД, КВ	5	150	30/0/15	105	Э						5			
ELC802	Инклюзивные технологии и универсальный дизайн в инженерных системах	1	БД, КВ	5	150	30/0/15	105	Э						5			
CSE831	Основы искусственного интеллекта	1	БД, КВ	5	150	15/0/30	105	Э							5		
М-9. Модуль современной энергетики																	
ELC578	Цифровое управление электроприводов	1	БД, КВ	4	120	30/0/15	75	Э							4		
ELC579	Частотное управление электроприводов	1	БД, КВ	4	120	30/0/15	75	Э							4		
ERG176	Электротехническое материаловедение		БД, ВК	5	150	30/0/15	105	Э								5	
М-10. Модуль электроприводов и механизмов																	
ELC481	Управление промышленными сетями		БД, ВК	4	120	30/0/15	75	Э						4			
ELC644	Основы электрических машин	1	БД, КВ	5	150	30/0/15	105	Э						5			
ELC683	Электромагнитные устройства и приборы	1	БД, КВ	5	150	30/0/15	105	Э						5			
ELC643	Динамика машин и механизмов	1	БД, КВ	5	150	15/15/15	105	Э								5	
ELC682	Интеллектуальные системы управления в энергетике	1	БД, КВ	5	150	15/15/15	105	Э								5	
М-11. Модуль автоматизации производства																	
AUT424	Основы автоматизации		БД, ВК	5	150	30/15/0	105	Э					5				
М-13.Модуль развития творческих способностей																	
ELC492	ТРИЗ в решении инженерных задач		БД, ВК	6	180	30/0/30	120	Э					6				

М-15. Модуль профессиональной деятельности																	
AAP173	Учебная практика		БД, ВК	2				О		2							
ЦИКЛ ПРОФИЛИРУЮЩИХ ДИСЦИПЛИН (ПД)																	
М-8. Модуль электроники и электротехники																	
ELC524	Программируемые логические интегральные схемы	1	ПД, КВ	5	150	30/0/15	105	Э						5			
ELC634	Микропроцессорные системы	1	ПД, КВ	5	150	30/15/0	105	Э						5			
М-9. Модуль современной энергетики																	
ELC640	Электротехнические устройства		ПД, ВК	5	150	30/0/15	105	К					5				
ELC677	Электронные сенсоры и преобразователи	1	ПД, КВ	4	120	30/0/15	75	Э					4				
ELC807	Измерительные и контрольные устройства в системах связи	1	ПД, КВ	4	120	15/15/15	75	Э					4				
ELC641	Энергоэффективность и оптимизация систем		ПД, ВК	5	150	30/15/0	105	Э						5			
М-10. Модуль электроприводов и механизмов																	
ELC631	Динамика и управление электроприводами		ПД, ВК	4	120	30/15/0	75	Э					4				
ELC580	Основы электропривода		ПД, ВК	4	120	15/15/15	75	О						4			
ELC642	Напряжение и энергетика		ПД, ВК	6	180	30/0/30	120	К						6			
ELC645	Электроника и микропроцессорные технологии	1	ПД, КВ	6	180	30/0/30	120	Э						6			
ELC646	Динамика электрических систем	1	ПД, КВ	6	180	30/0/30	120	Э						6			
М-12. Модуль управление проектами и концепции бережливого производства																	
NSE185	Теория и практика управления проектами	1	ПД, КВ	5	150	30/0/15	105	Э							5		
ELC565	Электронный инжиниринг	1	ПД, КВ	5	150	30/0/15	105	Э							5		
IND129	Бережливое производство	2	ПД, КВ	5	150	30/15/0	105	Э							5		
IND128	Lean система	2	ПД, КВ	5	150	30/15/0	105	Э							5		
М-14.Модуль "R&D"																	
ELC638	Проектирование электротехнических устройств	1	ПД, КВ	6	180	30/15/15	120	К						6			
ELC639	Проектирование электронных средств	1	ПД, КВ	6	180	30/15/15	120	К						6			
М-15. Модуль профессиональной деятельности																	
AAP102	Производственная практика I		ПД, ВК	2				О				2					
AAP183	Производственная практика II		ПД, ВК	3				О					3				
М-16. Модуль итоговой аттестации																	
ECA103	Итоговая аттестация		ИА	8											8		
Дополнительные виды обучения (ДВО)																	
AAP500	Военная подготовка																
Итого по УНИВЕРСИТЕТУ:									32	28	31	29	30	30	32	28	
									60		**60**		**60**		**60**		

Количество кредитов за весь период обучения

Код цикла	Циклы дисциплин	Кредиты			
		Обязательный компонент	Вузовский компонент	Компонент по выбору	Всего
ООД	Цикл общеобразовательных дисциплин	51	0	5	56
БД	Цикл базовых дисциплин	0	92	24	116
ПД	Цикл профилирующих дисциплин	0	29	31	60
Всего по теоретическому обучению:		**51**	**121**	**60**	**232**
ИА	Итоговая аттестация				8
ИТОГО:					**240**

Решение Учебно-методического совета КазНИТУ им. К.Сатпаева. Протокол № 3 от 20.12.2024

Решение Ученого совета института. Протокол № 1 от 22.11.2024

Подписано:	
Член Правления — Проректор по академическим вопросам	Ускенбаева Р. К.
Согласовано:	
Vice Provost по академическому развитию	Кальпеева Ж. Б.
Начальник отдела - Отдел управления ОП и учебно-методической работой	Жумагалиева А. С.
и.о. директора института - Институт автоматики и информационных технологий	Чинибаев Е. Г.
Заведующий(ая) кафедры - Электроника, телекоммуникации и космические технологии	Таштай Е. Т.
Представитель академического комитета от работодателей ____Ознакомлен____	Джаникеев М. С.

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	**B062 - "Electrical engineering and energy"**
Educational program	**6B07112 - "Electronic and Electrical Engineering"**
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-5. Module of anti-corruption culture, ecology and life safety base																	
CHE656	Ecology and life safety	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						
ELC577	Fundamentals of scientific research methods	1	GED, CCH	5	150	30/0/15	105	E			5						
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						
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					
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
MAT423	Mathematics		BD, UC	5	150	15/0/30	105	E			5						
M-7. Module of basic training																	
GEN429	Engineering and computer graphics		BD, UC	5	150	15/0/30	105	E	5								
ELC589	Theoretical Foundations of Electrical Engineering I		BD, UC	6	180	15/15/15	135	R			6						
ELC566	Simulation software	1	BD, CCH	5	150	30/15/0	105	E			5						
ELC556	Simulation of electronic circuits in MatLab and other software products	1	BD, CCH	5	150	15/30/0	105	E			5						
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	1	BD, CCH	5	150	30/0/15	105	E			5						
ELC590	Theoretical Foundations of Electrical Engineering II		BD, UC	5	150	15/15/15	105	R				5					
ELC544	Physical fundamentals of electronics		BD, UC	5	150	15/15/15	105	E				5					
M-8. Module of Electronics and Electrical Engineering																	
ELC479	Introduction to Electronic Science and Engineering		BD, UC	4	120	30/0/15	75	E		4							
ELC573	Fundamentals of electronics and measuring technique		BD, UC	5	150	15/15/15	105	E				5					
ELC591	Electronics and circuitry		BD, UC	5	150	15/15/15	105	R					5				
ELC500	Microelectronics		BD, UC	5	150	30/15/0	105	E					5				
ELC100	Fundamentals of optoelectronics		BD, UC	5	150	15/0/30	105	E					5				
ROB411	Embedded system programming	1	BD, CCH	5	150	15/15/15	105	E						5			
ROB195	Programming for microcontrollers	1	BD, CCH	5	150	30/15/0	105	E						5			
MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E						5			
ELC802	Inclusive technologies and universal design in engineering systems	1	BD, CCH	5	150	30/0/15	105	E						5			
CSE831	Fundamentals of Artificial Intelligence	1	BD, CCH	5	150	15/0/30	105	E							5		
M-9. Module of modern energy																	
ELC578	Digital control of the electric drive	1	BD, CCH	4	120	30/0/15	75	E							4		
ELC579	Frequency control of the electric drive	1	BD, CCH	4	120	30/0/15	75	E							4		
ERG176	Electrical and technical material scince		BD, UC	5	150	30/0/15	105	E								5	
M-10. Module of electric drives and mechanisms																	
ELC481	Industrial network management		BD, UC	4	120	30/0/15	75	E						4			
ELC644	Fundamentals of electric machines	1	BD, CCH	5	150	30/0/15	105	E						5			
ELC683	Electromagnetic devices and instruments	1	BD, CCH	5	150	30/0/15	105	E						5			
ELC643	Dynamics of machines and mechanisms	1	BD, CCH	5	150	15/15/15	105	E								5	
ELC682	Intelligent control systems in the energy sector	1	BD, CCH	5	150	15/15/15	105	E								5	
M-11. Module of production automation																	
AUT424	Basics of automation		BD, UC	5	150	30/15/0	105	E					5				
M-13.Module of creativity development																	
ELC492	TRIZ in solving engineering problems		BD, UC	6	180	30/0/30	120	E					6				
M-15. Module of professional activity																	
AAP173	Practical training		BD, UC	2				R		2							
CYCLE OF PROFILE DISCIPLINES (PD)																	
M-8. Module of Electronics and Electrical Engineering																	
ELC524	Programmable logic integrated circuits	1	PD, CCH	5	150	30/0/15	105	E							5		
ELC634	Microprocessor systems	1	PD, CCH	5	150	30/15/0	105	E							5		
M-9. Module of modern energy																	
ELC640	Electrical devices		PD, UC	5	150	30/0/15	105	C						5			
ELC677	Electronic sensors and transducers	1	PD, CCH	4	120	30/0/15	75	E						4			
ELC807	Measuring and control devices in communication systems	1	PD, CCH	4	120	15/15/15	75	E						4			
ELC641	Energy efficiency and system optimization		PD, UC	5	150	30/15/0	105	E							5		

M-10. Module of electric drives and mechanisms																	
ELC631	Dynamics and control of electric drives		PD, UC	4	120	30/15/0	75	E					4				
ELC580	Basics of electric drive		PD, UC	4	120	15/15/15	75	R						4			
ELC642	Voltage and energy		PD, UC	6	180	30/0/30	120	C							6		
ELC645	Electronics and microprocessor technologies	1	PD, CCH	6	180	30/0/30	120	E							6		
ELC646	Dynamics of electrical systems	1	PD, CCH	6	180	30/0/30	120	E							6		
M-12.Module of project management and concepts of lean manufacturing																	
NSE185	Theory and practice of project management	1	PD, CCH	5	150	30/0/15	105	E								5	
ELC565	Electronic engineering	1	PD, CCH	5	150	30/0/15	105	E								5	
IND129	Lean manufacturing	2	PD, CCH	5	150	30/15/0	105	E								5	
IND128	Lean system	2	PD, CCH	5	150	30/15/0	105	E								5	
M-14.Module of "R&D"																	
ELC638	Design of electrotechnical devices	1	PD, CCH	6	180	30/15/15	120	C							6		
ELC639	Design of electronic means	1	PD, CCH	6	180	30/15/15	120	C							6		
M-15. Module of professional activity																	
AAP102	Production practice I		PD, UC	2				R				2					
AAP183	Production practice II		PD, UC	3				R						3			
M-16. Module of final attestation																	
ECA103	Final examination		FA	8												8	
Additional type of training (ATT)																	
AAP500	Military training																
Total based on UNIVERSITY:									32	28	31	29	30	30	32	28	
									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	92	24	116
PD	Cycle of profile disciplines	0	29	31	60
Total for theoretical training:		**51**	**121**	**60**	**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 № 1 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 - Electronics, telecommunications and space technologies — Tashtay Y. .

Representative of the Academic Committee from Employers ____Acknowledged____ — Dzhanikeyev M. S.