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

INNOVATIVE EDUCATIONAL PROGRAM

7M07151-Electronic and Electrical Engineering

Code and classification of the field of education: 7M07 "Engineering, Manufacturing, and Construction Industries"
Training area code and classification: 7M071 "Engineering and Engineering Affairs"
Group of educational programs: Energy and Electrical engineering
NQF Level: 7
IQF Level: 7
Duration of study: 2 years
Volume of credits:120

Almaty 2025

The innovative educational program "7M07151-Electronic and Electrical Engineering" was approved at the meeting of the Academic Council of K.I.Satbayev KazNTU.
Protocol № 9 от «20» 02 2025 year.

Reviewed and recommended for approval at a meeting of the Educational and Methodological Council of K.I.Satpayev KazNTU.
Protocol №4 от «03» 02 2025 г.

The educational program **7M07151-**"Electronic and Electrical Engineering" was developed by the academic committee in the field of M099 "Energy and Electrical Engineering."

Name	Academic degree / academic title	Post	Place of work	Signature
Chairman of the Academic Committee:				
E. Tashtay	Candidate of Technical Sciences Professor	Head of the Department of Electronics, Telecommunications and Space Technologies	"Kazakh National Research Technical University named after K.I. Satpayev". Mobile phone; 87017889799	
Academic staff:				
Issembergenov N.T.	Doctor of Technical Sciences	Professor	"Kazakh National Research Technical University named after K.I. Satbayev".	
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Дараев А.М	Candidate of Technical Sciences	Associate Professor	"Kazakh National Research Technical University named after K.I. Satbayev".	
Employers:				
B.E. Bekmukhamedov	Doctor of Technical Sciences	Head of Department,	"Almaty Institute of Technologies" LLP.	
Students				
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			Research and Technology JSC	
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Ibekeyev S.E.	Master of Technical Sciences	2nd year doctoral student	National Center for Space Research and Technology JSC	

List of abbreviations and designations

ED – Educational program
NQF – National qualifications framework
IQF – Industry qualifications framework
SDGs – Sustainable Development Goals
IoT – Internet of Things
FPGA – Field-Programmable Gate Array
DSP – Digital Signal Processing
MEMS – Micro-Electro-Mechanical Systems
NEMS – Nano-Electro-Mechanical Systems
LED – Light Emitting Diode
USB – Universal Serial Bus
CAN – Controller Area Network
Wi-Fi – Wireless Fidelity
LoRa – Long Range
NB-IoT – Narrowband IoT
MOSFET – Metal-Oxide-Semiconductor Field-Effect Transistor
IGBT – Insulated Gate Bipolar Transistor
ADC/DAC – Analog-to-Digital Converter
UART – Universal Asynchronous Receiver-Transmitter
SPI – Serial Peripheral Interface
I2C – Inter-Integrated Circuit
ERP – Enterprise Resource Planning

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List of abbreviations and designations

1. Description of the educational program

The Educational program (hereinafter referred to as the EP) is a set of documents developed by the Kazakh National Research Technical University named after K. I. Satbayev and approved by the Ministry of Education and Science of the Republic of Kazakhstan.

In this educational program, the student takes a course of theoretical training, which has a high relevance and practical significance. The research results are presented in the form of a master's thesis, which is defended in accordance with the established procedure.

In case of successful completion of the full Master's degree course, the graduate is awarded the academic degree "Master of Technical Sciences" in the field of electrical engineering and electronics. The electronics program is aimed at training specialists who ensure the innovative development and modernization of promising electronic engineering applications. The content of the disciplines is compiled taking into account current trends in the development of electronic engineering and master's degree programs at leading foreign universities in the world.

In the future, students will be able to conduct promising research in the fields of electronics, optoelectronics and nanophotonics. He will participate in the development of industrial electronics and intelligent systems, as well as in the automation of production processes. In addition, he will have the opportunity to manage energy efficiency, develop innovative projects and conduct scientific research.

A special feature of the program is the abundance of practical research. Students undergo professional, scientific, research and scientific-pedagogical practice at leading universities of the world, actively participate in scientific and experimental research. In addition, as part of the academic mobility program, they have the opportunity to study abroad for one or more semesters. Professors from the world's leading universities are invited to conduct lectures and trainings.

2. The purpose and objectives of the educational program

Purpose of the program: The purpose of the program is to train highly qualified specialists capable of innovative development and modernization of promising applications of electronics engineering.

Students will be able to conduct scientific research in the field of electronics, optoelectronics and nanophotonics, as well as develop intelligent systems in electronics engineering. They will acquire professional competencies in the assessment, analysis and solution of production tasks, monitoring and management of technological processes. The program provides training of scientific personnel in accordance with international standards, providing graduates with the opportunity to work in research and innovation centers, high-tech industries, as well as in the field of scientific and pedagogical activities.

Responsibilities of the EP:

• - Mastering a cycle of general education disciplines to provide social and humanitarian education based on the laws of socio-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.

• Formation of scientific research skills in the field of electronics, optoelectronics and nanophotonics, as well as mastering the development of intelligent systems and their applications in electronics engineering.

• Mastering theoretical knowledge and developing practical skills in microprocessor complexes designed to manage processes in engineering automated control systems and information communication systems.

• Providing students with knowledge about 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 evaluate, analyze, and solve production problems, monitoring, and managing technological processes.

The disciplines "Theory and Practice of Photogenerators Based on Solar Energy," "Special and Advanced Automatic Control Systems in Power Engineering," and "Power Electronics and Intelligent Energy Systems" correspond to all stages of achieving SDG 7 – Ensuring universal access to affordable, reliable, sustainable, and modern energy sources.

The educational program is aimed at training graduates working in enterprises, complexes, institutions, educational organizations and other facilities using engineering and technological systems. Graduates will be able to work professionally in the field of electronic and electrical engineering, microprocessor

systems for automated control, digital technologies, various types of sensors, information and communication systems, as well as information processing and transformation using electronic devices.

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

The "7M07151-Electronic and Electrical Engineering" educational program ensures that all students achieve the learning outcomes necessary for their professional activities. Upon completion of the program, students master 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 for the formation of professional training in the field of natural, general technical and economic sciences.

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

As part of the practical training, students get acquainted with the technical processes of organization, planning and management of production. They receive professional skills in the field of microprocessor systems 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 industries, as well as in educational institutions. Their professional activities will be related to remote information processing, data transformation using electronic and radio technology, as well as methods and tools for managing technological processes.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the educational field	7M07 "Engineering, Manufacturing, and Construction Industries"
2	Training area code and classification	7M071 "Engineering and Engineering Affairs"
3	Group of educational programs	M099 "Energy and Electrical Engineering"
4	Name of the educational program	7M07151-Electronic and Electrical Engineering
5	Brief description of the educational program description	The Electronic and Electrical Engineering program is aimed at training highly qualified specialists in the field of modern electronics engineering. Students gain in-depth knowledge in areas such as electronics, optoelectronics, nanophotonics, 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 focuses on combining theoretical knowledge with practical experience and developing research activities. Students conduct laboratory and experimental research, undergo internships at industrial and innovative enterprises. As part of academic mobility, they have the opportunity to study at leading foreign universities and participate in international research projects. Graduates of the program can work in enterprises using engineering and technical systems, in research institutes, high-tech industries and educational institutions. Their professional activity is related to the development of intelligent systems in the field of electronics and electrical engineering, the introduction of automated control systems and the solution of scientific and engineering problems.
6	Purpose of the EP	Training of highly qualified specialists capable of innovatively advancing the promising applications of electronics and electrical engineering, and contributing to the progress of science and technology. Students conduct scientific research in the fields of electronics, optoelectronics, nanophotonics, as well as in electric power engineering, electric drives, and automation systems. They acquire professional competencies in assessing, analyzing, and solving industrial tasks, modeling energy systems, and monitoring and controlling technological processes. The program ensures the training of scientific personnel in accordance with international standards and provides graduates with opportunities to work in research and innovation centers, high-tech industries, energy companies, and in academic and pedagogical fields
7	Type of EP	new educational program
8	NQF Level	NBU 7
9	IQF Level	7
10	Distinctive features of the EP	It has no specific features

11	List of educational program competencies:	The duration of the master's degree is determined by the amount of academic credits acquired. Upon mastering the established amount of academic credits and achieving the expected learning outcomes for obtaining a master's degree, the Master's degree program is considered fully completed. The duration of the master's degree in scientific and pedagogical direction is 2 years (120 academic credits). Planning of the content of education, ways 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 Master's degree program implements educational programs for the training of managerial personnel with in-depth professional training within the framework of postgraduate education in the scientific and pedagogical field. The content of the Master's degree program includes: Theoretical training, covering the study of cycles of basic and specialized disciplines; Practical training of students, including various types of practice, scientific or professional internships; Experimental research work, including the implementation of a master's project (for specialized master's degree); 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 and Russian languages.
12	The results of the educational program implementation:	PO1 – Establish effective communication in foreign languages in professional and academic fields, apply philosophical, psychological, and pedagogical principles in research and engineering activities, and develop managerial skills. PO2 To explore the fundamental principles of electronics and the operation of electronic components, to analyze modern methods of applying quantum and nanoelectronics, and to apply the acquired knowledge in practice. PO3 – Apply methods of digital signal processing and protection, use technologies for transmission, amplification, and restoration of optical signals, and analyze the development prospects of fiber-optic systems. PO4 – Design and model integrated circuits and microprocessors, analyze, synthesize, and scientifically substantiate the obtained results. PO5 – Analyze microprocessors in information electronic systems, as well as in wired and wireless communication networks. PO6 Study the methods of design, modeling, optimization, and practical application of modern intelligent electronic systems. PO7 – Master knowledge and skills corresponding to all aspects of SDGs 7, including ensuring universal access to affordable, reliable, sustainable, and modern energy sources; efficiently utilize renewable energy sources; develop competencies in the management and automation of energy systems; research new

		energy sources; and develop effective solutions in the field of power electronics. PO8– Design, model, and analyze intelligent sensor devices, Internet of Things (IoT) technologies, cybersecurity methods, and energy-efficient protocols used in modern electronic and energy systems
13	The form of education	Full-time
14	Duration of training	2 Year
15	Volume of loans	120 credit
16	Languages of instruction	Kazakh, Russian, English
17	Academic degrees awarded	Master of Technical Sciences
18	Developer and authors:	E. Tashtai, A. Khabay

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

			Number of credits							
				PO1	PO2	PO3	PO4	PO5	PO6	P07
	The cycle of general education subjects, Required component									
1	Foreign language (professional)	Mastering professional English at an advanced level (for non-linguistic areas). The study of grammatical characteristics of scientific style in its oral and written forms. Professional oral communication in monological and dialogical form according to the educational program. Ability to demonstrate the results of research in the form of reports, abstracts, publications and public discussions; interpret and present the results of scientific research in a foreign language.	**2**	V						
2	History and philosophy of science	Purpose: to explore the history and philosophy of science as a system of concepts of global and Kazakh science. Content: the subject of philosophy of science, dynamics of science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.	**2**	V						
3	Higher school pedagogy	The course is aimed at mastering the methodological and theoretical foundations of higher education pedagogy. The discipline will help to master the skills of modern pedagogical technologies, technologies of pedagogical design, organization and control in higher education, skills of communicative competence. At the end of the course, undergraduates learn how to organize and conduct various	**2**	V		**V**				

		forms of organizing training, apply active teaching methods, and select the content of training sessions. Organize the educational process on the basis of credit technology of education								
4	Psychology of management	The course is aimed at mastering the tools for effective employee management, based on knowledge of the psychological mechanisms of the manager's activity. Discipline will help you master the skills of making decisions, creating a favorable psychological climate, motivating employees, setting goals, building a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.	**2**	V						
The cycle of basic disciplines is an optional component										
5	Current problems of modern nanoelectronics and electronics	This course is aimed at studying theoretical and experimental research, mastering mathematical and computer modeling, design and production technology. Students study the principles of operation of electronic materials, components, devices and devices, master the methods of their design, operation and maintenance. In addition, the course focuses on the design and analysis of production and technological processes of vacuum, plasma, solid-state, microwave, optical, micro- and nanoelectronic devices. Students acquire skills in selecting, optimizing, developing and researching modern high-performance electronic technologies					V			V
6	Intelligent and Specialized Automated Control Systems in Power Engineering	This course is dedicated to the study of intelligent and specialized automated control systems used in modern electric power engineering. The main focus is on artificial intelligence, the Internet of Things (IoT), machine learning, SCADA systems, digital substations, smart grids, and	**5**		V			V		

		cybersecurity issues. The course is designed in accordance with inclusive education principles, ensuring equal accessibility for all students. The learning materials are developed considering diverse educational needs, including interactive teaching methods, adapted assignments, and specialized support tools.								
7	Quantum and optical electronics	This course is aimed at studying the principles of electronics at the quantum level and familiarizing themselves with their fields of application. The student learns the specifics of using optoelectronic systems, laser systems and photoelectronics in information technology. The course includes research on the development of 3D laser scanning methods and the use of laser systems for remote monitoring of environmental parameters.	**5**		V			V		
8	Promising semiconductor electronic devices	This course is aimed at studying the physical principles of semiconductor devices based on metal-oxide systems, bipolar and field-effect transistors. Students analyze quantum dot connections, tunneling devices, and solid-state electronic devices. Integrated circuits, GaAs-based logic gates, chipsets, and digital data conversion methods are also being studied. The course examines monolithic microwave integrated circuits, as well as the dynamic and thermal effects of low-noise amplifiers.	**5**					V	V	
	The cycle of core disciplines is the University component									
9	Applied Electronics and photonics	This course is aimed at researching modern achievements in the field of quantum and nanotechnology, photonics. Students conduct in-depth analysis of microelectronics, integrated circuits, sensors, chips, and telecommunication systems. In addition, the course covers the study of medical equipment, optoelectronics, photonics and nanoelectronic systems, the development of methods of their application and the development of research skills.								
10	Theory and practice of	This discipline examines: the state and development of	**5**							

	phototransformers based on sunlight	unconventional and renewable energy sources, the introduction of solar photo switches into the theory, the physical foundations of solar energy conversion processes, photovoltaic compositions of semiconductors, volt-ampere characteristics of a solar cell, photon absorption, photovoltaic composition of the load and circuit, advantages and disadvantages of solar photo switches, features of solar photo switches, types of solar cells and structures, materials for solar cells, auxiliary systems, photoemission and thermal emission systems, photovoltaic solar Energy Conversion, New generation solar Photovoltaic Converters.								
The cycle of profile disciplines Component of choice										
11	Renewable Energy Sources	Renewable Energy Sources This course is aimed at the in-depth study of theoretical foundations, technical solutions, and research approaches in the field of renewable energy sources. It covers the physical principles of energy generation from solar, wind, hydro, geothermal, and biogenic resources, as well as modern technologies for energy generation, storage, and integration. Special attention is given to the integration of renewable energy sources into power systems, the management of energy flows, and the design of hybrid energy complexes.								
12	Control drivers in transistor converters	Students study DC pulse regulators, control drivers with powerful transistors, high-speed drivers, as well as MOSFET and IGBT drivers, and analyze their operating principles. In addition, research is being considered on topics such as control drivers integrated with inverters, automatic conversion systems, continuous and discrete models, work with high-power field-effect transistors and control controllers.	**5**			V	V			
13	Intelligent Sensor Systems and Internet of Things (IoT) Technologies	This course is aimed at an in-depth study of the practical foundations and applied aspects of intelligent sensor systems and Internet of Things (IoT) technologies. Students	**5**					V	V	

		analyze the structure of modern sensor modules, their operating principles, and their role in the data collection, processing, and transmission chain from a scientific perspective. As part of applied research projects, students gain skills in modeling sensor networks, developing prototypes, testing their functionality, and conducting performance analysis. Within the research component, methods for evaluating the performance and reliability of sensor systems are explored, along with innovative approaches to ensuring data security.								
14	Microprocessor Systems for Automatic Control	This course is aimed at studying the architecture, operating principles, and software of microprocessor devices used in automatic control systems. During the course, methods for developing control algorithms based on microcontrollers and microprocessors, integration with sensor systems, real-time data processing, and their application in industrial automation are explored.	**5**					V	V	
15	Programming of microcontroller systems	This course is aimed at the study, analysis and practical application of architecture, principles of operation of microcontrollers and methods of their programming. Students analyze and program microcontroller I/O ports, timers, interrupt systems, analog-to-digital and digital-to-analog converters, as well as communication interfaces such as UART, SPI, I2C, CAN, USB, and their energy efficiency aspects. In the practical part of the course, work is carried out on the development of Internet of Things (IoT) devices, sensor systems, robotic platforms and industrial control systems..	**5**					V		
16	Power electronics and intelligent energy systems	This course is aimed at studying the principles of operation of power converters, methods of management of intelligent energy systems and integration of renewable energy sources. The course covers modern inverters, converters, energy storage systems, and electric motor control	**5**						**v**	

		technologies. Smart Grid systems, effective energy management methods using IoT and artificial intelligence are also being studied. As a result of the course, the skills of designing, modeling and optimizing power electronics and intelligent systems are formed.								
17	Analog and digital electronic circuits-design and application	This course is aimed at learning the basics of designing, analyzing, and applying analog and digital circuits. Students learn the structure of electronic circuits, the processes of amplification, signal processing and transmission, as well as the features of circuits based on integrated and discrete components. In addition, amplifiers, combinational logic elements, digital algebra, analog-to-digital and digital-to-analog converters, microprocessors and the principles of digital filters are studied. The practical part discusses methods for performing circuit calculations for digital computing circuits and solving engineering problems.	**5**					V		
18	Wireless Sensor Networks and Energy-Efficient Protocols	The course covers the architecture of wireless sensor networks, types of sensors, and methods of data routing and transmission under resource-constrained conditions. Special attention is given to energy efficiency, fault tolerance, and scalability. Throughout the course, modern communication protocols (ZigBee, LoRaWAN, NB-IoT, Bluetooth LE), energy-saving techniques, energy harvesting technologies, and real-time network organization algorithms are studied.	**5**				**v**			
19	Communication devices based on embedded systems	This course examines the use of embedded systems in communication devices. Students learn about microcontrollers, FPGAs, and DSP processors and their role in telecommunication systems. The course covers the architecture of wired and wireless communication devices, data transmission protocols (UART, SPI, I2C, Ethernet, Wi-Fi, Bluetooth, 5G), signal processing algorithms, and energy efficiency management methods. In the practical part,	**4**							**v**

		students study programming of embedded systems in real time, the development of IoT devices and the integration of communication modules LoRa, ZigBee, NB-IoT. The course is applied in the fields of smart devices, telecommunications and industrial automation.								
20	Digital signal processing in electronics	This course is aimed at studying digital signal processing (DSP) methods in embedded systems (microcontrollers, DSP processors, FPGAs). Main topics: analog-to-digital conversion (ADC/DAC), filtering (FIR/IIR), spectral analysis, data compression and real-time signal processing. DSP technologies in wireless communications, video and audio signal processing, as well as in IoT and industrial sensor systems are also considered.	**5**						**v**	
21	Optical transmitters and photonic communication systems	The discipline optical transmitters and photonic communication systems is aimed at studying the principles of operation of modern optical transmitters, their role in photonic communication systems and signal transmission methods. The discipline examines the features of laser and LED transmitters, modulation methods, spectral efficiency, signal transmission and amplification technologies in fiber-optic systems. The characteristics of optical signal conversion to radio frequencies, noise effect, quantum efficiency, avalanche photodiodes and photonic detectors are also analyzed. Undergraduates master the features of fiber-optic communication, high-speed data transmission and the use of transmitters in modern photonic networks.	**5**						**v**	
22	Optical receiving modules	The discipline optical receiving modules is aimed at studying the principles of operation of optical modules for converting signals received from an optical transmitter into radio frequencies. Undergraduates study the sensitivity of photodetectors, quantum efficiency, features of photodiodes and their role in signal processing. Signal processing methods are also considered, including logic state detection,	**5**			V				

		inversion coding, the use of balanced signals, and processing methods without a permanent component..								
23	Design and modeling of electronic devices	This course is aimed at studying the theoretical and practical foundations of semiconductor devices, integrated circuits and nanoscale technologies. Students analyze the principles of operation of micro- and nanoelectronic devices, their production methods, materials and design features. Nanophotonics, quantum nanostructures, MEMS/NEMS systems, and next-generation sensors based on artificial intelligence are also considered. As a result of mastering the course, skills are formed in the development and optimization of nanotechnology solutions used in modern electronics, telecommunications and data processing.	**5**							
24	Internet of Things Devices	This discipline studies the architecture of Internet of Things (IoT) devices. It is aimed at studying hardware and software, as well as their use in various fields. Undergraduates master the main components of IoT devices – microcontrollers, sensors, communication modules (Wi-Fi, Bluetooth, LoRa, ZigBee, NB-IoT) and energy efficiency management methods. It also examines the principles by which IoT devices collect, process, and send data to cloud platforms. The discipline will explore IoT solutions used in smart cities, industrial automation, healthcare, and agriculture. In the practical part of the course, students develop the skills to design and program real IoT devices and connect them to the network.	**5**		V					
25	Electromagnetism and modern technologies	This course is aimed at researching, analyzing and mastering the basic principles of electromagnetism and their application in modern technologies. Students study the theory of electric and magnetic fields, the propagation of electromagnetic waves, and analyze their use in	**5**			V		V		

		communication systems, nanotechnology, energy systems, and intelligent devices..								

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 20.02.2025 Minutes № 9

WORKING CURRICULUM

Academic year	**2025-2026 (Spring, Autumn)**
Group of educational programs	**M099 - "Energy and electrical engineering"**
Educational program	**7M07151 - "Electronic and Electrical Engineering"**
The awarded academic degree	**Master of Technical Sciences**
Form and duration of study	**full time (scientific and pedagogical track) - 2 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		
									1 sem	2 sem	3 sem	4 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)													
CYCLE OF BASIC DISCIPLINES (BD)													
M-2. Professional and Social Training													
LNG213	Foreign language (professional)		BD, UC	3	90	0/0/30	60	E	3				
HUM213	Higher school pedagogy		BD, UC	3	90	15/0/15	60	E	3				
HUM212	History and philosophy of science		BD, UC	3	90	15/0/15	60	E		3			
HUM213	Higher school pedagogy		BD, UC	3	90	15/0/15	60	E		3			
M-2.Applied Electronics and System Modeling													
ELC714	Theory and practice of phototransformers based on sunlight	1	BD, CCH	5	150	30/0/15	105	E	5				
ELC715	Current problems of modern nanoelectronics and electronics	1	BD, CCH	5	150	30/0/15	105	E	5				
ELC705	Intelligent and Specialized Automated Control Systems in Power Engineering	1	BD, CCH	5	150	30/0/15	105	E		5			
ELC707	Applied Electronics and photonics	1	BD, CCH	5	150	30/0/15	105	E		5			
ELC706	Quantum and optical electronics	2	BD, CCH	5	150	30/0/15	105	E		5			
ELC708	Promising semiconductor electronic devices	2	BD, CCH	5	150	30/0/15	105	E		5			
M-4. Practice-oriented module													
AAP273	Pedagogical practice		BD, UC	8				R			8		
CYCLE OF PROFILE DISCIPLINES (PD)													
M-3. Intelligent Systems and Modern Electronics													
ELC729	Microprocessor Systems for Automatic Control		PD, UC	5	150	30/0/15	105	E	5				
ELC712	Analog and digital electronic circuits-design and application		PD, UC	5	150	30/0/15	105	E	5				
ELC735	Renewable Energy Sources	1	PD, CCH	5	150	30/0/15	105	E	5				
ELC709	Programming of microcontroller systems	1	PD, CCH	5	150	30/15/0	105	E	5				
ELC726	Power electronics and intelligent energy systems		PD, UC	5	150	30/0/15	105	E		5			
ELC724	Optical receiving modules	1	PD, CCH	5	150	30/0/15	105	E		5			
ELC717	Wireless Sensor Networks and Energy-Efficient Protocols	1	PD, CCH	5	150	30/0/15	105	E		5			
ELC722	Digital signal processing in electronics		PD, UC	5	150	15/15/15	105	E			5		
ELC720	Communication devices based on embedded systems	1	PD, CCH	5	150	30/0/15	105	E			5		

ELC719	Internet of Things Devices	1	PD, CCH	5	150	30/0/15	105	E			5		
ELC736	Intelligent Sensor Systems and Internet of Things (IoT) Technologies	2	PD, CCH	5	150	30/0/15	105	E			5		
ELC723	Optical transmitters and photonic communication systems	2	PD, CCH	5	150	30/0/15	105	E			5		
ELC725	Electromagnetism and modern technologies	3	PD, CCH	5	150	30/0/15	105	E			5		
ELC728	Design and modeling of electronic devices	3	PD, CCH	5	150	30/0/15	105	E			5		
ELC713	Control drivers in transistor converters		PD, UC	4	120	30/0/15	75	E				4	
M-4. Practice-oriented module													
AAP256	Research practice		PD, UC	4				R				4	
M-5. Experimental research module													
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R	4				
AAP268	Research work of a master's student, including internship and completion of a master's thesis		RWMS	4				R		4			
AAP251	Research work of a master's student, including internship and completion of a master's thesis		RWMS	2				R			2		
AAP255	Research work of a master's student, including internship and completion of a master's thesis		RWMS	14				R				14	
M-6. Module of final attestation													
ECA212	Registration and protection of the master thesis		FA	8								8	
Total based on UNIVERSITY:									30	30	30	30	
									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	0	0	0	0
BD	Cycle of basic disciplines	0	20	15	35
PD	Cycle of profile disciplines	0	28	25	53
Total for theoretical training:		**0**	**48**	**40**	**88**
RWMS	Research Work of Master's Student				24
ERWMS	Experimental Research Work of Master's Student				0
FA	Final attestation				8
TOTAL:					**120**

Decision of the Educational and Methodological Council of KazNRTU named after K.Satpayev. Minutes № 4 dated 03.02.2025

Decision of the Academic Council of the Institute. Minutes № 5 dated 23.01.2025

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.