Institute of Energy and mechanical named after A. Burkitbayev
Department of Power Engineering

EDUCATIONAL PROGRAM

6B07101 - «Power Engineering»
code and title of the educational program

Code and classification of the field of education: **6B07 Engineering, manufacturing and construction industries**
Code and classification of training directions: **6B071 Engineering and Engineering**
Group of educational programs: **B062 Electrical Engineering and Power Engineering**
Level based on NQF: **level 6**
Level based on IQF: **level 6**
Study period: **4 years**
Amount of credits: **240**

Almaty 2025

Educational program **6B07101-«Power engineering»**
code and name of educational program
was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes №10 dated «06» 03 2025.

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

Minutes №3 dated «20» 12 2024.

Educational program **6B07101-«Power engineering»**
code and name of educational program
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
SDG - Sustainable Development Goals

1. Description of the educational program

The educational program is designed to train personnel for work in production workshops and engineering departments of thermal and nuclear power plants, industrial and heating boilers and in the energy, Metallurgical, Mining, Oil and gas and TSHK industries, as well as in production laboratories, energy and environmental expertise, environmental, energy, housing and communal services.

The direction of the specialty and specialization program includes engineering and engineering business.

In case of successful completion of the full course of undergraduate training, the graduate is awarded the academic degree "Bachelor of engineering and technology in the field of Electrical Engineering and energy".

In the educational program, the volume of Mathematical, Natural-Scientific, basic and language disciplines was increased the educational program maintained the established deep training in Mathematical, Natural Sciences, Basic and language disciplines.

The main subjects to be added can be divided into four groups: thermal power disciplines, electric power disciplines, alternative energy disciplines and laboratory workshop on the application of modern technologies. As a result, an educational program with innovative and practical content and aimed at implementing the Digital Kazakhstan program was obtained.

The educational program provides for the study of the following innovative disciplines:

- laboratory practice on modern industrial technologies in the Electric Power Industry (1, 2, 3);
- energy audit and energy saving at enterprises;
- renewable energy;
- modeling of energy systems;
- calculation and design of power supply systems;
- calculation and design of electric power units and systems;
- calculation and design of heat exchange equipment;
- calculation and design of an automated electric drive.

In the process of mastering the educational program, a bachelor of engineering and technology in the field of thermal power engineering must have the following key competencies.

A bachelor should have the following concepts:

- at modern heat and energy facilities, independent power sources and renewable energy facilities, in promising areas of energy development;
- about modern approaches in the calculation and design of energy systems, as well as the use of software for the management and evaluation of energy systems;
- on modern elements and installations of power systems (devices, apparatuses, conductors, equipment, motors, microprocessors, etc.).

must know:

- theoretical and experimental research methods in order to create new promising areas in the field of Electrical Engineering and energy;
- principles of operation, technical characteristics and design features of the developed and used energy sources;
- Fundamentals of design, installation and operation of Electrical and thermal installations of the energy industry, methodological and regulatory materials;

to know:

- development of principles of organization and design of energy enterprises;
- use of application package for design, modeling and automation of energy systems;

must have skills:

- formation of basic technical and economic requirements for the designed energy systems;
- Organization of operation, installation and commissioning of Electrical and thermal equipment;
- development and design of a modern element and technical base of power systems and individual devices.

During the training, it is envisaged to undergo industrial practice in the following institutions: NC KEGOC, JSC ACC, JSC Ales, LLP Almaty heating systems, JSC VKREK, JSC TATEK, JSC Ontustik Zharyk Transit, JSC Kazatomprom, LLP Kazzinc, Karachaganak Petroleum Operating, etc.

2. Purpose and objectives of educational program

The purpose of EP: The purpose of the educational program is to train students in general education, basic and specialized disciplines with the achievement of relevant competencies having professional knowledge in the design, installation, operation and repair of equipment of basic electrical and thermal installations for energy systems, sources of energy supply of industrial enterprises and settlements, training of bachelors who have an understanding of the classical and new directions of modern energy and environmental technologies and are able to apply the acquired knowledge in scientific, practical and production activities.

This goal is implemented in accordance with the UN Sustainable Development Goals, namely:

SDG 4 – Quality Education: Adapt learners to the requirements of modern production by developing engineering thinking, digital literacy, and professional skills;

SDG 7 – Affordable and Clean Energy: Develop energy-efficient heat exchangers operating on renewable energy sources;

SDG 9 – Industry, Innovation, and Infrastructure: Develop innovative solutions in the field of heat engineering, the use of digital technologies, and artificial intelligence;

SDG 12 – Responsible Consumption and Production: Ensure sustainable production through the prudent use of materials and the reduction of harmful environmental impacts.

Objective:

1) Compliance with the Sustainable Development Goals:

Master the fundamentals of the design and theory of steam and gas turbines used in the technological chains of thermal power plants and industrial enterprises.

2) Principles of inclusive education:

- Ensuring equal opportunities for all learners (accessible educational resources, adapted teaching methods);
- Creating conditions for interaction between learners of different abilities through the development of teamwork and cooperation.

Tasks of EP: theoretical and practical training of highly qualified Bachelors of Electrical Engineering and energy, capable of performing the tasks of the entire complex of engineering problems of computing and equipping power supply systems with the use of modern computing equipment and the introduction of new technologies in design.

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

Admission to the university is carried out according to the applications of an applicant who has completed secondary, secondary special education in full on a competitive basis in accordance with the points of the certificate issued according to the results of the unified national testing with a minimum score of at least 65 points.

Special requirements for admission to the program apply to graduates of 12 summer schools, colleges, applied bachelor's degree programs, niches, etc. Such applicants must pass diagnostic testing in English, mathematics, physics and special disciplines.

Rules for credit transfer for accelerated (reduced) education based on 12-year secondary, secondary technical and higher education

Code	Competence type	Description	Competence result	Responsible
Shared (Includes full training with possible additional, depending on the level of knowledge)				
G1	Communication	- Fugitive monolingual oral, written and communication skills - The ability not to communi-cate fluently with a second language - The ability to use	Full 4-year study with a minimum of 240 academic loans (of which 120 contact classroom academic credits) with a possible re-recording of loans in the second	Department of Kazakh and Russian, Department of English

		communi-cative communication in different situations - There are basics to acade-mic writing in their native language - Diagnostic language test	language where students have an advanced level. The level of language is determined by passing the diagnostic test	
G2	Mathematical Literacy	- Basic mathematical thinking at the communication level - the ability to solve situational problems on the basis of the mathematical apparatus of algebra and began mathematical analysis - Diagnostic test for mathe-matical literacy in algebra	Full 4-year study with a minimum of 240 academic loans (of which 120 are contact auditary academic loans). With a positive test of diagnostic test, the level of mathematics 1, the negative - the level of algebra and the beginning of the analysis	Mathematics Department
G3	Basic literacy in science disciplines	- A basic understanding of the scientific picture of the world with an understanding of the basic laws of science - Understanding basic hypotheses, laws, methods, drawing conclusions and assessing errors	Full 4-year study with a minimum of 240 academic loans (of which 120 are contact auditary academic loans). With a positive test of diagnostic test level Physics 1, General Chemistry, at negative - the level of the Beginning of Physics and basic basics of chemistry	Departments in the fields of natural sciences
Specific (includes reduced tuition by re-counting credits depending on the level of competence knowledge for graduates of 12-year schools, colleges, universities, including humanitarian and economic areas)				
S1	Communication	- Fugitive bilingual oral, written and communication skills - The ability not to communi-cate fluently with a third language - writing skills of different styles and genres - skills of deep understanding and interpretation of one's own work of a certain level of complexity (essay) - basic aesthetic and theore-tical literacy as a condition of full perception, interpretation of the original text	Full re-repayment of credits by language (Kazakh and Russian)	Department of Kazakh and Russian

S2	Mathematical Literacy	- Special mathematical thin-king using induction and deduction, generalization and specification, analysis and synthesis, classification and systematization, abstraction and analogy - The ability to formulate, substantiate and prove positions - Application of common mathematical concepts, formulas and extended spatial perception for mathematical tasks - Full understanding of the basics of mathematical analysis	Re-credit for The Discipline of Mathematics (Calculus) I	Mathematics Department
S3	Special literacy in science disciplines (Physics, Chemistry, Biology and Geography)	- A broad scientific percep-tion of the world that suggests an understanding of natural phenomena - Critical perception to understand the phenomena of the world around - cognitive ability to formulate a scientific understanding of the forms of existence of matter, its interaction in nature	Re-credits for Physics I, General Chemistry, General Biology, Introduction to Geology, Introduction to Geodesy; Training practice, etc.	Departments in the fields of natural sciences
S4	English language	- Readiness for further self-learning in English in various fields - Ready to gain experience in design and research using English	Refilort English credits above academic to professional level (up to 15 credits)	Department of English
S5	Computer skills	- Basic programming skills in one modern language - Use software and applications to teach different disciplines	Reset Credits on Discipline Introduction to Information and Communication Technologies, Information and Communication Technologies	Department of Software Engineering
S6	Social and humanitarian competencies and behaviour	- Understanding and understanding the responsibility of every citizen for the development of the country and the world - The ability to	Re-credit for Kazakhstan's Modern History (excluding state exam)	Department of Public Discipline

		discuss ethical and moral aspects in society, culture and science		
		- Critical understanding and the ability to debate on modern scientific hypotheses and theories	Re-credit credits for philosophy and other humanities	
PROFESSIONAL (includes reduced education by re-counting credits depending on the level of knowledge on competences for college graduates, AV schools, universities)				
P1	Professional competencies	- Critical perception and a deep understanding of professional competencies at level 5 or 6 - The ability to discuss and debate professional issues within the framework of the mastered program	Re-credits for basic professional disciplines, including introduction to specialty, engineering ethics, robotic technology, automation technology, theoretical basics of electrical engineering, technological measurements and instruments, mathematical basics of control theory, electronic automation devices.	Releasing chair
P2	General Engineering Competencies	- Basic general engineering skills and knowledge, the ability to solve general engineering problems and problems - be able to use application packages to process experimental data, solve algebraic and differential equation systems	Re-credit for general engineering disciplines (engineering graphics, outline geometry, electrical engineering basics, microelectronics basics.)	Releasing chair
P3	Engineering and computer competencies	- Basic skills in using computer programs and software systems to solve general engineering problems	Re-credit for computer graphics discipline, computer modeling and programming in the MatLab environment.	Releasing chair
P4	Socio-economic competences	- Critical understanding and cognitive ability to reason on contemporary social and economic issues - A basic understanding of the economic assessment of research sites and the profitability of projects.	Re-transfer credits for socio-humanitarian and technical and economic disciplines in the set-off of the electorate cycle	Releasing chair

The university may refuse to re-borrow credits if the low diagnostic level is

confirmed or the final grades 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	6B07 Engineering, manufacturing and construction industries
2	Code and classification of training areas	6B071 Engineering and Engineering
3	Group of educational programs	B062 Electrical Engineering and Power engineering
4	Name of the educational program	Power Engineering
5	Brief description of the educational program	Educational program on modern approaches to the calculation and design of energy systems in promising areas of energy development, as well as the use of software for managing and evaluating energy systems; formation of basic technical and economic requirements for projected energy systems on modern elements and installations of power systems; use, installation and sale of electrical and thermal engineering equipment organization of commissioning; It is intended for training personnel for the development and design of modern element and technical base of power systems and individual devices. The specialization and specialization program area includes engineering and engineering business. In case of successful completion of the full bachelor's degree course, the graduate is awarded the academic degree "Bachelor of Engineering and Technology in the field of electrical engineering and energy". The educational program has increased the volume of mathematical, natural science, basic and language disciplines. It can be divided into four groups: disciplines of thermal power engineering, disciplines of electric power engineering, disciplines of alternative energy and a laboratory seminar on the application of modern technologies. As a result, an educational program with innovative and practical content was obtained and aimed at the implementation of the Digital Kazakhstan program.
6	Purpose of the EP	The purpose of the educational program is to teach students general education, basic and specialized disciplines with the achievement of appropriate competencies. Theoretical and practical training of highly qualified bachelors of electrical engineering and power engineering, capable of performing tasks of the entire complex of engineering problems of power supply using modern computer technology and the introduction of new technologies in design,

		having professional knowledge in the design, installation, operation and repair of equipment of power systems, sources of energy supply of industrial enterprises and settlements, bachelor's degree training, having an understanding of the classical and new directions of modern energy and environmental technologies and able to apply the knowledge gained in scientific, practical and industrial activities. This goal is implemented in accordance with the UN Sustainable Development Goals, namely: - SDG 4 – Quality Education: To adapt learners to the requirements of modern production by developing engineering thinking, digital literacy and professional skills; - SDG 7 – Affordable and Clean Energy: Design of heat exchangers that use energy efficiently and can work with renewable energy sources; - SDG 9 – Industry, Innovation and Infrastructure: Design innovative solutions in the field of heating technology, use of digital technologies and artificial intelligence; - SDG 12 – Responsible Consumption and Production: Ensure sustainable production through the economical use of materials and reducing harmful impacts on the environment. Objective: 1) Compliance with the Sustainable Development Goals: Master the fundamentals of the design and theory of steam and gas turbines used in the technological chains of thermal power plants and industrial enterprises. 2) Principles of inclusive education: - Ensuring equal opportunities for all learners (accessible educational resources, adapted teaching methods); - Creating conditions for interaction between learners of different abilities through the development of teamwork and cooperation.
7	Type of EP	New
8	The level of the NRK	level 6
9	ORC Level	Level 6
10	Distinctive features of the EP	No
11	List of competencies of the educational program:	A - knowledge and understanding: A1 - methods of building electrical, technological and functional schemes for the design of Power Engineering systems; A2 - current trends in the development of technical and technological systems of Power Engineering facilities; A3 - standards, methodical and regulatory materials accompanying the operation, installation and

		installation of thermal power and Electric Power Engineering facilities. B - applying knowledge and understanding: B1 - independent work and offer various options for solving professional problems using theoretical and practical knowledge; B2 - to organize installation, installation and operation of Electric Power Engineering and thermal systems; B3 - to organize the collection, storage and processing of information used in the field of professional activity. C - the formation of judgments: C1 - about modern Power Engineering industry facilities and process management systems; C2 - on the application of modern autonomous Power Engineering systems of different categories of consumer approaches; C3 - about modern technical devices and technological equipment of Power Engineering facilities (devices, devices, conductors, equipment, executive mechanisms, microprocessors, etc.). D - personal abilities: D1 - to be an Power Engineering engineer, electrical engineer of the production division of the operation of Power Engineering systems; D2 - to be a specialist in the maintenance of electrical and thermal networks, and systems; D3 - to be an engineer of the production unit for the repair of thermal and electrical installations; D4 - to be able to organize work on setting up Power Engineering and electromechanical plants of industrial enterprises. ***Competences at the end of training*** B - Basic knowledge, skills andskills: 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 apply in practice the basics of engineering professional ethics; B3 - to be able to analyze the current problems of the modern history of Kazakhstan. P - Professional competencies, including in accordance with the requirements of industry professionalstandards: P1 is a wide range of theoretical and practical knowledge in the professional field;

		P2 - is able to analyze and solve problems on the theory of electrical circuits and heat technology; P3 - is able to analyze thermal, electrical and installation schemes of technological production. I am ready to install, set up and operate thermal and electrical installations, and systems. O - Human, social and ethicalcompetences: O1 - is able to freely use english as a means of business communication, a source of new knowledge in the field of electrical engineering and Power Engineering. I am ready to use the English language in the professional activities in the field of Electric Power Engineering and heat Power Engineering; O2 - is able to freely master the Kazakh (Russian) language as a means of business communication, a source of new knowledge in the field of electrical engineering and Power Engineering. I am ready to use the Kazakh (Russian) language in professional activities in the field of Electric Power Engineering and heat Power Engineering; O3 - to know and apply in work and life the basics of applied ethics and ethics of business communication; O4 - to know and apply the basic concepts of professional ethics; O5 - to know and apply in practice the "code of conduct of engineer"; O6 - to know and solve the problems of human influence on the environment. C - Special and Management Competencies: C1 - self-management and control of work and training processes within the framework of the organization's strategy, policies and objectives, discussion of the problem, reasoning of conclusions and competent operation of information; C2 - *in the field of organizational and management activities:* to be the head of the group of the division for the operation, installation and repair of power plants in various industries; C3 - *in the field of experimental research:* to be a specialist in experimental research of thermal and electric power facilities; C4 - *in the field of research:* to be an engineer of a scientific laboratory for the research and development of modern Power Engineering installations and systems in various industries; C4 - in the field *of design:* to be an engineer in the development and design of electric power plants, and systems in various industries..
12	Learning outcomes of the educational program:	General standard requirements for graduation and awarding a bachelor's degree: mastering at least 240

		academic credits of theoretical training and final diploma work or state exam in specialty. Special requirements for graduating from university under this program *graduate should know:* To apply basic knowledge in the field of ecology and life safety, the fundamentals of anti-corruption culture, entrepreneurship and leadership, the perception of innovations, the principles of inclusivity, critical thinking, effective teamwork, and professional ethics in various types of professional and socio-political activities. To be able to formulate the main technical and economic requirements for the projected energy systems. Ensure uninterrupted and technically correct operation and reliable operation of the equipment. Formulate, substantiate and prove the provisions of the application of general mathematical concepts. Know the basics of all professional disciplines; modern technologies in various fields of mechanics and technology; experimental calculation methods. To develop the principles of organizing and designing energy enterprises, taking into account the goals of sustainable development aimed at ensuring access to clean and affordable energy for all. To use application software packages for calculations, modeling, and automation of energy system design, implementing innovative technologies that contribute to reducing carbon emissions and increasing energy efficiency. To formulate the main technical and economic requirements for the designed energy systems, ensuring their environmental safety, resilience to climate change, and accessibility for broad segments of the population. To possess the skills and abilities to conduct research and innovative activities for the development of new knowledge and the integration of knowledge from various fields. To be able to correctly and logically express thoughts in written and oral forms, as well as effectively apply theoretical knowledge in practice in a specific area of energy, which helps develop critical thinking and promotes sustainable learning. To use the skills of development and design based on modern component and technical infrastructure of energy systems and individual devices, which contributes to the development of innovations, as well as the creation of sustainable and efficient infrastructure that supports modern technological solutions in energy. Know the standards, methodological and regulatory materials, the basics of design, installation

		and operation of electrical and heat engineering installations in the energy industry. Know the theoretical and experimental research methods in the field of energy, principles of operation, technical characteristics and design characteristics of facilities and energy equipment Use the skills of organizing work on the operation, installation and commissioning of electrical and thermal equipment. Control of the implementation of plans (graphs) of inspections, tests and preventive repairs of equipment. To be a specialist in conducting experimental studies of heat and power facilities Know and apply in practice the basics of engineering professional ethics; to know modern and perspective directions of development of power industry, fuel and energy complex, modern trends in the provision of electricity and heat energy. Have knowledge of modern approaches in the calculation and design of energy systems, as well as the use of software tools for the management and evaluation of energy systems
13	Form of training	Daytime
14	Duration of training	4 years
15	Volume of loans	240
16	Languages of instruction	Kazakh, russian
17	Academic degree awarded	Bachelor of Engineering and Technology
18	Developer(s) and authors:	Sarsenbaev Y.A., Khidolda Y.

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)											
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12
1	Fundamentals of anti-corruption culture and law	Purpose: to increase the public and individual legal awareness and legal culture of students, as well as the formation of a knowledge system and a civic position on combating corruption as an antisocial phenomenon. Contents: improvement of socio-economic relations of the Kazakh society, psychological features of corrupt behavior, formation of an anti-corruption culture, legal responsibility for acts of corruption in various fields.	5	v											
2	Fundamentals of scientific research methods	Purpose: The goal of studying the discipline is to develop students' research skills; to introduce students to scientific knowledge, their readiness and ability to conduct research. Objectives of studying the discipline: to contribute to the deepening and consolidation of existing theoretical knowledge by students; to develop practical skills in conducting scientific research, analyzing the results obtained and developing recommendations; to improve methodological skills in independent work with information sources and appropriate software and hardware.	5					v							
3	Basics of Financial Literacy	Purpose: formation of financial literacy of students on the basis of building a direct link between the acquired knowledge and their practical application. Contents: using in practice all kinds of tools in the field of financial management, saving and increasing savings, competent budget planning, obtaining practical skills in calculating, paying taxes and correctly filling out tax reports, analyzing financial information, orienting in financial products to choose adequate investment strategies.	5		v										

4	Fundamentals of economics and entrepreneurship	Purpose: To develop basic knowledge of economic processes and skills in entrepreneurial activities. Content: The course aims to develop skills in analyzing economic concepts such as supply and demand, and market equilibrium. It includes the basics of creating and managing a business, developing business plans, risk assessment, and strategic decision-making.	5	v											
5	Ecology and life safety	Purpose: formation of ecological knowledge and consciousness, obtaining theoretical and practical knowledge on modern methods of rational use of natural resources and environmental protection. Contents: the study of the tasks of ecology as a science, the laws of the functioning of natural systems and aspects of environmental safety in working conditions, environmental monitoring and management in the field of its safety, ways to solve environmental problems; life safety in the technosphere, emergencies of a natural and man-made nature.	5	v											
6	Introduction to the specialty	The discipline examines the basics of energy, electric ground transport and charging infrastructure. Introduces the history of the development of the electric power industry. Provides information about the characteristics of the specialty. Studies the main technical means of production, transmission, conversion and consumption of electrical energy. Forms an idea of ground-based electric vehicles and charging infrastructure elements. Shows the possibilities of using renewable energy sources to charge electric vehicles.	4		v									v	
7	Mathematics I	Purpose: to introduce students to the fundamental concepts of linear algebra, analytical geometry and mathematical analysis. To form the ability to solve typical and applied problems of the discipline. Contents_ Elements of linear algebra, vector algebra and analytical geometry. Introduction to the analysis. Differential calculus of a function of one variable. The study of functions using derivatives. Functions of several variables. Partial derivatives. The extremum of a function of two variables.	5			v	v								

8	Mathematics II	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive. To teach how to apply a certain integral to solve practical problems. Contents_ integral calculus of the function of one and two variables, series theory. Indefinite integrals, methods of their calculation. Certain integrals and applications of certain integrals. Improper integrals. Theory of numerical and functional series, Taylor and Maclaurin series, application of series to approximate calculations_	5			v	v								
9	Mathematics III	Purpose: To teach students integration methods. To teach you how to choose the right method for finding the primitive.The discipline is a continuation of Mathematics II. The course includes sections: ordinary differential equations and elements of probability theory and mathematical statistics. Differential equations with separable variables, homogeneous, in full differentials, linear inhomogeneous differential equations with constant coefficients, systems of linear differential equations with constant coefficients, finding the probability of events, calculating the numerical characteristics of random variables, using statistical methods for processing experimental data are studied.	5			v	v								
10	Industrial electronics	The purpose of the course is to study the principles of operation of functionally complete electronic devices used in systems of electric power industry, automation of power systems and relay protection, energy cybernetics. Get the basic training necessary for the subsequent solution of various kinds of professional tasks related to the rational choice of electronic devices and their modes of operation in electronic equipment. Master the main types of devices and circuits used in electronics, the principle of operation and features of linear, pulse and digital devices for signal processing in electronic control systems and information display.	5				v		v		v				
11	Modern electric power industry	Energy resources and their use. Renewable and non-renewable sources of energy. Modern methods of obtaining electrical energy. Cycles of thermal, electric, hydroelectric and nuclear power plants. Methods of converting various types of energy	4						v		v				v

		into electrical energy. Non-traditional ways of obtaining energy. The concept of the electrical system. Management of electric power systems. The impact of technology and energy on the biosphere.													
12	Theoretical fundamentals of heat engineering	Students should have an understanding of the principles of operation of combined-cycle plants, in particular, waste heat boilers, gas-gas, gas-water and other types of heat exchangers; Know the basic laws and concepts of heat and mass transfer; thermal characteristics of bodies and media; equations of the system parameters. To be able to use the basic provisions and laws of heat engineering for the analysis of heat transfer processes; use tables and diagrams, calculate cycle efficiency based on heat exchange processes.	6			v								v	
13	Theoretical Foundations of Electrical Engineering I	It is considered in the discipline: basic concepts and definitions used in electrical engineering; modern methods of modeling of electromagnetic processes; methods of analysis of electric and magnetic circuits; numerical methods of the analysis of electrical circuits; basic laws and principles of electrical engineering, properties and characteristics of electrical circuits; methods of analysis of electrical circuits in steady state and transient modes; selection of the optimal method of calculation, to determination of the main parameters and characteristics of electrical circuits	5			v								v	
14	Theoretical Foundations of Electrical Engineering II	The course gives an idea of the basic equations and connection schemes; electrical filters and quadripoles; transients in linear electrical circuits, RL and RC circuits of the first degree; calculation of transients in circuits of the second degree. Introduces students to the characteristics of similar networks, types of long networks, the operator method, non-linear chains of sinusoidal currents and methods for their analysis.	5			v								v	

15	Engineering Thermodynamics	Purpose of the discipline: understanding the fundamental principles and laws of thermodynamics necessary for the analysis and optimization of energy systems and processes. Brief contents: introduction to basic thermodynamics concepts, first and second laws, Carnot and Rankine cycles, properties of ideal and real gases, thermodynamics of phase transitions and chemical reactions, analysis and calculation of energy installations and heat exchangers.	5			v							v	v	
16	Physics I	Purpose: to study the basic physical phenomena and laws of classical and modern physics; methods of physical research; the influence of physics on the development of technology; the relationship of physics with other sciences and its role in solving scientific and technical problems of the specialty. Contents: mechanics, dynamics of rotational motion of a solid body, mechanical harmonic waves, fundamentals of molecular-kinetic theory and thermodynamics, transfer phenomena, continuum mechanics, electrostatics, direct current, magnetic field, Maxwell's equations.	5			v								v	
17	Physics II	Purpose: to form students' knowledge and skills in using fundamental laws, theories of classical and modern physics, as well as methods of physical research as the basis of a system of professional activity. Contents: harmonic oscillations, damped oscillations, alternating current, wave motion, laws of refraction and reflection of light, quantum optics, laws of thermal radiation, photons, their characteristics, wave function, electrical conductivity of metals, atomic nucleus, its structure and properties, binding energy, radioactivity.	5			v								v	
18	Reading electrical circuits	Theory, the design of electrical apparatus and machines and their graphic designation according to state standards and a unified system of design documents.	5				v			v		v		v	
19	Electric devices	Classification of electrical apparatus and the requirements imposed on them. Electrodynamic forces in electrical apparatus. Heating of electrical apparatus. Electrical contacts. Electromagnets. Fundamentals of the theory of combustion and extinction of the electric arc. Insulating of electrical apparatus. Contactors and magnetic starters, thyristor starters. Controllers,	5						v		v	v			

		commanders and rheostats. Circuit breakers and fuses. Electromagnetic relays for current and voltage. Thermal relay, time relay, polarized, indicating relays. Magnetic amplifiers. Semiconductor electrical apparatus. High voltage circuit breakers. Disconnectors, separators and short-circuiting switches. Reactors, arresters. Measuring current and voltage transformers.													
20	Electrical and technical material scince	Classification of electrotechnical materials; Liquid dielectrics; Polymers; Inorganic electrical insulating materials; Conductor, superconducting and semiconductor materials; Magnetic materials and their classification and properties; Dielectrics and their electrical conductivity; Breakdown of gases, liquid and solid dielectrics; thermal conductivity and radiation resistance of materials.	5								v	v			
21	Power supply of enterprises	The discipline studies the issues of supplying enterprises with all types of energy necessary to fulfill the production plans of enterprises and are obtained from both local and district power supply installations.	5		v		v								
22	Automated electric drive	Discipline is a basic subject, where students get a general idea of the modern electric drive. The main topics of the course: Mechanics of electric drive, Electric drives of direct and alternating current. Adjustable electric drives. Transients in the drive. Power characteristics of the electric drive. Design of electric drives of typical industrial mechanisms.	6				v								v
23	Information and measuring technics	5B071800 "Information and measuring technics" is to obtain knowledge in the field of measurement and evaluation, processing of the measurement signals, the study of modern principles of construction of electric engineering, information systems and measuring systems, the use of the methods and the use of measuring instruments in various practice areas.	5			v							v		
24	Quality of Electrical Energy	Course Objective: To study the principles and methods of ensuring high-quality power in energy systems. Description: The discipline covers power quality parameters, analysis methods, and quality management techniques in power grids. Special attention is given to factors affecting the stability and	5								v			v	v

		reliability of power supply, as well as methods to improve quality parameters for the efficient operation of electrical equipment.													
25	Modeling in power systems	Acquaintance of students with the basic elements of electric power systems (EPS) and their mathematical and virtual models, the development of students' skills in modeling electric power objects in the MATLAB software environment. The course covers the following main topics: modeling single-phase and three-phase power transformers, modeling DC machines in generator and motor modes, modeling asynchronous machines in generator and motor modes, simulating synchronous machines in generator and motor modes, modeling power lines, modeling loads, and modeling switching devices .	5			v	v	v			v				
26	Fundamentals of Artificial Intelligence	Purpose: to familiarize students with the basic concepts, methods and technologies in the field of artificial intelligence: machine learning, computer vision, natural language processing, etc. Contents: general definition of artificial intelligence, intelligent agents, information retrieval and state space exploration, logical agents, architecture of artificial intelligence systems, expert systems, observational learning, statistical learning methods, probabilistic processing of linguistic information, semantic models, natural language processing systems.	5	v			v								v
27	Fundamentals of the theory of fuel combustion and the combustion device	Considers the combustion processes of liquid, solid and gaseous fuels, as well as the associated conditions for optimal combustion. The devices ensuring the burning of various types of fuels are considered. The principles of operation of fuel burning devices, their main design features. Features of burning fuels of various aggregative state. Chemical combustion processes, optimal combustion conditions. Torch, combustion zone, oxidizers.	5										v	v	
28	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the	5	v	v		v								

		principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.													
29	Transition processes in energy systems	The discipline "Transients in Power Systems" is Variable discipline, forming students' willingness to learn theoretical knowledge, practical skills and skills of using calculation algorithms electromagnetic transients arising from short circuits and other violations of the normal operation of the energy system, as well as knowledge necessary for understanding transients in electromechanical systems and their resistance to change of operating modes and deviations of the operating mode from normal.	5			v	v				v			v	
30	Legal regulation of intellectual property	Purpose: the goal is to form a holistic understanding of the system of legal regulation of intellectual property, including basic principles, mechanisms for protecting intellectual property rights and features of their implementation. Content: The discipline covers the basics of IP law, including copyright, patents, trademarks, and industrial designs. Students learn how to protect and manage intellectual property rights, and consider legal disputes and methods for resolving them.	5	v	v			v							
31	Theory and practice of project management	Purpose: To develop knowledge and skills in project management for effective project execution in various fields. Content: The course covers fundamental theories and methods of project management, including project planning, organization, control, and completion. Topics include risk management, resource management, communication, and quality management.	5	v	v		v								
32	Heat and mass transfer equipment in heat power engineering	The goal of the course is to train specialists in the field of application of thermodynamic and heat exchange methods for analyzing the processes of heat and mass transfer equipment of thermal power plants and other industrial enterprises. Considers the processes of heat and mass transfer in the apparatus and installations of heat and power engineering. These include boiler installations, waste heat boilers, heat exchangers of	5			v		v						v	

		various pressures.													
33	Main Machinery Operation of Heat Power Plant	The course occupies an important place among the general technical disciplines that determine the theoretical level of professional training of specialists in the modern system of education. The main objectives of the course is the formation of knowledge in the field of operation of heat supply equipment; mastering the skills and abilities to assess the functional, quantitative and qualitative characteristics of the heating supply of devices. The discipline deals with the main equipment of thermal power plants - boilers, turbines, pumping equipment, capacitors and their operation. The issues of repair and equipment reliability are touched.	5								v	v		v	
34	Electrical part of power stations	Consideration of the design of electrical apparatus, characteristics and modes of equipment, electrical circuits, methods of limiting short-circuit currents, etc. Calculation and selection of basic data on the parameters and characteristics of electrical machines, power transformers, electrical apparatus and conductors. Selection of materials for the development of the main circuits, schemes of own needs and structures of power plants and substations.	6			v					v			v	
35	Electrical insulation and cable technology	The purpose of the discipline is the study and development of the principles of design and production of electrical insulation, cables, wires used in electric power, electrical equipment	5				v			v	v	v			
36	Electrotechnical and thermotechnical measurements	The discipline "Electrical and heat engineering measurements" is a core subject, where students receive basic knowledge of the theory, device, as well as their graphical designation according to state standards and a single system of design documents (ESKD). They also gain knowledge of metrology, the classification of measurements and their errors, methods for measuring various electrical and heat engineering quantities.	5							v			v	v	
37	Energy conversation in heat power and heat engineering	Knowledge for the development of theoretical and practical knowledge on energy efficiency, energy conversion, energy audits and energy-audit facilities, energy-saving technologies.	5				v	v						v	
38	Accumulation of electric and thermal	The discipline studies technologies that allow generating and storing thermal energy using new and renewable technologies.	4								v		v	v	

	energy	Energy storage allows you to save energy and provide a reserve in the event of a sudden shutdown of the main energy source. The types of energy storage and ways of their application in all modern spheres of human activity are considered													
39	Renewable energy	The study of the physical nature of the processes of conversion of renewable energy sources (RES) into electrical energy and the implementation of the most economical and safe conditions for operating power plants based on renewable energy. Formation of graduates' readiness to conduct a feasibility analysis, comprehensively justifying the decisions made and implemented in the field of operation of power plants based on renewable energy sources; application of results in practice, the desire for self-development, improvement of their skills and skills - rational use of technological processes and methods for the production and transmission of electricity; possess the method of calculating the design and optimal analysis of power supply systems, acquire knowledge and practical skills for reliable and safe operation of electrical equipment operating on the basis of renewable energy sources.	6								v				v
40	Laboratory workshop on modern industrial technologies in the electric power industry I	To form a specialist with solid fundamentals of knowledge, high mathematical culture and practical skills, sufficient for successful production activities and allowing him to independently master new necessary knowledge and achievements in the field of programming and solving engineering problems. Master the methodology of automated software development of automation and control systems. Learn how to use modern software development and design tools, as well as design methodologies and regulatory documentation to acquire skills in creating high-quality automation and control software. Provide theoretical training in the development and design of software tools and automation and control systems.	5			v	v								v
41	Laboratory workshop on modern industrial technologies in the electric power	The discipline "Laboratory Workshop on Modern Industrial Technologies in Power Engineering II" is one of the main fundamental disciplines that form professional skills in solving problems in industry, examining the basic principles and	4				v					v			v

	industry II	methods that are part of electromechanical systems. Acquire the necessary stock of fundamental knowledge in the simulation of electric drive systems; stages of installation and commissioning; system approach to the installation and commissioning of electrical machines. Acquire knowledge of the principles of installation, options for constructing closed-frequency systems of variable frequency drives, calculate and simulate systems of asynchronous variable-frequency drives, perform the entire list of tasks related to the choice of hardware and software, and use the application software package for modeling and analyzing modern power supply systems common industrial mechanisms.													
42	Electrical machines	The discipline "Electrical Machines" will allow you to have an idea about the technical condition of electric drives used in the process, their torque characteristics and capabilities, instrumentation and devices that control the parameters of electric machines, will give the necessary skills for their proper operation, will allow in the preparation of technical specifications for the reconstruction of electromechanical equipment. The content of the discipline: Power transformers. Single and three phase transformers. Electric cars of alternating and direct currents. Synchronous and asynchronous electric machines.	5						v			v			
43	Engineering design of electrical connection diagrams of power plants and substations	THE PURPOSE AND OBJECTIVE OF THE COURSE Training of a highly qualified specialist capable of performing the main tasks related to reliable and economical generation of electrical energy with its standardized quality, reliability and efficiency. BRIEF DESCRIPTION OF THE COURSE Methods of calculation of the electrical part of power plants, calculation and selection of communication transformers, calculations of short-circuit current, drawing up diagrams of connections of stations, own needs and substations, circuits of a switchgear, studying issues related to the choice of electrical equipment of substations. KNOWLEDGE, SKILLS, AND SKILLS AT THE END OF THE COURSE - mastering the choice of transformers; - the ability to develop the main wiring	5										v	v	v

		diagrams and routines; - - satisfying reliable transmission of electricity, providing high-quality voltage at electric energy receivers.													
44	Engineering design of electrical machines in the power industry	Study of methods of calculation, design and optimization analysis, development of skills for independent solution of engineering problems and the practical application of theoretical knowledge	5				v				v			v	
45	boiler plants and steam generators	Bailer plants and steam generators course consists of several parts: Technological scheme of the boiler, Technical characteristics of the fuels and the use of the boiler efficiency, Calculation of the heat of the heating boiler, The structures of the boilers, Calculation of boiler plants hydraulic and aerodynamic, Boilers of industrial and technological systems, Use boilers of industrial enterprises.	4										v	v	
46	Blowers and temple engines	Considers pumps, compressors, the principle of their work, as well as the work of heat engines, which include gas and steam turbines. As part of the course, students become familiar with the principles of their work and methods for calculating them, the working conditions of the main elements of superchargers and heat engines, the principles of designing superchargers and heat engines, technologies for manufacturing machine parts, structures for controlling the operation of superchargers and heat engines.	5										v	v	
47	Lighting technology and lighting	Basic concepts of lighting equipment. Sources of light. Electric lighting. Light technical characteristics of lighting fixtures. Normalization and the device of illumination. Calculation of electric lighting. Methods of illumination. Selection of light source and lighting device. Placement of lighting fixtures. Calculation of the number of fixtures. Choice of voltage and power scheme of lighting installations. The choice of the brand of wires and the way they are laid.	6								v	v		v	
48	Basics of electrical safety	organization of safety engineering and liability for violation of safety regulations. Electrotraumatism, classification, types and act of electric trauma investigation, ways to reduce electrotrauma. The action of electric current on the human body	5	v											

		and the degree of danger. The parameters of the electrical circuit, the effect of voltage, current, frequency, time of action, the resistance of the human body and the current loop on the severity of the outcome of electrical injuries. Gosstandart for electrical safety. Danger of networks with earthed and isolated neutral. Danger of earth fault. Protective measures, the role of isolation. Application of small voltages, safety interlocks, protection during the transition of higher voltage to the lower network. Safety shutdown and automatic capacity compensation. Electrofeedback means, assistance with electrocution.													
49	Steam-gas and gas-turbine facilities for heat and nuclear power plants	The fundamentals and types of steam and gas turbines are considered, which are used in the field of power engineering, structure and thermal schemes, additional devices and equipment of thermal power plants and nuclear power plants, as well as the use and ways of increasing the efficiency, operating modes, variable operating modes of modern steam and gas turbines.	5										v	v	
50	Industrial and domestic heat and power equipment	Technological scheme of the boiler, Technical characteristics of the fuels and the use of the boiler efficiency, Calculation of the heat of the heating boiler, The structures of the boilers, Calculation of boiler plants hydraulic and aerodynamic, Boilers of industrial and technological systems, Use boilers of industrial enterprises.	5										v	v	
51	Calculation and projecting of systems of automated electrical drive	The automated electric drives of typical industrial installations and complexes (excavators, drilling rigs, electric locomotives, conveyors, fans, pumps, compressors and lifting installations) are considered. The main issues of the electric drive, the conditions of its operation are stated. For the working machine in question, the operating modes are given and the requirements for its electric drive are specified. The possible schemes of the electric drive and ways of its automation for realization of the requirements presented to them are given. The technique of calculation and selection of the basic elements of the electric drive, and also their typical schemes are described.	5		v		v	v	v	v					

52	Calculation and projecting of power supply systems	The methods of calculation of electrical loads, reactive power compensation calculation, charting shop and in-plant networks, study issues related to the calculation of consumer power supply with a specific load.	5		v			v	v	v					v
53	Calculation and Design of Heat Exchange Equipment	Considers the processes of heat and mass transfer in the apparatus and installations of heat and power engineering. These include boiler installations, waste heat boilers, heat exchangers of various pressures. We consider the design and methods of calculation of recuperative and regenerative heat exchangers, deaerators, evaporation and crystallization plants, drying plants, distillation and distillation plants, absorption and adsorption apparatus.	5		v		v		v	v					
54	Calculation and projecting of electrical power networks and systems	The basic definitions. Selecting the nominal voltage. Selection of wire sizes. Making power lines equivalent circuit for the calculation of the steady state and the definition of its parameters. Selection of substation transformers. transformer parameters. Losses in transformers. Calculations and analysis of modes of closed and open electrical networks. Technical and economic calculations in electric networks of power. Mechanical calculation of wires and cables. Choosing supports, spans.	5		v			v	v	v					v
55	Relay protection of power systems	Expansion of views on the possibilities of relay protection; Fixing and concretization of theoretical material concerning the principles of operation and the device of relay protection, their basic properties, application techniques; Gaining the skills of calculating the parameters necessary for configuring relay protection; The correct choice of methods and means of relay protection; Evaluation of the efficiency and reliability of the selected relay protection.	5		v				v						v
56	Energy accumulation systems	All the main energy storage systems are considered, from gigantic and capital-intensive pumped storage stations, which in their idea are most suitable for joint use with renewable energy sources, to compact electrochemical systems of all basic types, including used and promising modifications of lithium batteries, fuel cells, redox accumulators and modern supercapacitors.	5				v	v			v				

57	Thermal machines and GTU	Students in the course of studying the discipline should acquire the knowledge and skills necessary for a free orientation in the practice of operating superchargers in production. The main cycles of heat engines are considered - Carnot, Renkin, Brighton, etc. The main attention is paid to the production of energy based on gas turbines.	6									v		v	
58	Technology of production of high-potential steam in TPP	Technological scheme of a steam boiler. Combined power plants. Technical characteristics of fuels and the efficiency of their use in the boiler. Combustion of gaseous, liquid fuel. The gorenje of a pulverized coal torch in the furnaces of steam generators. Heat exchange in boiler units. Thermal calculation and layout of steam boilers. The design of steam boilers. Energy steam boilers. Hydrodynamics of closed, open hydraulic systems. Environmental problems of fuel combustion	5								v		v	v	
59	Electric power networks and systems	Basic definitions. Electrical and power systems, electrical networks. Elements and construction of electrical networks. Elements and constructions of electrical networks. Practical methods of calculation of the established modes of electric networks and systems. Determination of capacity and energy losses in the elements of the electrical systems. Calculation of network dual feed at different voltages, power supplies of electricity and transmission quality. Setting voltage regulation in electric networks. How to change the control voltage power systems.	5				v							v	
60	Power and electrotechnical equimpment	The acquisition of students knowledge of the basics and trends in the development of energy and electrical equipment. Clearly understand the concept of providing consumers with electricity, understand the structure of energy and electrical equipment systems, the relationship between its various links, get an idea of the composition of electricity consumers in various sectors of the economy. Questions on the generalized electromechanical converter are considered. The device and principles of construction of electromechanic systems. Laws of electromechanics. Electrical insulation and cable technology.	4							v	v			v	
61	Industrial Energy Audit and Energy-	The following issues are discussed: regulatory framework for energy saving and its development trends, contractual relations	5							v		v			

	Saving	of consumers with energy supplying organizations and settlement of disputable situations, tariffs and price categories for electric energy, the structure of a mandatory energy audit and an algorithm for its implementation with the development of a program for energy efficiency hanging and filling in the energy passport of the consumer of fuel and energy resources. Special attention is paid to the calculation of energy efficiency indicators, the feasibility study of organizational, technical, investment energy saving measures and the development of a program to improve energy efficiency.													

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

SATBAYEV UNIVERSITY

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

WORKING CURRICULUM

Academic year	**2025-2026 (Autumn, Spring)**
Group of educational programs	**B062 - "Electrical engineering and energy"**
Educational program	**6B07101 - "Power engineering"**
The awarded academic degree	**Bachelor of engineering and technology**
Form and duration of study	**full time (shortened after TVET) - 3 years**

Discipline code	Name of disciplines	Block	Cycle	Total ECTS credits	Total hours	lek/lab/pr Contact hours	in hours SIS (including TSIS)	Form of control	Allocation of face-to-face training based on courses and semesters						Prerequisites
									1 course		2 course		3 course		
									1 sem	2 sem	3 sem	4 sem	5 sem	6 sem	
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-2. Module of physical training															
KFK103	Physical culture III		GED, RC	2	60	0/0/30	30	E	2						
KFK104	Physical culture IV		GED, RC	2	60	0/0/30	30	E		2					
M-5.Module of anti-corruption culture, ecology and life safety base															
HUM136	Fundamentals of anti-corruption culture and law	1	GED, CCH	5	150	30/0/15	105	E		5					
MNG489	Fundamentals of economics and entrepreneurship	1	GED, CCH	5	150	30/0/15	105	E		5					
PET519	Fundamentals of scientific research methods	1	GED, CCH	5	150	30/0/15	105	E		5					
CHE656	Ecology and life safety	1	GED, CCH	5	150	30/0/15	105	E		5					
MNG564	Basics of Financial Literacy	1	GED, CCH	5	150	30/0/15	105	E		5					
M-3. Module of information technology															
CSE677	Information and communication technology		GED, RC	5	150	30/15/0	105	E		5					
M-4. Module of socio-cultural development															
HUM137	History of Kazakhstan		GED, RC	5	150	15/0/30	105	GE	5						
HUM134	Module of socio-political knowledge (cultural studies, psychology)		GED, RC	5	150	30/0/15	105	E	5						
HUM132	Philosophy		GED, RC	5	150	15/0/30	105	E		5					
HUM120	Module of socio-political knowledge (sociology, political science)		GED, RC	3	90	15/0/15	60	E		3					
CYCLE OF BASIC DISCIPLINES (BD)															
M-6.Module of physical and mathematical training															
MAT103	Mathematics III		BD, UC	5	150	15/0/30	105	E	5						MAT102
M-7. Module of basic training of special disciplines in power engineering															
ERG176	Electrical and technical material scince		BD, UC	5	150	30/0/15	105	E	5						
ELC542	Theoretical Foundations of Electrical Engineering I		BD, UC	5	150	30/15/0	105	E	5						
ERG596	Theoretical fundamentals of heat engineering		BD, UC	6	180	30/0/30	135	E	6						
ELC543	Theoretical Foundations of Electrical Engineering II		BD, UC	5	150	30/15/0	105	E		5					
ERG110	Information and measuring technics	1	BD, CCH	5	150	30/15/0	105	E		5					
ERG401	Energy conversation in heat power and heat engineering	1	BD, CCH	5	150	15/15/15	105	E		5					
ERG530	Power supply of enterprises		BD, UC	5	150	15/15/15	105	E				5			ERG179
ERG521	Heat and mass transfer equipment in heat power engineering	1	BD, CCH	5	150	30/0/15	105	E				5			PHY112
ERG528	Electrotechnical and thermotechnical measurements	1	BD, CCH	5	150	30/15/0	105	E				5			

MNG562	Legal regulation of intellectual property	1	BD, CCH	5	150	30/0/15	105	E				5			
ERG433	Transition processes in energy systems	2	BD, CCH	5	150	30/0/15	105	E				5			ELC163
ERG533	Fundamentals of the theory of fuel combustion and the combustion device	2	BD, CCH	5	150	30/0/15	105	E				5			
CSE831	Fundamentals of Artificial Intelligence	2	BD, CCH	5	150	15/0/30	105	E				5			
ERG441	Electrical insulation and cable technology	1	BD, CCH	5	150	30/0/15	105	E					5		
ERG689	Quality of Electrical Energy	1	BD, CCH	5	150	30/0/15	105	E					5		
MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan	1	BD, CCH	5	150	30/0/15	105	E					5		
ERG447	Automated electric drive	2	BD, CCH	6	180	30/15/15	120	E					6		ERG168
ERG601	Electrical part of power stations	2	BD, CCH	6	180	30/0/30	135	E					6		
ERG559	Main Machinery Operation of Heat Power Plant	3	BD, CCH	5	150	30/0/15	105	E					5		
MNG533	Theory and practice of project management	3	BD, CCH	5	150	30/0/15	105	E					5		
ERG560	Modeling in power systems	3	BD, CCH	5	150	15/30/0	105	E					5		
M-7. Module of basic training of special disciplines in power engineering															
ERG669	Industrial electronics		BD, UC	5	150	15/15/15	105	E			5				
ERG526	Electric devices		BD, UC	5	150	30/15/0	105	E			5				ERG176
ERG153	Engineering Thermodynamics		BD, UC	5	150	30/0/15	105	E			5				PHY112
ERG673	Modern electric power industry		BD, UC	4	120	15/15/15	75	E			4				
CYCLE OF PROFILE DISCIPLINES (PD)															
M-8. Module of professional disciplines in power engineering															
AAP102	Production practice I		PD, UC	2				R		2					
ERG504	Laboratory workshop on modern industrial technologies in the electric power industry I		PD, UC	5	150	0/45/0	105	E			5				
ERG527	Electrical machines		PD, UC	5	150	30/15/0	105	E			5				
ERG562	Laboratory workshop on modern industrial technologies in the electric power industry II		PD, UC	4	120	0/45/0	75	E				4			
AAP183	Production practice II		PD, UC	3				R				3			
ERG178	Electric power networks and systems	1	PD, CCH	5	150	15/15/15	105	E				5			
ERG507	Blowers and temple engines	1	PD, CCH	5	150	30/0/15	105	E				5			ERG147
ERG563	Power and electrotechnical equimpment	2	PD, CCH	4	120	30/0/15	75	E				4			
ERG564	boiler plants and steam generators	2	PD, CCH	4	120	30/0/15	75	E				4			
ERG671	Renewable energy		PD, UC	6	180	30/0/30	120	E					6		
ERG571	Accumulation of electric and thermal energy		PD, UC	4	120	30/0/15	75	E					4		
ERG598	Lighting technology and lighting	1	PD, CCH	6	180	30/0/30	135	E					6		
ERG599	Thermal machines and GTU	1	PD, CCH	6	180	30/0/30	135	E					6		
ERG511	Calculation and projecting of power supply systems	2	PD, CCH	5	150	30/0/15	105	C					5		ERG448
ERG517	Calculation and projecting of electrical power networks and systems	2	PD, CCH	5	150	30/0/15	105	C					5		ERG178
ERG516	Calculation and Design of Heat Exchange Equipment	2	PD, CCH	5	150	30/0/15	105	C					5		
ERG510	Calculation and projecting of systems of automated electrical drive	2	PD, CCH	5	150	30/0/15	105	C					5		ERG447
ERG595	Relay protection of power systems	1	PD, CCH	5	150	15/15/15	105	E						5	
ERG124	Basics of electrical safety	1	PD, CCH	5	150	15/15/15	105	E						5	
ERG588	Steam-gas and gas-turbine facilities for heat and nuclear power plants	1	PD, CCH	5	150	15/15/15	105	E						5	
ERG450	Energy accumulation systems	2	PD, CCH	5	150	30/0/15	105	E						5	

ERG180	Industrial Energy Audit and Energy-Saving	2	PD, CCH	5	150	30/0/15	105	E						5	
ERG429	Industrial and domestic heat and power equipment	2	PD, CCH	5	150	30/15/0	105	E						5	
ERG502	Engineering design of electrical machines in the power industry	3	PD, CCH	5	150	15/0/30	105	C						5	ERG168
ERG672	Engineering design of electrical connection diagrams of power plants and substations	3	PD, CCH	5	150	30/0/15	105	C						5	
ERG522	Technology of production of high-potential steam in TPP	3	PD, CCH	5	150	30/0/15	105	E						5	
M-9. Module of final attestation															
ECA103	Final examination		FA	8										8	
Additional type of training (ATT)															
AAP500	Military training														
Total based on UNIVERSITY:									33	32	29	31	37	23	
									65		**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	27	0	5	32
BD	Cycle of basic disciplines	0	50	31	81
PD	Cycle of profile disciplines	0	29	35	64
Total for theoretical training:		**27**	**79**	**71**	**177**
FA	Final attestation				8
TOTAL:					**185**

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

Decision of the Academic Council of the Institute. Minutes № 3 dated 19.12.2024

Signed:

Governing Board member - Vice-Rector for Academic Affairs — Uskenbayeva R. K.

Approved:

Vice Provost on academic development — Kalpeyeva Z. Б.

Head of Department - Department of Educational Program Management and Academic-Methodological Work — Zhumagaliyeva A. S.

Director of the Institute - A.Burkitbaev Institute of Energy and Mechanical Engineering — Yelemesov K. .

Department Chair - Power Engineering — Sarsenbayev Y. .

Representative of the Academic Committee from Employers ____Acknowledged____ — Abdykalykov G. Y.