NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATBAYEV»

Institute of Energy and mechanical
Department of Energy

EDUCATIONAL PROGRAM

7M07113 – Electrical Engineering and power engineering

Code and classification of the field of education: **7M07 Engineering, manufacturing and construction industries**
Code and classification of training areas: **7M071 Engineering and Engineering affairs**
Group of educational programs: **M099 - Energy and electrical engineering**
NRK Level: **Level 7**
ORC Level: **Level 7**
Duration of study: **2 years**
Volume of credits: **120 ECTS**

Almaty 2024

Educational program **7M07113 «Electrical engineering and power engineering»** was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes # 12 dated «22» 04 2024.

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

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Educational program **7M07113 «Electrical engineering and power engineering»** was developed by Academic committee based on direction «Engineering and Engineering»

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Table of contents

List of abbreviations and designations

EP – educational program
BC – basic competencies
PC – professional competencies
LO – learning outcomes
MOOC – massive open online courses
NQF – National Qualifications Framework
IQF – Industry Qualifications Framework

1. Description of the educational program

The professional activity of graduates of the program is directed in the field of electric power, thermal power engineering and electrical engineering.

The direction of the specialty and specialization program covers engineering and engineering.

The purpose of the Master's educational program "Electrical Engineering and Power Engineering" is to train scientific and scientific-pedagogical personnel with relevant professional knowledge and practical skills in the field of electric power industry, capable of solving problems of improving society, economy, production, science and education. The Master of Technical Sciences in the educational program "Electrical Engineering and Power Engineering" must have competencies in accordance with the types of professional activity:

- to search, analyze and process information to solve the set scientific and production tasks;
- demonstrate the ability to plan and conduct experiments, interpret the data obtained and draw conclusions;
- use modern information technologies to solve applied problems;
- to choose analytical and numerical methods in the development of mathematical models of electrical installations and systems, technological processes in the electric power industry;
- demonstrate knowledge for the analysis and synthesis of automatic control systems in the electric power industry;
- demonstrate scientific and mathematical principles of reliability of technical systems;
- know the methods of calculation and selection of power energy converters and conversion equipment;
- choose methods for calculating relay protection devices and analyze the reliability of their operation;
- know the methods of calculation and selection of elements of an automated electric drive;
- use modern systems and methods of electromechanical conversion

The educational program "Electrical Engineering and Power Engineering" provides training for masters in the following activities: Design and engineering activities

- the ability to compose and develop various simulation models and electrical circuits;
- knowledge to carry out technological and electric power calculations, to choose electrical and electromechanical equipment.

Design and technological activities

-the ability to justify the effective operating parameters and indicators of the electric power system;
- knowledge to develop energy-efficient, resource-saving technologies and measures to protect the environment;
- skills to make a business plan for a technological project.

Research activities

- the ability to conduct a literary and patent search;
- ability to plan and conduct research; - the ability to analyze and summarize the results of the study;
- skills to make reports and conclusions, publish research results;

Organizational and managerial activities

- the ability to organize the activities of the team, make work plans and set tasks; - the ability to carry out activities for the organization of production, develop and compile the necessary documentation;
- - ability to solve logistical issues and control the execution of tasks.

2. The purpose and objectives of the educational program

The purpose of the Master's educational program "Electrical Engineering and Power Engineering" is to train scientific and scientific-pedagogical personnel with relevant professional knowledge and practical skills in the field of electric power industry, capable of solving problems of improving society, economy, production, science and education.

Tasks of the OP: Based on the achievements of modern science, technology and production, to give knowledge and skills in the field of: - production of electric energy and substations; - electric power networks and systems; - power supply of enterprises; - automated electric drive; - relay protection and automation of electric power systems; - renewable energy. 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 Electric Power Engineering". The Master's degree program "Electrical Engineering and Power Engineering" differs from the existing educational program in the specialty 6M071800 – "Electric Power Engineering" by updating the internal content of the disciplines. The Master's degree program provides for further deepening of the competencies acquired in the bachelor's degree. In this connection, modern innovative disciplines have been introduced into the program:

-energy management system according to international standards;
- modern high voltage equipment;
- modeling of elements of electric power systems;
- management of the energy complex and regulation of the energy sector;
- theory and practice of technical experiment in EE;
- digital electric drive control systems;
- emergency and technological automation of power systems;
- special and special automatic control systems in EE.

In the process of mastering the educational program, the Master of Technical Sciences in the field of electric power engineering must acquire the following key competencies:

- to search, analyze and process information to solve the set scientific and production tasks;
- demonstrate the ability to plan and conduct experiments, interpret the data obtained and draw conclusions;
- use modern information technologies to solve applied problems;
- to choose analytical and numerical methods in the development of mathematical models of electrical installations and systems, technological processes in the electric power industry;
- demonstrate knowledge for the analysis and synthesis of automatic control systems in the electric power industry;
- demonstrate scientific and mathematical principles of reliability of technical systems;
- know the methods of calculation and selection of power energy converters and conversion equipment;
- choose methods for calculating relay protection devices and analyze the reliability of their operation;
- know

develop plans for the organization of innovative activities at the enterprise;

- assess innovation and technological risks when introducing new technologies;
- to know the principles of operation and specifics of emergency and technological automation of power systems;
- have practical skills in maintenance, repair and diagnostics of industrial digital electric drive control systems;
- demonstrate the ability to choose and use methods and methods of optimizing power grids;
- possess the ability to install, test, adjust and put into operation electric power and electrical equipment;
- organize and carry out the operation, repair and maintenance of industrial electrical installations;
- know the methods of overvoltage protection, insulation testing methods and operating principles of test installations;
- know the types of high-voltage electrical technologies used;
- be able to use methods of modeling electrical installations and electrical systems. Obr

the ability to compose and develop various simulation models and electrical circuits;

- knowledge to carry out technological and electric power calculations, to choose electrical and electromechanical equipment;

Design and technological activities - the ability to justify the effective operating parameters and indicators of the electric power system;

- knowledge to develop energy-efficient, resource-saving technologies and measures to protect the environment;
- skills to make a business plan for a technological project;

Research activities - the ability to conduct a literary and patent search;
- ability to plan and conduct research;
- the ability to analyze and summarize the results of the study;
- skills to make reports and conclusions, publish research results;

Organizational and managerial activities

- the ability to organize the activities of the team, make work plans and set tasks;

- the ability to carry out activities for the organization of production, develop and compile the necessary documentation;

- ability to solve logistical issues and control the execution of tasks.

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

The previous level of education of applicants is higher professional education (bachelor's degree). The applicant must have a diploma of the established sample and confirm the level of knowledge of the English language with a certificate or diplomas of the established sample. The procedure for admission of citizens to the magistracy is established in accordance with the "Standard rules for admission to training in educational organizations implementing educational programs of postgraduate education".

The formation of a contingent of undergraduates is carried out by placing a state educational order for the training of scientific and pedagogical personnel, as well as paying for training at the expense of citizens' own funds and other sources. The State provides citizens of the Republic of Kazakhstan with the right to receive free postgraduate education on a competitive basis in accordance with the state educational order, if they receive education of this level for the first time. At the "entrance", a master's student must have everything

Special requirements for admission to the program apply to graduates of related educational programs: heat power engineering, automation and management.

Code	Type of competence	Description of competence	Competence result	Ответствен-ный
Common (Implies full training with possible additional depending on the level of knowledge)				
G1	Communication	Fluent monolingual oral, written and communication skills - ability of non-fluent communication with a second language - The ability to use communicative	Complete 4-year training with the development of at least 240 academic credits (including 120 contact classroom academic credits) with the possible transfer of credits in the second language where	Department of Kazakh and Russian Language, Department of English

		communication in various situations - there are basics of academic writing in the native language - diagnostic test for language level	students have an advanced level. The language level is determined by passing a diagnostic test	
G2	Mathematical literacy	- Basic mathematical thinking at the communication level - ability to solve situational problems based on the mathematical apparatus of algebra and the principles of mathematical analysis - diagnostic test for mathematical literacy in algebra	Complete 4-year training with the development of at least 240 academic credits (including 120 contact classroom academic credits). With a positive diagnostic test, the level of mathematics is 1, with a negative one – the level of algebra and the beginning of analysis	Mathematical literacy
G3	Basic literacy in natural sciences	- basic understanding of the scientific picture of the world with an understanding of the essence of the basic laws of science - understanding of basic hypotheses, laws, methods, formulation of conclusions and estimation of errors	Complete 4-year training with the development of at least 240 academic credits (including 120 contact classroom academic credits). With a positive diagnostic test, the level of Physics 1, General Chemistry, with a negative – the level of the Beginning of physics and the Basic basics of chemistry	Departments in the areas of natural sciences
SPECIFIC (implies reduced training due to credit transfer, depending on the level of knowledge on competencies for graduates of 12-year schools, colleges, universities, including humanitarian and economic areas)				
S1	Communication	- Fluent bilingual oral, written and communication skills - ability of non-fluent communication with a third language - skills of writing text of various styles and genres - skills of deep understanding and interpretation of one's own work of a certain level of complexity (essay) - basic aesthetic and theoretical literacy as a condition for full-fledged perception, interpretation of the original text	Full credit transfer by language (Kazakh and Russian)	Department of Kazakh and Russian Language
S2	Mathematical literacy	- Special mathematical thinking using induction and deduction, generalization and concretization, analysis and synthesis, classification and systematization, abstraction and analogy - the ability to formulate, justify and prove	Transfer of credits in the discipline of Mathematics (Calculus) I	Department of Mathematics

		provisions - application of general mathematical concepts, formulas and extended spatial perception for mathematical problems - complete understanding of the basics of mathematical analysis		
S3	Special literacy in natural sciences (Physics, Chemistry, Biology and Geography)	- A broad scientific perception of the world, assuming an understanding of natural phenomena - critical perception for understanding the phenomena of the surrounding world - cognitive abilities to formulate a scientific understanding of the forms of existence of matter, its interaction in nature	Transfer of credits in Physics I, General Chemistry, General Biology, Introduction to Geology, Introduction to Geodesy; Educational practice, etc.	Departments in the areas of natural sciences
S4	English language	- readiness for further self-study in English in various fields - readiness to gain experience in project and research work using English	Transfer of English language credits above academic to professional level (up to 15 credits)	Department of English
S5	Computer skills	- Базовые навыки программирования на одном современном языке - использование программного обеспечения и приложений для преподавания различных дисциплин	Transfer of credits in the discipline Introduction to information and communication technologies, Information and communication technologies	Department of Software Engineering
S6	Socio-humanitarian competencies and behavior	- understanding and awareness of the responsibility of each citizen for the development of the country and the world - the ability to discuss ethical and moral aspects in society, culture and science	Transfer of credits in the Modern history of Kazakhstan (with the exception of the state exam)	Department of Social Disciplines
		- critical understanding and capacity for polemics for debating on modern scientific hypotheses and theories	Transfer of credits in philosophy and other humanities	
PROFESSIONAL				

(implies reduced training due to credit transfer, depending on the level of knowledge on competencies for graduates of colleges, secondary schools, universities)				
P1	Professional competencies	- critical perception and deep understanding of professional competencies at level 5 or 6 - the ability to discuss and polemize on professional issues within the framework of the mastered program	Transfer of credits in basic professional disciplines, including introduction to the specialty, engineering ethics, technology of robotic production, technological automation facilities, theoretical foundations of electrical engineering, technological measurements and instruments, mathematical foundations of control theory, electronic automation devices.	Graduating Department
P2	General engineering competencies	- basic general engineering skills and knowledge, the ability to solve general engineering tasks and problems - be able to use application software packages for processing experimental data, solving systems of algebraic and differential equations	Transfer of credits in general engineering disciplines (engineering graphics, descriptive geometry, fundamentals of electrical engineering, fundamentals of microelectronics.)	Graduating Department
P3	Engineering and computer competencies	- basic skills of using computer programs and software systems to solve general engineering tasks	Transfer of credits in the discipline of computer graphics, computer modeling and programming in the MatLab environment.	Graduating Department
P4	Socio-economic competencies	- critical understanding and cognitive ability to reason on contemporary social and economic issues - basic understanding of the economic assessment of the objects of study and the profitability of projects.	Transfer of credits in socio-humanitarian and technical-economic disciplines to the credit of the elective cycle	Graduating Department

The university may refuse to transfer credits if the low diagnostic level is confirmed or the final grades for completed disciplines were lower than A and B.

4. Passport of the educational program

4.1. General information

№	Field name	Note
1	Code and classification of the field of education	7M07 Engineering, manufacturing and construction industries
2	Code and classification of training areas	7M071 Engineering and Engineering affairs
3	Group of educational programs	M099 Energy and electrical engineering
4	Name of the educational program	7M07113 - Electrical engineering and power engineering
5	Brief description of the educational program	The educational program "Electrical Engineering and Power Engineering" provides training for masters in the following activities: Design and engineering activities - the ability to compose and develop various simulation models and electrical circuits; - knowledge to carry out technological and electric power calculations, to choose electrical and electromechanical equipment; Design and technological activities - the ability to justify the effective operating parameters and indicators of the electric power system; - knowledge to develop energy-efficient, resource-saving technologies and measures to protect the environment; - skills to make a business plan for a technological project; Research activities - the ability to conduct a literary and patent search; - ability to plan and conduct research; - the ability to analyze and summarize the results of the study; - skills to make reports and conclusions, publish research results; - Organizational and managerial activities - the ability to organize the activities of the team, make work plans and set tasks; - - the ability to carry out activities for the organization of production, develop and compile the necessary documentation; - - ability to solve logistical issues and control the execution of tasks
6	Purpose of the OP	The purpose of the Master's educational program "Electrical Engineering and Power Engineering" is to train scientific and scientific-pedagogical personnel with relevant professional knowledge and practical skills in the field of electric power industry, capable of solving

		problems of improving society, economy, production, science and education.
7	Type of OP	Current
8	The level of the NRK	7 level
9	ORC Level	7 level
10	Distinctive features of the OP	No
11	List of competencies of the educational program:	**B – basic knowledge, skills and abilities** B1 is capable of philosophical analysis of social phenomena, personality behavior and other phenomena. I am ready to conduct a philosophical assessment of social phenomena; B2 – to know and put into practice the basics of engineering professional ethics; B3 – be able to analyze the current problems of the modern history of Kazakhstan. **P – professional competencies** P1 – a wide range of theoretical and practical knowledge in the professional field; P2 –is able to analyze electrical circuit diagrams and wiring diagrams of electric power systems. P3 – ready to install, adjust and operate electromechanical and electrical systems; P4 – ready to participate in the development and design of new facilities of traditional and alternative energy. **O – universal, social and ethical competencies** O1 – is able to use English fluently as a means of business communication, a source of new knowledge in the field of electrical engineering and energy.I am ready to use English in my professional activity in the field of electric power industry; O2 – is able to speak Kazakh (Russian) fluently as a means of business communication, a source of new knowledge in the field of electrical engineering and energy. I am ready to use Kazakh (Russian) language in my professional activity in the field of electric power industry; O3 – to know and apply in work and life the basics of applied ethics and ethics of business communication; O4 – know and apply the basic concepts of professional ethics; O5 – to know and solve the problems of human influence on the environment. **C – special and managerial competencies** C1– independent management and control of the processes of labor and educational activities within the framework of the strategy, policy and goals of the organization, discussion of problems, reasoning conclusions and competent information management; C2 –to be a specialist in conducting experimental studies of electric power facilities; C3 –to be a researcher on the study of modern electromechanical and electrical systems;
12	Learning outcomes of the educational program:	The graduate of this educational program is awarded the academic degree "Master" Master of Technical Sciences in the direction. A graduate who has mastered master's degree

		programs must have the following general professional competencies: – the ability to independently acquire, comprehend, structure and use new knowledge and skills in professional activities, develop their innovative abilities; – the ability to independently formulate research goals, establish the sequence of solving professional tasks; – the ability to apply in practice the knowledge of fundamental and applied sections of disciplines that determine the orientation (profile) of the master's degree program; – the ability to professionally choose and creatively use modern scientific and technical equipment to solve scientific and practical problems; – the ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities; – proficiency in the preparation and execution of scientific and technical documentation, scientific reports, reviews, reports and articles; – willingness to lead a team in the field of their professional activities, tolerantly perceiving social A graduate who has mastered the master's degree program must have professional competencies corresponding to the types of professional activities that the master's degree program is focused on: research activity: - the ability to form diagnostic solutions to professional problems by integrating fundamental sections of sciences and specialized knowledge acquired during the development of the master's degree program; – the ability to independently conduct scientific experiments and research in the professional field, generalize and analyze experimental information, draw conclusions, formulate conclusions and recommendations; – the ability to create and explore models of the studied objects based on the use of in-depth theoretical and practical knowledge in the field of production, transmission and consumption of electrical energy; scientific and production activity: - the ability to independently carry out production and scientific and production field, laboratory and interpretive work in solving practical problems; – the ability to professionally operate modern field and laboratory equipment and devices in the field of the master's degree program; – the ability to use modern methods of processing and interpreting complex information to solve production problems; project activity: – the ability to independently draw up and submit projects of research and scientific-production works; – readiness to design complex research and scientific-production works in solving professional tasks; organizational and managerial activity: - readiness to use practical skills of organization and management of research and scientific-production works in solving professional tasks; – readiness for the practical use of normative documents in the planning and organization of scientific and production work; scientific and pedagogical activity: - ability to conduct seminars, laboratory and practical classes; – the ability to participate in the management of scientific and educational work of students in the field of production, transmission and consumption of electric energy.

		When developing a master's degree program, all general cultural and general professional competencies, as well as professional competencies related to those types of professional activities that the master's program focuses on, are included in the set of required results of mastering the master's program. Mandatory standard requirements for completing the Master's degree and awarding the academic degree of Master of Technical Sciences: mastering at least 59 academic credits of theoretical training, passing the state exam in the specialty, preparation and defense of the final dissertation work before the SAC. Special requirements for completing a master's degree in this program , the graduate must know: - methods of construction of modern electric power and electromechanical systems; - current trends in the development of electrical equipment and electrical installations, technical means and automation systems of electric power facilities; - standards and industry rules, methodological and regulatory materials accompanying the operation, installation, commissioning and design of electric power systems; be able to: - develop and research traditional and autonomous electric power systems using modern technical and technological means.
13	Form of training	Daytime
14	Duration of training	2 years
15	Volume of loans	120 ECTS
16	Languages of instruction	state, Russian
17	Academic degree awarded	Master of Technical Sciences in OP "7M07113 - Electrical Engineering and Power Engineering"
18	Developer(s) and authors:	Sarsenbaev E.A., Khidolda Y.

	КК1
PO1	Demonstrates knowledge of society as an integral system and of man. Knows the role of spiritual processes in modern society, the legal interests of the parties in the sphere of protecting the rights of individuals and legal entities. Has an understanding of the economic and social conditions for carrying out entrepreneurial activity, the impact of harmful and dangerous factors on man and the natural environment.
PO2	Possesses basic knowledge in the field of natural sciences, which helps to solve professional problems in the field of energy and to form a highly educated individual with a broad outlook.
PO3	Can use tables and diagrams. Has knowledge of modern methods and devices for monitoring and accounting of electricity. Knows modern and promising directions of development of energy systems, principles of operation, technical characteristics and design features of energy installations being developed and used.
PO4	Expands and systematizes the knowledge gained during the study of the module's disciplines. Gains experience in reading and constructing various types of diagrams.
PO5	Applies methods of calculating electrical systems. Conducts electrical calculations of industrial electrical equipment. Analyzes operating modes of electrical systems, applies methods of their study.
PO6	Implements innovative approaches into practical activities to achieve specific results in the energy sector. Independently processes and makes the right decision when creating or mastering new technologies and materials.
PO7	Uses knowledge of basic disciplines to understand the physical nature of processes occurring in the main and auxiliary equipment of electric power systems.
PO8	Demonstrates ability to design systems, system components or processes to achieve a desired outcome, taking into account real-world constraints (cost effectiveness, environmental and social impact, ethics, health and safety, manufacturability and sustainability).
PO9	Has knowledge of design, calculation and regulation methods for energy production and distribution systems, applies information technologies to solve engineering problems using computer processing methods. Knows how to use computer technologies to process measurement results, and comply with GOST and industry standards.
PO10	Knows and understands contemporary social, political and energy issues.
PO11	Understands the benefits and potential challenges of working in a team, describes the qualities and processes needed to work effectively in a team, and the role of teamwork in the engineering design process.
PO12	Understands the importance of career planning and management.

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

№	Name of the discipline	Brief description of the discipline	Number of credits	Generated learning outcomes (codes)								
				PO1	PO2	PO3	PO4	PO5	PO6	PO7	.....	……..
Cycle of basic disciplines University component												
M1	Foreign language (professional)	PURPOSE AND OBJECTIVES OF THE COURSE The aim of the course is to develop students' knowledge of English for their current academic research and to improve the effectiveness of their work in the field of project management. BRIEF DESCRIPTION OF THE COURSE The course is aimed at developing vocabulary and grammar for effective communication in the field of project management and improving reading, writing, listening and speaking skills at the Intermediate level. It is expected that students will acquire and replenish their vocabulary of business English and learn grammatical structures that are often used in the context of management. The course consists of 6 modules. The 3rd module of the course ends with an intermediate test, and the 6th module is followed by a test at the end of the course. The course ends with a final exam. Undergraduates also need to study independently (MIS). MIS - independent work of undergraduates under the guidance of a teacher. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE After successful completion of the course, students are expected to be able to recognize the main idea and the main message, as well as specific details when listening to monologues,		+								

		dialogues and group discussions in the context of business and management; understand written and oral speech in English on topics related to management; write management texts (reports, letters, emails minutes of meetings), following the generally accepted structure with a higher degree of grammatical accuracy and using business words and phrases, talk about various business situations using the appropriate business vocabulary and grammatical structures - in pair and group discussions, meetings and negotiations.										
M2	Management Psychology	GOALS AND OBJECTIVES OF THE COURSE Familiarization of future teachers with the methodological and theoretical foundations of higher school pedagogy, modern technologies of analysis, planning and organization of training and education, communicative technologies of subject-subject interaction of a teacher and a student In the educational process of a university. BRIEF DESCRIPTION OF THE COURSE The subject of higher school pedagogy, methodology of pedagogical science, aspects and trends in the development of modern education, pedagogical activity, the personality of a higher school teacher, the essence and structure of pedagogical activity, modern requirements for competence, communicative competence of a higher school teacher, didactics of higher school, modern pedagogical technologies, the educational process of higher school. active methods and forms of education in the preparation of future specialists, educational work in higher education, organization of independent work of students in the conditions of credit technology, organization of pedagogical control in the conditions of credit technology.		+								

		KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE To know and understand the current problems of pedagogical science, the laws of pedagogical theories, the essence of pedagogical activity of a university teacher. Master the skills of designing the educational process based on new concepts of teaching and upbringing; creating a creative and developing environment in the process of learning and upbringing. Be competent in solving problems of higher pedagogical education and prospects for its further development; in the application of effective university teaching technologies; the main types of pedagogical communicative interaction, organization and management of students' activities.										
M3	History and philosophy of science	GOALS AND OBJECTIVES OF THE COURSE To reveal the connection between philosophy and science, to highlight the philosophical problems of science and scientific cognition, the main stages of the history of science, the leading concepts of the philosophy of science, modern problems of the development of scientific and technical reality BRIEF DESCRIPTION OF THE COURSE The subject of philosophy of science, dynamics of science, specifics of science, science and pre-science, antiquity and the formation of theoretical 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 KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE To know and understand the philosophical issues of science,		+								

		the main historical stages of the development of science, the leading concepts of the philosophy of science, to be able to critically evaluate and analyze scientific and philosophical problems, to understand the specifics of engineering science, to possess the skills of analytical thinking and philosophical reflection, to be able to justify and defend their position, to master the techniques of discussion and dialogue, to possess the skills of communicativeness and creativity in his professional activity										
M4	Higher school pedagogy	PURPOSE AND OBJECTIVES OF THE COURSE The course is aimed at studying the psychological and pedagogical essence of the educational process of higher education; forming ideas about the main trends in the development of higher education at the present stage, considering the methodological foundations of the learning process in higher education, as well as psychological mechanisms affecting the success of learning, interaction, management of subjects of the educational process. Development of psychological and pedagogical thinking of undergraduates. BRIEF DESCRIPTION OF THE COURSE In the course of studying the course, undergraduates get acquainted with the didactics of higher education, forms and methods of organizing education in higher school, psychological factors of successful learning, features of psychological impact, mechanisms of educational influence, pedagogical technologies, characteristics of pedagogical communication, mechanisms for managing the learning process. They analyze organizational conflicts and ways to resolve them, psychological destructions and deformations of the teacher's personality.		+								

		KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE At the end of the course, a master's student should know the features of the modern system of higher professional education, the organization of pedagogical research, the characteristics of the subjects of the educational process, the didactic foundations of the organization of the learning process in higher school, pedagogical technologies, the patterns of pedagogical communication, the features of educational influences on students, as well as the problems of pedagogical activity.										
Cycle of basic disciplines Elective component												
M5	Special and special automatic control systems in EE	THE PURPOSE AND OBJECTIVES OF THE COURSE are to train undergraduates by methods of mathematical description of control objects, methods of ACS synthesis using modern technical means. A BRIEF DESCRIPTION OF THE COURSE mastering methods of mathematical description of control objects, methods of ACS synthesis using modern technical means, including VT, methods of automation of individual technical objects and technical lines as a whole. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE familiarization of students with the basic mathematical descriptions of control objects, methods of synthesis of ACS with the use of modern technical means. To develop the ability of undergraduates to effectively solve the problems of rational use of automatic control systems in the electric power industry.Be able to determine the actual state of the object, synthesize its structure, choose the right criterion for controlling the object, synthesize the structure of the control system, evaluate the advantages of the vibrated structure, predict the								+		

		behavior of the synthesized control system, remove control, alarm and regulation, evaluate the advantages and disadvantages of the system.										
M6	Optimal and adaptive control systems	PURPOSE AND OBJECTIVES OF THE COURSE The purpose of teaching the discipline “Optimal and adaptive control systems” is to inform undergraduates of knowledge on the analysis of a priori and current information about the properties of an object, the definition of the type of disturbances, the formulation of limiting conditions, target criteria, the main classes and methods of synthesis of optimal and adaptive control systems. As well as the acquisition by undergraduates of skills in calculating and modeling optimal and adaptive control systems for use in production activities related to the operation, configuration and development of control systems and devices of these classes. BRIEF DESCRIPTION OF THE COURSE Basic concepts and definitions of optimal control theory. Formulation of the problem of synthesis of an optimal control system. Definition of an adaptive control system. Formulation of the adaptive control problem. Stages of adaptive system synthesis, basic methods of synthesis of the main circuit and the adapter in direct adaptive control systems. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE As a result of mastering the discipline, undergraduates should know: Types of disturbances acting on the control object characteristics of the main classes of adaptive systems, features of methods of synthesis of optimal and adaptive regulators, properties and scope of application of the main types of optimal and adaptive regulators								+		

		Must be able to: Analyze a priori and current information about the properties of the object; Determine the type of disturbances; Formulate limiting conditions; Define target criteria; Formulate the problem of synthesis of optimal and adaptive regulators; Choose an algorithm for the synthesis of an adaptive system; To carry out the calculation of adaptive regulators to ensure the specified properties of the systems.										
M7	Theory of electromechanical energy conversion	PURPOSE AND OBJECTIVES OF THE COURSE Formation of general scientific knowledge and in-depth professional training for undergraduates based on the study by students of the basics of the theory of electromechanical energy conversion, modern electromechanical systems, methods of mathematical description and modeling of processes of electromechanical energy conversion. BRIEF DESCRIPTION OF THE COURSE The discipline "Theory of electromechanical conversion of electricity", where students study issues related to the basic laws of electromechanical energy conversion, the device and the principle of operation of electromechanical converters. Learn how to calculate electromagnetic forces and electromagnetic moments in electromechanical energy converters. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE Basic methods, methods and means of obtaining, storing and processing information; basic concepts and content of classical sections of electromechanics of basic physical phenomena and laws of mechanics, electrical engineering, energy and their mathematical description; basic methods of experimental studies of objects and systems of electric power and										+

		electrical engineering. The use of modern technical means and information technologies in the professional field; methods of mathematical and physical modeling of modes, processes, states of objects of electric power and electrical engineering analysis of physical phenomena in technical devices and systems. Apply and analyze information, solve engineering problems in the field of electromechanical energy conversion, perform various tasks of analyzing the operation of electromechanical converters using mathematical modeling methods, develop recommendations for optimizing EMF operation modes. Development of design solutions for the execution of electromechanical converters of various applications.										
M8	Reliability in the electric power industry	THE PURPOSE AND OBJECTIVES OF THE COURSE are to form a fundamental knowledge base for undergraduates about the basic concepts, definitions of reliability theory and reliability indicators of electric power systems and installations. BRIEF DESCRIPTION OF THE COURSE basic methods of ensuring and improving reliability; methods of assessing the reliability of elements, maintaining and restoring the operability and resource of power equipment; methods of engineering calculation of reliability of complex systems; methods of testing systems for reliability. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE should know: - basic concepts, definitions and terms from the theory of reliability; - types of failures and their characteristics; - qualitative and quantitative indicators of reliability of objects;						+				

		- principles of developing mathematical models of reliability in the event of gradual, sudden and joint failures of an object; - principles of reserving elements of complex electric power systems; Must be able to: - calculate the main reliability indicators of electric power facilities; - select and compile optimal reliability systems for electric power facilities, as well as analyze their effectiveness.										
M8	Modeling of elements of electric power systems	PURPOSE AND OBJECTIVES OF THE COURSE Familiarization of students with the basics of modeling elements of electric power systems (EES) and their mathematical and virtual models, the formation of students' skills in simulation modeling of electric power facilities in the MATLAB software environment. BRIEF DESCRIPTION OF THE COURSE The course covers the following main topics: research of operating modes of single-phase and three-phase power transformers, research of operating modes of DC machines, research of operating modes of asynchronous machines, synchronous machines, modeling of power lines, load modeling, simulation of switching device ЗНАНИЯ, УМЕНИЯ, НАВЫКИ ПО ЗАВЕРШЕНИЮ КУРСА As a result of mastering the discipline "Modeling in electric power systems", the student will: know: - EES modeling methods; - the principle of operation of the main elements of the EES; - mathematical models of the main EES equipment; - methods for regulating the parameters of the EES mode; be able to: - work in the MATLAB software environment; - calculate the parameters of the main electrical equipment; - collect simulation models of EES objects; - explore the modes of operation of the EES; own: - methods of regulating the					+					

		parameters of electrical equipment; - skills of working with EES schemes										
Cycle of profile disciplines University component												
M9	Theory and practice of relay protection	THE PURPOSE AND OBJECTIVES OF THE COURSE are to provide undergraduates with knowledge in the field of principles of building relay protection, applied modern calculation methods, basic elements and means of relay protection. The task of studying the discipline is to expand the understanding of the possibilities of relay protection; to consolidate and concretize theoretical material concerning the principles of operation and device of relay protection, their basic properties, methods of application; to acquire skills in calculating the parameters necessary to configure relay protection; the correct choice of methods and means of relay protection; evaluation of the effectiveness and reliability of the selected relay protection. BRIEF DESCRIPTION OF THE COURSE characteristics of relay protection, algorithms of functioning and principles of protection construction and methods of calculation of various RS KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE information, methodological and mathematical support for the implementation of relay protection systems; domestic and foreign experience, as well as development prospects in the field of application of relay protection systems; methods of calculating relay protection systems. To know: - basic concepts, definitions and purpose of relay protection; - requirements for relay protection; - principles of construction of relay protection; - elements and functional parts of relay protection devices; -principles of operation of									+	

		basic protection schemes with relative and absolute selectivity; Must be able to: - calculate the main parameters of relay protection circuits; - select modern elements and relay protection devices, analyze their effectiveness and reliability; - read various electrical circuit diagrams and wiring diagrams of relay protection of electric power systems.										
M10	Scientific and technical problems of the electric power industry	KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE The purpose of teaching the discipline is to prepare a specialist to solve the problems of design, research and operation of electric power and electrotechnological installations and systems, able to analyze the efficiency of energy conversion schemes, evaluate the prospects of new methods of energy production and put into practice innovative developments. BRIEF DESCRIPTION OF THE COURSE The discipline covers the following theoretical information about the state of development of modern electric power industry: - structure and functioning of modern power plants of various types and electrical networks; - principles of construction, structure and optimization of the electric power system of an industrial enterprise; - the scale, directions and prospects of energy production and distribution; - methods of obtaining and quality requirements for new types of electrical technology; - regulatory and regulatory and technical basis of energy saving; - fundamentals of energy audit of electric power facilities; - principles of waste-free technology, fuel and energy indicators of waste-free;							+			

		- environmental aspects of energy conservation. KNOWLEDGE, SKILLS, SKILLS UPON COMPLETION OF THE COURSE As a result of studying the discipline, undergraduates should know: - on the structure and functioning of modern power plants and electrical networks; - about the general principles, structure and functioning of electric power systems and networks; - about the energy characteristics of electrical processes and installations; - on the principles of construction, structure and optimization of the electric power system of an industrial enterprise; - about the variety of electrotechnological processes and installations, about the main types and classification of electrical equipment; - on the scale, directions and prospects of energy production and distribution; - on the methods of obtaining and quality requirements for new types of electrical technology; - about the regulatory and regulatory and technical basis of energy saving; - about the basics of energy audit of electric power facilities; - about the principles of waste-free technology, about fuel and energy indicators of waste-free. As a result of studying the discipline, undergraduates should have an idea of: - the main directions of fundamental research in electrical power engineering and electrical technology; - about the structure and functioning of various types of power plants and about the combined generation of electricity and heat at the CHP;										

		- about the principles and methods of developing energy saving measures. As a result of studying the discipline, undergraduates must possess: -methods of calculating the energy indicators of electric power plants; - methods of calculating the energy characteristics of electricity production; - methods of calculating the characteristics of energy carriers used in electrotechnological production; - methods of calculating the main characteristics of energy carriers; - methods of optimization of power plants and systems.										
M11	Renewable energy sources	PURPOSE AND OBJECTIVES OF THE COURSE The discipline focuses the knowledge gained in chemistry, biology, physics, and the theoretical foundations of electrical engineering. Carries out their connection with special disciplines, processes and technologies in renewable energy sources, industries. And also shows their connection with special disciplines, processes and technologies for obtaining renewable energy sources from the relevant materials used. BRIEF DESCRIPTION OF THE COURSE The main factors determining the degree of use of any energy source are its estimated reserves, the actual yield of useful energy, cost, potential hazardous environmental impacts, as well as social consequences and impact on the security of the state. Renewable energy sources include hydrogen, bioethanol and biogas artificially obtained from biological waste from agriculture, as well as solar, water, wind, sea waves, tides, and hydroelectric power plants. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE In the process of						+				

		studying the discipline, students should understand the concept of providing electricity consumers, understand the structure of the electric power industry, the relationship between its various links, have an idea of the latest achievements in obtaining renewable energy sources, get an idea of the composition of electricity consumers in various industries.										
M12	Power electronics	PURPOSE AND OBJECTIVES OF THE COURSE Familiarization of undergraduates with the basics of power electronics, with the basic elements of power electronics, about their application in industrial converter devices and the formation of undergraduates' skills to work with them. BRIEF DESCRIPTION OF THE COURSE The course covers the following main topics:power electronic devices; element base and standard components of control systems; converters with network switching; DC-to-DC conversion; controlled converters; pulse width modulation in converters; resonant converters; application of power electronics devices. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE As a result of mastering the discipline "Power Electronics", the student will: know: - the basic element base of power electronics; - the principle of operation and characteristics of the main electronic devices; - device of power converters; - application of power converters; be able to: - read electronic circuits; - carry out basic calculations of power electronic devices; - collect circuits of power converters; - identify malfunctions in converter circuits;									+	

		own: - calculation methods of the most common converter devices; - skills of working with electronic converters.										
Cycle of profile disciplines Component of choice												
M13	Digital electric drive control systems	PURPOSE AND OBJECTIVES OF THE COURSE Study of issues related to the choice of hardware and software, as well as the use of application programs for modeling and analysis of modern digital control systems of electric drives. Know the methods of developing generalized solutions to electric drive problems, analyzing options, predicting consequences, finding compromise solutions in conditions of multi-criteria, uncertainty BRIEF DESCRIPTION OF THE COURSE The discipline "Digital control systems of electric drives", where students study issues related to the choice of hardware and software, as well as the use of a package of application programs for modeling and analysis of modern digital control systems of electric drives. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE As a result of studying this discipline, a master's student should know the devices, principles of operation and properties of the main elements of microprocessor devices, automation software. Undergraduates will acquire knowledge and practical skills in the development and design of digital control systems for electric drives of industrial installations.										+
M14	ASDA and optimization of power system modes	PURPOSE AND OBJECTIVES OF THE COURSE The objectives of mastering the discipline are: the formation of knowledge				+						

		about the tasks, structure, features of energy and energy systems, technological features of power systems, about electrical modes and their management capabilities, operational management tasks in the conditions of automated dispatch control systems (ASDS), compatibility of the control system in the energy sector with biological environments, the formation of skills and abilities to control the modes of power systems, carrying out optimization calculations and analysis of technical and economic indicators of networks; planning and forecasting modes, choosing the optimal composition of operating equipment in the power system. BRIEF DESCRIPTION OF THE COURSE The discipline belongs to the "Professional cycle" of the basic part of the module "Electric Power Engineering". This discipline is one of the basic ones; it has both independent significance and is the basis for a number of special disciplines. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE To successfully master the discipline , the student must: know: laws of electrical engineering; basic elements of electrical systems; to draw up replacement schemes for elements of the power system; Apply and analyze information, solve engineering problems in the field of electromechanical energy conversion, perform various tasks of analyzing the operation of electromechanical converters using mathematical modeling methods, develop recommendations for optimizing EMF operation modes. Development of design solutions for the execution of electromechanical converters of various applications.										

M15	Installation, commissioning and operation of electrical equipment	PURPOSE AND OBJECTIVES OF THE COURSE The purpose of studying the discipline is the formation of theoretical knowledge and mastery of organizational and technical issues of rational operation and advanced industrial methods of installation, commissioning, operation and diagnostics of electrical equipment. BRIEF DESCRIPTION OF THE COURSE The discipline "Installation, commissioning and operation of electrical equipment" is a basic subject where students study the accumulated experience of modern methods of organizing and performing work on installation, commissioning and maintenance of electrical installations and automation equipment on the basis of regulatory documents; safety rules, devices and technical operation. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE As a result of studying this discipline, a master's student must possess a systematic, integrated approach to solving issues of selection, placement of equipment, installation, commissioning, operation, maintenance and repair, as well as its intended use. Undergraduates will acquire skills in industrial installation, repair and operation of elements of the electric power grid in accordance with the requirements of the rules of technical operation of electrical installations of consumers, safety regulations for the operation of electrical installations of consumers and the rules of electrical installations.								+		
M16	Operation of electric power systems and networks	PURPOSE AND OBJECTIVES OF THE COURSE Familiarization with the main tasks and organizational issues of technical operation, as well as operational reliability					+					

		issues. Competent planning and implementation of preventive maintenance, planning and calculation of the number of spare parts, as well as ways to improve operational reliability. BRIEF DESCRIPTION OF THE COURSE The discipline is based on the knowledge gained in the courses: electric power engineering, electromechanics and electrical equipment, electrical machines, electrical machines, electrical apparatus, power supply of enterprises, electric power networks and systems, electrical part of power plants, relay protection and automation of power supply systems, fundamentals of electrical safety. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE The knowledge gained by undergraduates while studying the discipline "Operation of electric power systems and networks" should provide the final cycle of training on the operation of electrical equipment of industrial enterprises and electrical installations, electric power systems and networks, as well as on some issues of operational reliability.										
M17	Energy management system according to international standards	PURPOSE AND OBJECTIVES OF THE COURSE To prepare a specialist to solve problems of design, research and operation of electric power and electrotechnological installations and systems capable of analyzing the efficiency of energy conversion schemes, assessing the prospects of new methods of energy production and putting into practice innovative developments. BRIEF DESCRIPTION OF THE COURSE The discipline covers the following theoretical information about the state of development of modern electric power industry: - structure and functioning of modern power plants of various types and electrical networks; -		+								

		principles of construction, structure and optimization of the electric power system of an industrial enterprise; - the scale, directions and prospects of energy production and distribution; - methods of obtaining and quality requirements for new types of electrical technology; - regulatory and regulatory and technical basis of energy saving; - fundamentals of energy audit of electric power facilities; - principles of waste-free technology, fuel and energy indicators of waste-free; - environmental aspects of energy conservation. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE - ability to identify promising areas in the energy sector - to understand general and particular problems in the energy sector; - read and quote scientific literature; - analyze a scientific publication; - use scientific methods of analysis.										
M18	Monitoring and energy audit of energy complexes	PURPOSE AND OBJECTIVES OF THE COURSE To prepare a specialist to solve problems of design, research and operation of electric power and electrotechnological installations and systems capable of analyzing the efficiency of energy conversion schemes, assessing the prospects of new methods of energy production and putting into practice innovative developments. BRIEF DESCRIPTION OF THE COURSE The discipline covers the following theoretical information about the state of development of modern electric power industry: - structure and functioning of modern power plants of various types and electrical networks; - principles of construction, structure and optimization of the electric power system of an								+		

		industrial enterprise; - the scale, directions and prospects of energy production and distribution; - methods of obtaining and quality requirements for new types of electrical technology; - regulatory and regulatory and technical basis of energy saving; - fundamentals of energy audit of electric power facilities; - principles of waste-free technology, fuel and energy indicators of waste-free; - environmental aspects of energy conservation. KNOWLEDGE, SKILLS, SKILLS AT THE END OF THE COURSE As a result of studying the discipline, the student should know: the elements of accounting and control of energy consumption, the possibilities of energy management and the elements of analysis of investments in energy conservation;										
M19	Preparation and defense of a master's thesis	The purpose of the master's thesis is to demonstrate the level of scientific / research qualifications of a graduate student, the ability to independently conduct a scientific search, test the ability to solve specific scientific and practical problems, knowledge of the most general methods and techniques for solving them. SHORT DESCRIPTION A master's thesis is a final qualifying scientific work, which is a generalization of the results of an independent study by a master's student of one of the actual										+

		problems of a particular specialty of the relevant branch of science, having an internal unity and reflecting the progress and results of the development of the chosen topic. The Master's thesis is the result of the research /experimental research work of the undergraduate conducted during the entire period of the undergraduate's studies. The defense of a master's thesis is the final stage of master's degree preparation. The Master's thesis must meet the following requirements: – research should be carried out in the work or current problems in the field of electrical engineering and electric power industry should be solved; – the work should be based on the identification of important scientific problems and their solution; – decisions must be scientifically sound and reliable, have internal unity; – the dissertation work must be written alone										

NJSC "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATPAEV"

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of Kazgtu named after K. Satpayev
M.M. Begentaev
_____ 2024 .

CURRICULUM
of Educational Program on enrollment for 2024-2025 academic year

Educational program 7M07113 - "Electrical and Energy Engineering "
Group of educational programs M099 - "Power and Electrical Engineering"

Form of study: full-time **Duration of study: 2 year** **Academic degree:Master of Technical Sciences**

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on			
								1 course		2 course	
								1 semester	2 semester	3 semester	4 semester
CYCLE OF BASIC DISCIPLINES (BD)											
M-1. Module of basic training (university component)											
LNG213	English (professional)	BD UC	3	90	0/0/2	60	E	3			
HUM214	Management Psychology	BD UC	3	90	1/0/1	60	E	3			
HUM212	History and philosophy of science	BD UC	3	90	1/0/1	60	E		3		
HUM213	Higher school pedagogy	BD UC	3	90	1/0/1	60	E		3		
component of choice											
ERG222	Specific and special automatic control systems in the power industry	BD CCH	5	150	2/1/0	105	E	5			
ERG221	Optimal and adaptive control systems				2/0/1						
MNG781	Intellectual property and research				2/1/0						
ERG273	The theory of the automated electric drive	BD CCH	5	150	2/0/1	105	E	5			
ERG272	The theory of electromechanical energy conversion										
MNG782	Sustainable development strategies				2/0/1	105	E			5	
ERG218	Reliability in power industry	BD CCH	5	150							
MNG704	Project Management										
ERG214	Modeling of elements of electric power systems				2/1/0	105					
CYCLE OF PROFILE DISCIPLINES (PD)											
M-2. Module of specialized training in electric engineering (university component, component of choice)											
ERG233	Theory and practice of relay protection	PD UC	5	150	2/0/1	105	E	5			
ERG265	Scientific and technical problems of power industry	PD UC	5	150	2/0/1	105	E				
ERG269	Renewable energy sources	PD UC	5	150	2/0/1	105	E		5		
ERG252	Power electronics	PD UC	5	150	2/1/0	105	E		5		
ERG228	Design of industrial electric drives	PD, CCH	5	150	2/0/1	105	E			5	
ERG260	Theory and practice of technical experiment in the power industry										
ERG239	Digital control systems of electric drives	PD, CCH	5	150	2/1/0	105	E		5		
ERG203	ASDC and optimization of the modes of power supply systems			150	1/1/1	105	E				
ERG217	Installation, commissioning and operation of eletrical equipment	PD, CCH	5	150	2/1/0	105	E		5		
ERG241	Operation of electric power systems and networks			150							
ERG206	High-voltage electrical technologies and equipment	PD, CCH	5	150	2/0/1	105	E			5	
ERG246	Modern high voltage equipments										
ERG247	Energy management system according to international standards	PD, CCH	5	150	1/1/1	105	E			5	
ERG256	Monitoring and energy audit of power complexes				2/0/1	105					
M-3. Practice-oriented module											
AAP273	Pedagogical practice	BD UC	8							8	
AAP269	Research practice	PD UC	8								8
M-4. Experimental research module											
AAP268	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	4					4			
AAP268	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	4						4		
AAP251	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	2							2	
AAP255	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	14								14
M-5. Module of final attestation											

ECA212	Preparation and defense of a master's 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			
			university component (UC)	component of choice (CC H)	Total
BD	Cycle of basic disciplines		20	15	35
PD	Cycle of profile disciplines		28	25	53
	Total for theoretical training:	*0*	*44*	*40*	*88*
	RWMS				*24*
FA	Final attestation	12			8
	TOTAL:	**12**	**44**	**40**	**120**

Decision of the Academic Council of Kaznu named after K.Satpayev. Protocol № 12 "28" 04 2024 y.

Decision of the Educational and Methodological Council of Kaznu named after K.Satpayev. Protocol № 6 "14" 04 2024 y.

Decision of the Academic Council of the Instituteof Energy and Mechanical Engineering. Protocol № 4 "18" 01 2024 y.

Vice-Rector for Academic Affairs — **R.K. Uskenbayeva**

Director Institute of Energy and Mechanical Engineering — **K.K. Yelemessov**

Department Head «Power Engineering» — **Ye.A. Sarsenbayev**

Specialty Council representative from employers — **G.E. Abdykalykov**