NCJS «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY

named after K.I.SATBAYEV»

Institute of Energy and Mechanical Engineering
Department of Power Engineering

EDUCATIONAL PROGRAM

6B07101 - «Power Engineering»

Code and classification of the field of education: **6B07 Engineering, manufacturing and construction industries**
Code and classification of training areas: **6B071 Engineering and Engineering**
Group of educational programs: **B062 Electrical Engineering and Power Engineering**
NRK level: **level 6**
ORC level: **level 6**
Duration of study: **4 years**
Volume of credits: **240 ECTS**

Almaty 2024

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

Educational program **6B07101-«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

Minutes # 06 dated «19» 04 2024.

Educational program **6B07101-«Power engineering»**
was developed by Academic committee based on direction «Engineering and Engineering»

Full name	Academic degree/ academic title	Post	Place of work	Signature
Chairman of the Academic Committee:				
Yelemessov Kassym	Candidate of Technical Sciences, Professor	Director of the Institute of Energy and Mechanical Engineering – Chairman of the Academic Committee	Kazakh National Research Technical University named after K.I.Satpayev, NCJS, mobile phone: **+77056011116**	
Teaching staff:				
Sarsenbayev Yerlan	Doctor of Philosophy PhD	Head of the Department, Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev, NCJS, mobile phone: **+77053157262**	
Hidolda Yerkin	Candidate of Technical Sciences	Associate Professor	Kazakh National Research Technical University named after K.I.Satpayev, NCJS, mobile phone: **+77021120211**	
Employers:				
Abdikalykov Galymzhan		General manager	Lighting Technologies Kazakhstan LLP, mobile phone: +77012252638	

Students:				
Danko Igor		2nd year doctoral student	Kazakh National Research Technical University named after K.I.Satpayev, NCJS, mobile phone: **+77053184203**	

Table of contents

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.

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 communi-cative communication in different situations - There are basics to acade-mic writing in their native language - Diagnostic language test	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 language where students have an advanced level. The level of language is determined by passing the diagnostic test	Department of Kazakh and Russian, Department of English
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	Reset Credits on Discipline Introduction to Information	Department of Software

		- Use software and applications to teach different disciplines	and Communication Technologies, Information and Communication Technologies	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 discuss ethical and moral aspects in society, culture and science	Re-credit for Kazakhstan's Modern History (excluding state exam)	Department of Public Discipline
		- 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.
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:* - theoretical and experimental research methods to create promising new directions in the field of electrical engineering and Power Engineering; - principles of work, specifications and design features of Power Engineering products developed and used; - standards, methodical and regulatory materials, design, installation and operation of electrical and thermal installations of the Power Engineering industry; *graduate should be able to:* - develop the principles of the organization and design of Power Engineering companies; - use application packages to calculate, model and automate Power Engineering systems design; - to formulate the basic feasibility and economic requirements for the Power Engineering systems being projected; - to organize the operation, installation and installation of electrical and thermal facilities. Training in this OP is completed by passing the state exam in the following disciplines or protection before the GAC diploma project (work).
13	Form of training	Daytime
14	Duration of training	4 years

15	Volume of loans	240 ECTS
16	Languages of instruction	State, russian
17	Academic degree awarded	Bachelor of Engineering and Technology in EP "6B07101-Power Engineering"
18	Developer(s) and authors:	Sarsenbaev Y.A., Khidolda Y.

	КК1
PO1	Apply basic knowledge in the field of ecology and life safety, the basics of an anti-corruption culture, entrepreneurship and leadership, the receptivity of innovations in various types of professional and socio-political activities
PO2	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.
PO3	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.
PO4	Develop principles for the organization and design of energy enterprises, use application packages for calculations, modeling and automation of the design of energy systems, formulate the main technical and economic requirements for the designed energy systems
PO5	Possess the skills and abilities to carry out research and innovation activities to develop new knowledge and procedures for integrating knowledge in various fields, correctly and logically formulate one's thoughts in writing and orally, put into practice theoretical knowledge in a specific field of energy
PO6	Use the skills of development and design on a modern elemental and technical base of energy systems and individual devices
PO7	Know the standards, methodological and regulatory materials, the basics of design, installation and operation of electrical and heat engineering installations in the energy industry.
PO8	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
PO9	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.
PO10	To be a specialist in conducting experimental studies of heat and power facilities
PO11	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.
PO12	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

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	PO8	PO9	PO10	PO11	PO12
1	Fundamentals of scientific research methods	Purpose: to form a systematic understanding of the methodology of scientific cognition among students; to develop scientific thinking skills; to form experience in organizing and conducting scientific research; to develop a competence-based approach to the use of methods and rules for conducting research in the field of mechanical engineering, related processes and their technologies. Contents: stages of scientific research, terms and concepts, methods of conducting an experiment, mathematical methods of processing research results. Concepts of engineering, laboratory and industrial experiment, bench research.	5				+								
2	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	+											
3	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: Content: 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	+											
4	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	5	+											

		field of its safety, ways to solve environmental problems; life safety in the technosphere, emergencies of a natural and man-made nature.													
5	Fundamentals of economics and entrepreneurship	The purpose of studying the discipline is to familiarize students with the basic principles of economic theory and entrepreneurial activity. The course includes the study of basic economic concepts, market mechanisms, management tools and key aspects of entrepreneurship, such as starting and managing a business, analyzing the market environment, financial planning, assessing risks and developing development strategies.	5	+											
6	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		+								+		
7	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	+									+		
8	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 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.	4										+	+	
9	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	+									+		
10	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	5			+		+							

		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.													
11	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			+		+							
12	Mathematics III	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			+		+							
13	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				+								+
14	Engineering Thermodynamics	The course provides a systematic exposition of physical kinetics with thermodynamics. All specific tasks are considered using common methods. The fundamental laws of thermodynamics are formulated based on a multi-year study of real bodies and processes. As well as the methods for solving specific problems of nonequilibrium statistical physics of kinetic phenomena in various systems (gases, liquids, solids, plasmas) are described. The consideration of processes in plasma, irreversible processes and the method of calculation of entropy production as a quantitative measure of irreversibility are of	5										+	+	

		particular interest.													
15	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	+				+							
16	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	+				+							
17	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, 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.	5		+										
18	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		+					+					
19	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		+					+					

20	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		+										
21	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		+										
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				+								
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											+	
24	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			+									+
25	Theory and practice of project management	The goal is for students to acquire knowledge in the field of theory and practice necessary for project management. Discipline topics: Project-oriented management system model, International project management standards, Project life cycle and organizational	5			+								+	

		structures, Project management processes, Project financial management, Project communications management, Project stakeholder management, Project risk management, Project procurement management, Project closure documentation													
26	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							+			+		
27	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			+	+								
28	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. Contents: 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	+											
29	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 various pressures.	5				+			+					
30	Fundamentals of sustainable development and ESG projects in Kazakhstan	Purpose: the goal is for students to master the theoretical foundations and practical skills in the field of sustainable development and ESG, as well as to develop an understanding of the role of these aspects in the modern economic and social development of Kazakhstan. Contents: introduces the principles of sustainable development and the implementation of ESG practices in Kazakhstan, includes the study of national and international standards, analysis of successful ESG projects and strategies for their implementation in enterprises and organizations.	5			+			+						

31	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							+					
32	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									+			
33	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						+						
34	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							+			+		
35	The quality of electrical energy	THE PURPOSE AND OBJECTIVE OF THE COURSE Training of a highly qualified specialist capable of performing the main tasks related to reliable and economical supply of electricity to consumers with its standardized quality, reliability and efficiency. BRIEF DESCRIPTION OF THE COURSE The main indicators of the quality of electrical energy. Reactive power compensation. The quality and performance of electricity. Voltage and frequency deviations. Asymmetry and non-sinusoidality. The norms of the SCE. KNOWLEDGE, SKILLS, AND SKILLS AT THE END OF THE COURSE Mastering the requirements of electrical energy quality indicators, the ability to calculate voltage and frequency deviations that ensure high-quality voltage at electric energy receivers	5								+	+			
36	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	5									+			+

		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 .													
37	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					+				+			
38	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						+			+			
39	Accumulation of electric and thermal energy	The discipline studies technologies that allow generating and storing thermal energy using new and renewable technologies. 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	4							+		+			
40	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	5								+	+			

		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.													
41	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								+	+			
42	Laboratory workshop on modern industrial technologies in the electric power industry II	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 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.	4						+		+				
43	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				+			+					

44	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					+			+				
45	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							+			+		
46	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									+	+		
47	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					+			+				
48	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							+	+				
49	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									+			

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								+	+			
51	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				+			+					
52	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 diagrams and routines; - - satisfying reliable transmission of electricity, providing high-quality voltage at electric energy receivers.	5			+									
53	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					+				+			
54	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	5						+			+			

		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.													
55	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					+	+						
56	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					+			+				
57	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								+				
58	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					+				+			
59	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											+	

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

SATBAYEV UNIVERSITY

APPROVED
Chairman of the Management Board-
Rector of Kazhtu named after K.Satpayev
_____ M.M. Begentaev
«___» 04 2024.

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

Educational program 6B07101 - "Power Engineering"
Group of educational programs B062 Electrical and Power Engineering

Form of study: full-time **Duration of study: 4 years** **Academic degree: Bachelor of Engineering and Technology**

Discipline code	Name of disciplines	Cycle	Total amount in Academic credits	Total hours	classroom volume of lek/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters							
								I course		II course		III course		IV course	
								1 semester	2 semester	3 semester	4 semester	5 semester	6 semester	7 semester	8 semester
CYCLE OF GENERAL EDUCATION DISCIPLINES (GED)															
M-1. Module of language training															
LNG 108	English language	GED, RC	5	150	0/0/3	105	E	5							
LNG 108	English language	GED, RC	5	150	0/0/3	105	E		5						
LNG 104	Kazakh (Russian) language	GED, RC	5	150	0/0/3	105	E	5							
LNG 104	Kazakh (Russian) language	GED, RC	5	150	0/0/3	105	E		5						
M-2. Module of physical training															
KFK 101-104	Physical Culture	GED, RC	8	240	0/0/8	120	Diferedit	2	2	2	2				
M-3. Module of information technology															
CSE 677	Information and communication technologies (in English)	GED, RC	5	150	2/1/0	105	E				5				
M-4. Module of socio-cultural development															
HUM 137	History of Kazakhstan	GED, RC	5	150	1/0/2	105	SE		5						
HUM 132	Philosophy	GED, RC	5	150	1/0/2	105	E				5				
HUM 120	Socio-political knowledge module (sociology, politology)	GED, RC	3	90	1/0/1	60	E				3				
HUM 134	Socio-political knowledge module (culturology, psychology)	GED, RC	5	150	2/0/1	105	E			5					
M-5. Module of anti-corruption culture, ecology and life safety base															
HUM 136	Fundamentals of Anti-Corruption Culture and Law	GED, CCH	5	150	2/0/1	105	E				5				
MNG 489	Fundamentals of Economics and Entrepreneurship														
MSM500	Scientific research methods														
CHE 656	Ecology and life safety														
MNG564	Basics of Financial Literacy														
CYCLE OF BASIC DISCIPLINES (BD)															
M-6. Module of physical and mathematical training															
MAT 101	Mathematics I	BD, UC	5	150	1/0/2	105	E	5							
PHY 111	Physics I	BD, UC	5	150	1/1/1	105	E	5							
PHY 112	Physics II	BD, UC	5	150	1/1/1	105	E		5						
MAT 102	Mathematics II	BD, UC	5	150	1/0/2	105	E		5						
MAT103	Mathematics III	BD, UC	5	150	1/0/2	105	E			5					
M-7. Module of basic training of special disciplines in power engineering															
ERG158	Reading electrical circuits	BD, UC	5	150	1/0/2	105	E	5							
ERG 556	Introduction to specialty	BD, UC	4	120	2/0/1	75	E	4							
ERG176	Electrical and technical material scince	BD, UC	5	150	2/0/1	105	E			5					
ELC542	Theoretical Foundations of Electrical Engineering I	BD, UC	5	150	2/1/0	105	E			5					
ERG596	Theoretical fundamentals of heat engineering	BD, UC	6	180	2/0/2	120	E			6					
2211	Elective	BD, CCH	5	150	2/1/0	105	E				5				
ELC543	Theoretical Foundations of Electrical Engineering II	BD, UC	5	150	2/1/0	105	E				5				
ERG669	Industrial electronics	BD, UC	5	150	1/1/1	105	E					5			
ERG526	Electric devices	BD, UC	5	150	2/1/0	105	E					5			
ERG153	Engineering Thermodynamics	BD, UC	5	150	2/0/1	105	E					5			
ERG673	Modern electric power industry	BD, UC	4	120	1/1/1	75	E					4			

ERG530	Power supply of enterprises	BD, UC	5	150	1/1/1	105	E						5		
3205	Elective	BD, CCH	5	150	2/0/1	105	E							5	
3206	Elective	BD, CCH	5	150	2/0/1	105	E						5		
3207	Elective	BD, CCH	6	180	2/1/1	120	E							6	
3208	Elective	BD CCH	5	150	2/0/1	105	E						5		
3209	Elective	BD CCH	5	150	2/0/1	105	E							5	
AAP173	Educational practice	BD, UC	2						2						
CYCLE OF PROFILE DISCIPLINES (PD)															
M-8. Module of professional disciplines in power engineering															
ERG504	Laboratory workshop on modern industrial technologies in the electric power industry I	PD, UC	5	150	0/3/0	105	E					5			
ERG527	Electrical machines	PD, UC	5	150	2/1/0	105	E					5			
ERG671	Renewable energy	PD, UC	6	180	2/0/2	120	E							6	
ERG562	Laboratory workshop on modern industrial technologies in the electric power industry II	PD, UC	4	120	0/3/0	75	E						4		
ERG571	Accumulation of electric and thermal energy	PD, UC	4	120	2/0/1	75	E							4	
3305	Elective	PD, CCH	5	150	1/1/1	105	E						5		
3306	Elective	PD, CCH	4	150	2/0/1	105	E						4		
4302	Elective	PD, CCH	6	150	2/0/2	105	E							6	
4303	Elective	PD, CCH	5	150	2/0/1	105	E							5	
4304	Elective	PD, CCH	5	150	1/1/1	105	E								5
4305	Elective	PD, CCH	5	150	2/0/1	105	E								5
4306	Elective	PD, CCH	5	150	1/0/2	105	E								5
AAP102	Production practice I	PD, UC	2								2				
AAP183	Production practice II	PD, UC	3										3		
M-9. Module of final attestation															
ECA109	Writing and defense of the thesis / project	FA	8												8
M-10. Module of additional types of training															
AAP500	Military affairs	ATT	0												
Total based on UNIVERSITY:								31	29	28	32	29	31	37	23
								60		60		60		60	

Number of credits for the entire period of study					
Cycle code	Cycles of disciplines	Credits			
		required component (RC)	university component (UC)	component of choice (CCH)	Total
GED	Cycle of general education disciplines	51		5	56
BD	Cycle of basic disciplines		81	31	112
PD	Cycle of profile disciplines		29	35	64
	Total for theoretical training:	*51*	*110*	*71*	*232*
FA	Final attestation	8			8
	TOTAL:	59	110	71	240

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

Decision of the Educational and Methodological Council of Kazntu named after K.Satpayev. Protocol № 6 "18" 04 2024 y.

Decision of the Academic Council of the Institute of 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**

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATBAYEV

SATBAYEV UNIVERSITY

ASSERT
Director Institute of Energy and Mechanical Engineering
K.K. Yelemessov
2024 .

ELECTIVE DISCIPLINES of the educational program on enrollment for the 2024-2025 academic year
Educational program 6B07101 - "Power Engineering"
Group of educational programs B062 Electrical and Power Engineering

Form of study: full-time Duration of study: 4 years Academic degree: Bachelor of Engineering and Technology

Year of study	Elective code according to the curriculum	Discipline code	Name of disciplines	Semester	Cycle	Credits	Total hours	lek/lab/pr	SIS (including TSIS) in hours
1	Module of basic training of special disciplines in power engineering								
	2211	ERG110	Information and measuring technics	4	BD, CCH	5	150	2/1/0	105
		ERG401	Energy conversation in heat power and heat engineering					1/1/1	
	3205	ERG441	Electrical insulation and cable equipment	7	BD, CCH	5	150	2/0/1	105
		MNG563	Fundamentals of sustainable development and ESG projects in Kazakhstan						
	3206	ERG521	Heat and mass transfer equipment in heat power engineering	6	BD, CCH	5	150	2/0/1	105
		ERG528	Electrotechnical and thermotechnical measurements					2/1/0	
		MNG562	Legal regulation of intellectual property					2/0/1	
	3207	ERG447	Automated electric drive	7	BD, CCH	6	180	2/1/1	120
		ERG601	Electrical part of power stations					2/0/2	120
	3208	ERG433	Transition processes in energy systems	6	BD, CCH	5	150	2/0/1	105
		ERG533	Fundamentals of the theory of fuel combustion and the combustion device						
		CSE831	Fundamentals of Artificial Intelligence					1/0/2	
	3209	ERG559	Main Machinery Operation of Heat Power Plant	7	BD, CCH	5	150	2/0/1	105
		MNG 533	Theory and practice of project management						
		ERG560	Modeling in power systems					1/2/0	105
2	Module of professional disciplines in power engineering								
	3305	ERG178	Electric power networks and systems	6	PD, CCH	5	150	1/1/1	105
		ERG507	Blowers and temple engines					2/0/1	
	3306	ERG563	Power and electrotechnical equimpment	6	PD, CCH	4	120	2/0/1	75
		ERG564	Boiler Plants and Steam Generators						
	4302	ERG598	Lighting technology and lighting	7	PD, CCH	6	180	2/0/2	120
		ERG599	Thermal machines and GTU						
	4304	ERG595	Relay protection of power systems	8	PD, CCH	5	150	1/1/1	105
		ERG588	Steam-gas and gas-turbine facilities for heat and nuclear power plants						
	4305	ERG450	Energy accumulation systems	8	PD, CCH	5	150	2/0/1	105
		ERG429	Industrial and domestic heat and power equipment					2/1/0	
	4306	ERG502	Engineering design of electrical machines in the power industry	8	PD, CCH	5	150	1/0/2	105
		ERG672	Engineering design of electrical connection diagrams of power plants and substations					2/0/1	
		ERG522	Technology of production of high-potential steam in TPP					2/0/1	
	The "R&D" module								
	4303	ERG511	Calculation and projecting of power supply systems	7	PD, CCH	5	150	2/0/1	105
		ERG517	Calculation and projecting of electrical power networks and systems						
		ERG516	Calculation and Design of Heat Exchange Equipment						
		ERG510	Calculation and projecting of systems of automated electrical drive						

Number of credits for the entire period of study	
Cycles of disciplines	**Credits**
Cycle of basic disciplines (B)	**31**
Cycle of profile disciplines (P)	**35**
Total:	**66**

Decision of the Scientific Council of the Institute Protocol № 4 "18" 01 2024

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

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