



Institute of Energy and Mechanical Engineering
Department of Power Engineering

EDUCATIONAL PROGRAM

6B07127 - «Ground electric transport and charging
infrastructure»
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 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**

Almaty 2025

Educational program **6B07127 - «Ground electric transport and charging infrastructure»** was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

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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 **6B07127 - «Ground electric transport and charging infrastructure»** was developed by Academic committee based on direction "Engineering and Engineering"

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Table of contents

- List of abbreviations and designations
- 1. Description of the educational program
- 2. The purpose and objectives of the educational program
- 3. Requirements for evaluating the learning outcomes of an educational program
- 4. Passport of the educational program
- 4.1. General information
- 4.2. The relationship between the achievability of the formed learning outcomes according to the educational program and academic disciplines
- 5. Curriculum of the educational program

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 educational program

Educational program designed to train personnel for work in production shops and engineering departments of companies manufacturing ground electric vehicles; companies for the manufacture, installation and operation of charging infrastructure; transport companies for the operation of: electric vehicles, electric buses, electric cars, etc.; service centers for the operation and repair of personal mobility equipment: electric scooters, electric skateboards, gyro scooters, segways, unicycles and other similar devices; as well as in production laboratories for energy and environmental expertise.

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

In case of successful completion of the full undergraduate course, the graduate is awarded the academic degree "Bachelor of Engineering and Technology in Ground Electric Transport and Charging Infrastructure ".

The volume of mathematical, natural science, basic and language disciplines has been increased in the educational program. Specialized disciplines have been added, which can be divided into two groups: disciplines in electric transport and charging infrastructure, as well as disciplines in alternative energy. The result was an educational program that has innovative and practical content and is aimed at implementing the Digital Kazakhstan program.

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

- Electric vehicles and electrical special equipment;
- Chargers for electric vehicles;
- Energy of electric transport;
- Organization of charging infrastructure for electric transport;
- Fundamentals of technical diagnostics of electric vehicles;
- Unmanned control in electric transport;
- Charging infrastructure management systems;
- Hybrid energy complexes (HEC) based on RES with different types of charging stations.

In the process of mastering the educational program, the Bachelor of Engineering and Technology in the field of electric transport and charging infrastructure should have the following key competencies.

The bachelor must:

have an idea:

about modern ground electric transport and charging infrastructure for electric transport, autonomous power sources and renewable energy facilities, about promising directions for the development of energy;

- about modern approaches in the calculation and design of electric transport charging infrastructure systems, as well as the use of software tools for managing and evaluating energy systems;

- about modern electrical means of individual mobility: electric scooters , electric skateboards , hoverboards , segways, unicycles , etc.) .

know:

- theoretical and experimental research methods in order to create new promising areas in the field ground electric transport ;
- principles of operation, technical characteristics and design features of the developed and used electric means of individual mobility;
- standards, methodological and regulatory materials, design basics, installation and operation of electric transport charging infrastructure installations ;
- modern and perspective directions of development ground electric transport , principles of operation, technical characteristics and design features of the developed and used electric means of individual mobility .

be able to:

- to develop the principles of organization and design of modern ground electric transport ;
- use application software packages for calculations, modeling and automation of the design of electric transport charging infrastructure systems ;
- use theoretical information on the organization of the technological process of interaction between the energy network and charging station systems;
- apply methods to improve the economic efficiency of energy systems through the use of new renewable energy sources, methods for calculating solar and wind generation;
- solve the main issues of introducing RES systems into the power system , design features of internal autonomous power supply systems ;
- and use methods for calculating an automated electric drive.
- apply the methods and means of measurement used in the consumption of electrical energy in electric transport and in the charging infrastructure;
- use energy and resource-saving technologies, conduct a preliminary feasibility study of design calculations ;
- to carry out calculations on expenses electricity in electric transport .

have skills:

- formulations of the main technical and economic requirements for the designed charging infrastructure systems and electric vehicles ;
- organization of work on the operation, installation and adjustment of ground electric vehicles and means of individual mobility;
- development and design on a modern elemental and technical base of energy systems and individual devices of the charging infrastructure.
- owns modern methods and devices for control and accounting of energy carriers .
- calculate energy losses during mechanical transmission and determine electrical losses in charging stations .

During the training, production practices are provided at such enterprises as: PoliTechElectronics LLP, EZS Operator LLP, Metropolitan State Enterprise, Almatyelectrotrans LLP , Jet Sharing LLP and others.

2. Purpose and objectives of the educational program

Purpose of the EP: The purpose of the educational program is to teach students general education, basic and profile disciplines with the achievement of relevant competencies. Preparation of bachelors with professional knowledge in design, installation, operation and repair of ground electric transport, means of individual mobility, energy sources for settlements, who have an idea of the classical and new directions of modern energy and environmental technologies, and are able to apply the knowledge gained in scientific, practical and industrial activities .

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 11: Sustainable Cities and Communities: Investing in infrastructure development will help achieve sustainable development.

SDG 13: Climate Action: Climate change knows no borders and requires a global solution.

Tasks of the EP: Theoretical and practical training of bachelors of highly qualified electric transport workers, capable of performing the tasks of the entire complex of engineering issues of modern land-based electric transport, using modern computer technology and introducing new technologies in design.

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

Admission to the university is carried out at the request of an applicant who has completed in full secondary, secondary special education 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 admission requirements for the program apply to graduates of 12 summer schools, colleges , applied baccalaureate programs, NIS, etc. Such applicants must pass diagnostic testing in English, mathematics, physics and special disciplines.

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

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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 auditory 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 auditory academic loans). With a positive test of diagnostic test level Physics 1, General Chemistry, at negative - the level of the Beginning	Departments in the fields of natural sciences

			of Physics and basic basics of chemistry	
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	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

		- cognitive ability to formulate a scientific understanding of the forms of existence of matter, its interaction in nature		
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 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	Re-credit for general engineering disciplines (engineering graphics, outline geometry,	Releasing chair

		solve general engineering problems and problems - be able to use application packages to process experimental data, solve algebraic and differential equation systems	electrical engineering basics, microelectronics basics.)	
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 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	Ground electric transport and charging infrastructure
5	Brief description of the educational program	The educational program is designed to train personnel for the production and engineering departments of power plants and substations, industrial production enterprises in the energy, construction, transport, metallurgical, mining, oil and gas industries and in the housing and communal services industry, as well as in secondary specialized educational institutions. The specialty and specialization program area covers engineering and engineering. 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 energy".

		The educational program has increased the volume of mathematical, natural science, basic and language disciplines. Specialized disciplines have been added, which can be divided into three groups: disciplines in the electric power industry, disciplines in digital management and disciplines in programming. As a result, we have an educational program that has innovative and practical content and is aimed at implementing the Digital Kazakhstan program.
6	Purpose of the OP	The purpose of the educational program is to teach students general education, basic and profile disciplines with the achievement of relevant competencies. Training of bachelors with professional knowledge in the design, installation, operation and repair of power plant equipment, power supply sources for industrial enterprises, cities and agriculture, with an understanding of the classical and new areas of modern energy and environmental technologies, and able to apply the knowledge gained in scientific, practical and production activity. 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 11: Sustainable Cities and Communities: Investing in infrastructure development will help achieve sustainable development. SDG 13: Climate Action: Climate change knows no borders and requires a global solution.
7	Type of OP	New
8	The level of the NRK	6 level
9	ORC Level	6 level
10	Distinctive features of the OP	No
11	List of competencies of the educational program:	A - knowledge and understanding: A1 - methods for constructing electrical, technological and functional diagrams for the design of electric power systems; A2 - modern trends in the development of technical and technological systems of energy facilities; A3 - standards, methodological and regulatory materials accompanying the operation, installation and commissioning of electric power facilities; A4 - the basics of programming, to create control systems for electrical systems. B - application of knowledge and understanding: B1 - independent work and the proposal of various options for solving professional problems using theoretical and practical knowledge; B2 - for organizing work on the installation, commissioning and operation of electric power systems; B3 - for the organization of work on the collection, storage and processing of information used in the field of professional activity.

	C - the formation of judgments: C1 - about modern facilities of the energy industry and process control systems; C2 - on the use of modern systems of autonomous energy supply for various categories of consumers; C3 - on modern technical devices and technological equipment of energy facilities (devices, apparatus, equipment, actuators, etc.); C4 - about modern application programs used in energy systems; D - personal abilities: D1 - to be an energy engineer, an electrical engineer of the production unit for the operation of energy systems; D2 - to be a specialist in maintenance of electrical networks and systems; D3 - to be an engineer of the production unit for the repair of electrical and electrical installations; D4 - to be able to organize work on the adjustment of energy and electromechanical installations of industrial enterprises. <i>Competencies upon completion of training</i> B - Basic knowledge, skills and abilities: B1 - capable of philosophical analysis of social phenomena, behavior of the individual and other phenomena. Ready to conduct a philosophical assessment of social phenomena; B2 - know and apply in practice the basics of engineering professional ethics; B3 - be able to analyze the actual problems of the modern history of Kazakhstan. P - Professional competencies, including in accordance with the requirements of industry professional standards: P1 - a wide range of theoretical and practical knowledge in the professional field; P2 - able to analyze and solve problems on the basics of electrical engineering and automatic control; P3 - is able to analyze electrical, electrical and wiring diagrams of technological production. Ready to install, adjust and operate electrical installations and systems. M - Universal, social and ethical competencies: O1 - is able to use English fluently as a means of business communication, a source of new knowledge in the field of electrical engineering and energy. Ready to use English in professional activities in the field of energy; O2 - is able to speak Kazakh (Russian) fluently as a means of business communication, a source of new knowledge in the field of electrical engineering and energy. Ready to use the Kazakh (Russian) language in professional activities in the field of energy; O3 - to know and apply in work and life the basics of applied ethics and ethics of business communication; O4 - know and apply the basic concepts of professional ethics; O5 - know and apply in practice the "engineer's code of ethics"; O6 - to know and solve the problems of human impact on the environment. C - Special and managerial competencies:
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		C1 - independent management and control of the processes of labor and educational activities within the framework of the strategy, policy and goals of the organization, discussion of the problem, argumentation of conclusions and competent handling of information; C2 - in the field of organizational and managerial activities: to be the head of the group of the unit for the operation, installation and repair of power plants in various industries; C3 - in the field of experimental research activities: to be a specialist in conducting experimental research of electric power facilities; C4 - in the field of research activities: to be an engineer in a scientific laboratory for research and development of modern power plants and systems in various industries; C5 - in the field of design and development: to be an engineer for the development and design of electric power plants and systems in various industries.
12	Learning outcomes of the educational program:	Obligatory standard requirements for graduation from a university and awarding an academic degree of a bachelor: mastering at least 240 academic credits of theoretical training and a final thesis or a state exam in a specialty. Special requirements for graduation from this program <i>the graduate should know:</i> - theoretical and experimental methods of research in order to create new promising areas in the field of energy; - principles of operation, technical characteristics and design features of the energy devices being developed and used; - standards, methodological and regulatory materials, basic design, installation and operation of electrical installations in the energy industry; <i>the graduate should be able to:</i> - to carry out and design power supply plans for energy enterprises; - use application software packages for calculations, modeling and automation of the design of energy systems; - to formulate the main technical and economic requirements for the designed energy systems; - organize work on the operation, installation and adjustment of electrical devices and equipment. The training in this EP ends with the passing of the state exam in the following disciplines or the defense of the diploma project (work) before the SAC. To show the results of inclusive and equitable quality education that allows achieving sought-after and effective learning outcomes based on equal access to all levels of education and vocational training for vulnerable segments of the population, including people with disabilities, indigenous peoples and students in vulnerable situations (According to SDG 4). To show knowledge about society as an integral system and a person, the role of spiritual processes in modern society, the legal interests of the parties in the field of protecting the rights of

	individuals and legal entities, economic and social conditions for doing business. Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries (According to SDG 13). To have basic knowledge in the field of natural sciences, contributing to the solution of professional tasks in the field of electric transport and the formation of a highly qualified specialist with technical competencies. Have a clear understanding of modern materials science. To study and be able to determine the properties of electrical and structural materials used in electric transport. To form knowledge, skills and abilities in the field of application of electrical materials in ground electric transport. To provide practical experience in testing electrical and structural materials in the operation of electric vehicles. Calculate the main parameters of electric transport and charging infrastructure. Determine the most effective traction current sources used in electric vehicles, electric buses and other electric vehicles. Be able to calculate the performance characteristics of batteries and charging stations. Be able to make calculations on the consumption of electric energy on electric transport. Apply methods for calculating electrical parameters of electric drives of electric vehicles. Perform electrical calculations of the traction electric drive and its elements. To select a traction motor and a power converter. Determine the influence of movement, mass, and path profile on the parameters of an electric vehicle, electric bus, and other ground-based electric vehicles. Be able to put into practice and develop achievements in the field of modern electric transport technologies. Have the competencies to create a modern charging infrastructure and improve the energy efficiency of ground electric vehicles. Independently process and make the right decisions when creating or mastering new technologies and materials. Use knowledge of basic disciplines and understand the physical essence of the processes occurring in the facilities of electric transport equipment and charging stations. Be able to organize training on ensuring the safety of life and labor protection, organization of civil protection, ensuring safety from environmental and industrial factors of harmful and dangerous factors on humans and the natural environment. To put into practice the skills of providing first aid to victims in emergency situations to reduce the losses of the population and personnel of energy and electric transport facilities. Possess ways to ensure access to affordable, reliable, sustainable and modern energy sources for all, allowing for a significant increase in the share of renewable energy sources in the global energy mix (According to SDG 7). Possess methods of calculation, design and regulation of systems of production, distribution and consumption of electric energy. Be able to develop rational and economically sound power
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		supply systems for facilities. Use methods for calculating energy supply and energy saving. Develop energy-saving measures. Use theoretical information on the organization of the technological process of renewable energy generation to significantly increase the share of renewable energy sources in the global energy balance (According to SDG 7). Use theoretical information on the organization of the technological process of generating electricity on renewable energy sources. Perform calculations of the characteristics of renewable energy sources, calculations of solar insolation and wind energy potential. Perform calculations of solar-wind and bioenergy installations. Be able to carry out the calculation, design, selection of equipment, installation, commissioning and operation of hybrid power complexes for charging infrastructure. Calculate the charging process and put into practice theoretical information on the organization of charging infrastructure. To use methods of increasing the economic efficiency of charging electric vehicles, methods of calculating electrical devices, techniques for using electronic equipment and charging infrastructure systems. Solve the main issues of electric transport and charging infrastructure systems. Apply methods of calculation and analysis of design and technological factors affecting the efficiency of electric transport charging processes. Apply information technology to solve engineering problems by computer processing methods. Be able to use computer technologies in devices of ground electric transport and charging infrastructure. Develop programs for processing digital information using modern software products and technologies. To make constructive, verification and aerodynamic calculations of electric vehicles and means of individual mobility. Be able to use energy- and resource-saving technologies, conduct a preliminary feasibility study of design calculations. Be able to use standardization techniques to unify and disseminate the best practices of leading manufacturers. To carry out certification of electric vehicles in order to protect consumers from potentially dangerous products for human health and the environment. Apply methods and measuring instruments used in the production and consumption of electrical energy. Be able to use electrical and electronic devices of ground electric transport. Possess methods for calculating linear electrical and resonant circuits, transient and impulse characteristics.
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 in EP "6B07127-Ground electric transport and charging infrastructure"
18	Developer(s) and authors:	Sarsenbayev E.A., Bayanbayev K.A.

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Пәннің атауы	Пәннің қысқаша сипаттамасы	Кол-во кредиты	Қалыптастырылатын оқыту нәтижелері (кодтар)														
				LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10	LO11	LO12	LO13	LO14	LO15
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: 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		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	5	v			v											

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		financial products to choose adequate investment strategies.																
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	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.	4					v		v								
7	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	4				v			v								

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		possibilities of using renewable energy sources to charge electric vehicles.																
8	Engineering and computer graphics	Purpose: To develop students' knowledge of drawing construction and skills in developing graphical and textual design documentation in accordance with standards. Content: Students will study ESKD standards, graphic primitives, geometric constructions, methods and properties of orthogonal projection, Monge's projection, axonometric projections, metric tasks, types and features of connections, creating part sketches and assembly drawings, detailing, and creating complex 3D solid objects in AutoCAD.	5									v						
9	Construction and arrangement of ground electric transport	The discipline studies the following issues: engine; transmission and chassis; steering and braking control of cars and ground electric transport; general structure and technical characteristics of cars and ground electric transport; purpose and types of various systems; body; steering drive and braking system; convergence and collapse of controlled wheels; purpose of braking systems; analysis of structures and calculation of transmission mechanisms of ground electric transport.	5			v	v		v									
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 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													
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.	5		v													

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		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_																
12	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													
13	General course of ground electric transport	The discipline studies the issues of the essence of electric transport and its role in the development of society, the economic, state and social significance of electric transport, the concept of transport costs, the role of transport in globalization, integration and international specialization of regions, the concept of transport process, indicators of the capacity of technical equipment of transport.	6			v			v									
14	The theoretical mechanics	The purpose of the discipline is to form the foundations of engineering thinking among students by studying the basics of mechanics and mastering the basic principles and laws of theoretical mechanics The content of the discipline: the basic laws of mechanical motion and mechanical interaction of material bodies; the basic concepts of the law of mechanics, methods for studying the equilibria of motion of a material point, a solid and a mechanical system	5		v		v											

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15	Theoretical Foundations of Electrical Engineering	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.	6															
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												
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												
18	Chemical energy sources for electric transport	The discipline considers various power sources for electric vehicles. Classification and principles of operation of chemical current sources. Types of chemical current sources. Electric batteries. Fuel cells.	4				v										v	

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		Lead-acid batteries. Nickel-cadmium and nickel-metal hydride batteries. Lithium-ion batteries. Sodium-sulfur batteries.																
19	Electrical and electronic devices	Classification of electrical apparatus and the requirements imposed on them. Electrical contacts. Electromagnets. 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 devices. Disconnectors, isolators and short-circuiting switches. Reactors, arresters. Measuring current and voltage transformers.	5											v				v
20	Electrical measurements	Basic concepts of measurements and units of physical quantities. The main types of measuring instruments and their classification. Measurement methods. Metrological indicators of measuring instruments. Types and methods of determining measurement errors. The principle of operation of devices for the formation of standard measuring signals. The influence of measuring instruments on the accuracy of measurements. Methods and methods of automation of current, voltage and power measurements.	5			v										v		v
21	Electrical and technical material science	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												
22	Electric car high voltage traction battery	The discipline considers the battery of an electric car as the main source of energy that drives the wheels. The need for a high-voltage battery for an electric car. Types of elements used in electric vehicle batteries. Battery electronics management issues. The device of	6									v				v		

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		the battery compartment housing. The process of discharging the battery. The battery life of the electric vehicle and the rules of use. Issues of battery recycling.																
23	Electric vehicle chargers	The discipline studies the device, the principle of operation of charging systems of alternating (AC) and direct (DC) current. Forms an idea of the charging stations of the world's major manufacturers present on the market. Considers the main types of installation of charging stations: - Wall-mounted (for private households or office parking lots); - Mobile with parameters similar to wall-mounted; - Stationary high-power charging stations.	5							v				v				
24	Integrated and microprocessor circuitry in electric transport	In the process of studying the discipline, the issues of the device and principles of operation of microprocessor and converter technology are considered. The information about the circuit principles of operation of automation tools intended for conversion and storage is studied information. The structures of microprocessors and the element base for constructing microprocessor systems are considered.	5			v												v
25	Computer diagnostics in electric transport	Overview of the electronic control system. Subsystems and main functions of computer diagnostics of electronics. Self-diagnosis. Engine diagnostics. Introduction to Diagnostics Types of Engine Diagnostics. The need for an OBD (On-Board Diagnostic) and its types. General requirements. Management of the diagnostic system. Individual transmission of diagnostic data between the electronic system of an electric vehicle, based on the model: «Diagnostic control - Diagnostics of various systems».	5						v			v						
26	Ensuring the safety of ground electric transport	The discipline studies the issues of ensuring transport security in Kazakhstan, features of the structure of transport security management, regulatory legal acts of Kazakhstan regulating issues of ensuring transport security, requirements for ensuring transport security, security levels of transport infrastructure facilities and	5								v							

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		ground electric vehicles, general information about transport infrastructure facilities and ground electric vehicles.																
27	Organization of charging infrastructure for electric transport	The discipline "Organization of charging infrastructure for electric transport" is a variable discipline that forms students' readiness for the practical use of skills and work skills. Examines the problems of infrastructure development for eco-friendly modes of transport. The growth rates of the number of electric vehicles in foreign countries and the level of infrastructure development for charging stations are estimated. Their classification and features of architectural solutions are given. The necessity of studying user scenarios when designing the infrastructure of charging stations for the purpose of their most efficient placement is substantiated.	5						v					v				
28	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			
29	Fundamentals of technical diagnostics of electric vehicles	The course occupies an important place among general technical disciplines that determine the theoretical level of professional training of specialists in the modern education system. The main objectives of the course are the formation of knowledge in the field of technical diagnostics of electric vehicles; mastering the skills and abilities to assess the functional, quantitative and qualitative characteristics of electric vehicles. The discipline examines the main equipment of electric	5									v						v

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		vehicles. The issues of repair and reliability of equipment are touched upon.																
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								v						v	
31	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			
32	Electric vehicle drive	The general structure and principle of operation of transmissions of electric vehicles and hybrid cars. Study of the principle of operation of the electric vehicle engine, the device of the rotor and stator of the electric motor. Types of electric motors of electric vehicles: asynchronous, synchronous electric motors; motor-wheel. The general structure of the car	5					v					v					
33	Design of electric transport and charging infrastructure	The discipline studies the basics of designing electric, unmanned and connected transport, energy supply systems of the transport system, electrical equipment and transport infrastructure networks, on-board sources and energy storage of vehicles, power converters and traction electric drive, electric and unmanned rolling	5									v		v				

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		stock of urban public transport, hybrid cars, electric vehicles and charging stations.																
34	Production of electric vehicles	This discipline presents the basics of designing electric vehicles, electric buses and other electric means of individual mobility. The course is devoted to the design of mechatronic systems and components of electric vehicles based on the requirements for energy consumption management, power conversion and, consequently, to the dynamics of the vehicle and its energy efficiency. Mechanical transmission design issues are considered in combination with electric drive design. The course covers the design of batteries and energy storage devices, power electronics of vehicles.	5						v	v								
35	Electric vehicle control systems	The discipline studies electronic car control systems and their purpose. Modules, drives and sensors included in the electronic control system of the car and their application. Special sensors that allow you to measure specific parameters of the engine. Electronic means for controlling suspension kinematics, lateral stability stabilizers, damping and elastic suspension elements.	5													v		v
36	Standardization and certification of electric vehicles and charging infrastructure	Within the framework of the discipline, the issues of systematization and expansion of knowledge in the field of standardization and certification of ground electric transport are considered; the formation of competencies for the assessment, selection and effective use of measurement methods and tools for solving problems of efficient production, operation and repair of electric vehicles, electric loaders, electric buses, as well as new means of individual mobility.	5						v									
37	Technical operation and maintenance of ground electric transport	The discipline studies the issues of technical operation and maintenance of ground electric transport, maintenance and repair systems, and the issues of changing the composition of the transport fleet in Kazakhstan, the organization of technological processes of maintenance, operation and repair of cars	5													v		v

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		in motor transport enterprises. The discipline reveals the issues of workplace and workstation layout, the use of technological maps in the process of maintenance and repair.																
38	Economy of electric transport	The issues of the economy of ground electric transport, its features in comparison with the economies of other industries, the importance of electric transport in the development of the economy and the structure of public production of the city, the position of ground electric transport in the market management system are considered. The discipline uses mathematical apparatus, computing systems, forecasting and planning methodology based on the wide application of information technologies.	5						v									
39	Electronics	The discipline studies the main technical parameters of semiconductor devices and microelectronic technology, the principles of their operation and purpose. Basic information about electro-vacuum and semiconductor devices, rectifiers, oscillatory systems, antennas; amplifiers, generators of electrical signals; general information about the element base of circuitry (resistors, capacitors, diodes, transistors, microchips, optoelectronics elements); digital-analog and analog-to-digital converters.	6													v		v
40	Electric transport power engineering	The discipline examines the general principles of electric traction and traction systems. Traction and braking force. Power and power consumption requirements. Power and auxiliary systems for conventional light and heavy road vehicles. Power and auxiliary systems for electric and hybrid vehicles. Power engineering of ground vehicles: electric drives, transformers and converters, control system and mechanical transmission.	6										v		v			
41	Laboratory workshop on modern charging	Stationary charging stations. Mobile charging stations. Contactless charging technologies: wireless charging and battery charging stations. Charging with alternating	4									v		v				

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	technologies of electric vehicles	current. Direct current charging. Communication and management of the charging process.																
42	Laboratory workshop on modern computer technologies in the electric vehicle industry	Development of electric vehicles based on digital twin technology. Digital design; mathematical and computer modeling; verification and validation; system engineering and model-oriented system engineering; computer and supercomputer engineering; digital engineering; virtual tests, virtual stands and virtual polygons; artificial intelligence, big data, blockchain and others.	5						v			v						
43	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.	6													v		v
44	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									

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45	Power and electrotechnical equipment	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							
46	Unmanned control in electric transport	The discipline studies the creation of unmanned electric vehicles and their support systems in urban planning conditions. Modeling the movement of a vehicle with a multifactorial effect on the movement of a vehicle. Motion planning algorithms using the capabilities of intelligence and control tools, such as machine learning and neural networks.	5							v			v					
47	Renewable energy sources in electric transport	The discipline studies the use of renewable energy sources in electric transport. Basic concepts and prospects for the development of solar vehicles. Representatives of the family of solar vehicles. Solar and wind systems of charging stations of ground electric transport. The composition of the equipment and the principle of operation of charging stations using renewable energy sources.	5										v			v		v
48	Hybrid energy complexes based on renewable energy sources with different types of charging stations	The discipline studies the use of solar and wind charging stations. Hybrid energy complexes, their typical schemes and configurations, the composition of the equipment used, economic aspects of practical application. The use of hybrid systems based on renewable for decentralized power supply in rural areas and remote facilities, as well as to ensure the accumulation of excess electrical energy, removal of peak loads during the operation of seasonally and	5										v			v		

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		weather-dependent renewable energy sources of high capacity.																
49	Charging stations for electric vehicles based on renewable energy sources	Infrastructure of charging stations for electric vehicles. Efficiency of RES use for ground electric transport. The main types of charging stations and charger connectors. Autonomous charging station for electric vehicles. Types of renewable energy installations that can be used to recharge electric vehicles. Types of charging stations: 1) for charging electric vehicles at night, located near residential buildings or night public institutions; 2) for charging during the day, located in parking lots near residential and municipal buildings; 3) stations located at gas stations used both during the day and at night.	5										v	v	v		v	
50	Power sources of autonomous electric transport	The discipline studies the device and the principle of operation of autonomous electric transport power sources: lithium batteries, batteries with molten salt, air-zinc batteries, nickel-based structures and others. Maintenance of batteries. Increasing the resource and energy efficiency of batteries.	4						v	v								
51	Methods of calculation and design of traction batteries	Determination of the amount of hydrogen released and alkali aerosols when charging traction alkaline batteries and rechargeable batteries. Determination of the amount of hydrogen released and acid aerosols when charging traction acid batteries and rechargeable batteries. Calculations to determine the category of the charging room for explosion and fire hazard for traction batteries. Alkaline batteries. Acid batteries. Traction alkaline batteries and rechargeable batteries for MNBET. Traction acid batteries and rechargeable batteries for MNBET. Nomenclature of charging rectifiers for traction batteries.	5							v			v					
52	Methods of calculation and design of DC and AC electric motors	The general issues of designing electric machines are considered. Determination of the main dimensions of the machine. Determination of the main dimensions of the machine. Determination of the main dimensions of	5					v					v					

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		the machine. Design of a single machine and a series of machines. The impact on the size of the machine of the main operational requirements of ground electric transport. Calculation of the magnetic circuit of an electric machine. Losses and efficiency. thermal and ventilation calculation of electric machines. Design of asynchronous machines. Design of synchronous machines. Design of DC machines. Computer-aided design systems for electric machines.																
53	Power electronics in electric transport	The discipline studies the use of power energy converters in electric transport. Fundamentals of power electronics. Parameters of semiconductor devices. Schemes of controlled and unmanaged rectifiers. The device and principles of operation of inverters and frequency converters.	5									v		v				v
54	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					
55	Calculation and design of ground transport charging systems	The discipline examines the problems of practical calculation of electrification of the transport sector. The charging infrastructure of passenger cars is currently under development. Consideration of factors that can make it profitable to use batteries in combination with well-planned charging infrastructure. Calculation of the cost for connecting to the power grid. The impact on the power grid when replacing conventional cars with	5											v		v		

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		electric ones. The need to adjust the charging time so as not to increase peak loads and losses in the system.																
56	Repair and maintenance of electric vehicles	The discipline studies the features of maintenance and repair of electric vehicles, electric buses, electric loaders and other means of individual mobility. Analysis of the technical condition of electric vehicles. The design, device and principle of operation of ground electric vehicles. Formation of practical skills of repair and maintenance of electric vehicles.	5						v									v
57	Charging infrastructure management systems	The basics and types of charging infrastructure management systems are considered. Communication of components of charging stations and service systems. Description of the functions of the charging controller Organization of the Master-Slave management system. Load management in the local charging network. Dynamic power management systems. Uniform power distribution mode.	4						v	v				v				
58	Technology of production and repair of ground electric transport	The discipline studies the following issues: technology of production of cars and ground electric transport; technology of repair of electric cars and ground electric transport; technological processes of manufacturing parts; modern methods of restoration of parts; repair methods for various types of destruction.	5				v		v	v								
59	The device of electric vehicles	The discipline studies the basic equipment and device of electric vehicles. Traction batteries. Electric vehicle transmissions. Onboard chargers. Inverters. DC converters. Electronic control systems. Input sensors.	6				v		v	v								
60	Economics of electric transport and charging infrastructure	The issues of the economy of ground electric transport and charging infrastructure, its features in comparison, the importance of electric transport in the development of the economy and the structure of public production of the city are considered. Prospects for the development of ground electric transport and charging infrastructure in the market management system. The use of mathematical apparatus, computer programs,	6						v				v					

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		forecasting and planning methodology based on the widespread use of information technologies.																
61	Special purpose electric transport	The discipline studies special purpose vehicles with electric drive. Electric vehicles of category L6, L7, electric rickshaws and sequential hybrids, electric buses, electric loaders, electric trucks, etc.	5			v	v								v			
62	Electrical equipment of ground electric transport	The discipline studies the following issues: power supply systems of ground electric transport; start-up and lighting systems and light signals; classification and composition of electrical equipment; The discipline reveals the classification of battery ignition systems, the features of the elements of the electronic engine control system, the device of traction vehicles and electrical equipment of ground electric transports, the description of electromagnetic processes in power circuits and transport control systems, the selection and calculation of electrical devices, structural diagrams of automatic speed control systems of transport.	5													v		v



WORKING CURRICULUM

Academic year	2025-2026 (Autumn, Spring)
Group of educational programs	B062 - "Electrical engineering and energy"
Educational program	6B07127 - "Ground electric transport and charging infrastructure"
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-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						
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						
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 ground electric transport and charging infrastructure																
ERG176	Electrical and technical material science		BD, UC	5	150	30/0/15	105	E	5							
ELC684	Theoretical Foundations of Electrical Engineering		BD, UC	6	180	30/15/15	120	E	6							
TRA637	General course of ground electric transport		BD, UC	6	180	30/0/30	135	E	6							
ERG633	Chemical energy sources for electric transport		BD, UC	4	120	30/0/15	75	E		4						
ERG641	Economy of electric transport	1	BD, CCH	5	150	30/15/0	105	E		5						
TRA640	Ensuring the safety of ground electric transport	1	BD, CCH	5	150	30/0/15	105	E		5						

ERG634	Electrical measurements		BD, UC	5	150	30/15/0	105	E			5			
ERG167	Electrical and electronic devices		BD, UC	5	150	30/15/0	105	E			5			
TRA639	Construction and arrangement of ground electric transport		BD, UC	5	150	30/15/0	105	E			5			
GEN412	The theoretical mechanics		BD, UC	5	150	30/0/15	105	E			5			
ERG557	Automated electric drive		BD, UC	4	120	15/15/15	75	E				4		
ERG644	Electric vehicle drive	1	BD, CCH	5	150	30/0/15	105	E				5		
ERG636	Integrated and microprocessor circuitry in electric transport	1	BD, CCH	5	150	30/0/15	105	E				5		
ERG645	Production of electric vehicles	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		
ERG659	Design of electric transport and charging infrastructure	2	BD, CCH	5	150	30/0/15	105	E				5		
ERG638	Organization of charging infrastructure for electric transport	2	BD, CCH	5	150	30/0/15	105	E				5		
ERG648	Electric vehicle control systems	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		
ERG642	Standardization and certification of electric vehicles and charging infrastructure	1	BD, CCH	5	150	30/0/15	105	E					5	
ERG643	Electric vehicle chargers	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	
ERG646	Electric transport power engineering	2	BD, CCH	6	180	30/15/15	120	E					6	
ERG637	Electronics	2	BD, CCH	6	180	30/15/15	120	E					6	
ERG647	Electric car high voltage traction battery	2	BD, CCH	6	180	30/0/30	120	E					6	
ERG649	Fundamentals of technical diagnostics of electric vehicles	3	BD, CCH	5	150	15/30/0	105	E					5	
TRA636	Technical operation and maintenance of ground electric transport	3	BD, CCH	5	150	30/0/15	105	E					5	
ERG650	Computer diagnostics in electric transport	3	BD, CCH	5	150	15/30/0	105	E					5	
CYCLE OF PROFILE DISCIPLINES (PD)														
M-8. Module of professional disciplines in ground electric transport and charging infrastructure														
AAP102	Production practice I		PD, UC	2				R		2				
ERG639	Laboratory workshop on modern computer technologies in the electric vehicle industry		PD, UC	5	150	0/45/0	105	E			5			
ERG527	Electrical machines		PD, UC	5	150	30/15/0	105	E			5			
ERG640	Laboratory workshop on modern charging technologies of electric vehicles		PD, UC	4	120	0/45/0	75	E				4		
AAP183	Production practice II		PD, UC	3				R				3		
ERG651	Unmanned control in electric transport	1	PD, CCH	5	150	15/15/15	105	E				5		
ERG652	Power electronics in electric transport	1	PD, CCH	5	150	30/0/15	105	E				5		
ERG653	Power sources of autonomous electric transport	2	PD, CCH	4	120	30/0/15	75	E				4		
ERG654	Charging infrastructure management systems	2	PD, CCH	4	120	30/0/15	75	E				4		
ERG597	Industrial electronics		PD, UC	6	180	30/15/15	135	E					6	
ERG563	Power and electrotechnical equipment		PD, UC	4	120	30/0/15	75	E					4	
ERG655	Economics of electric transport and charging infrastructure	1	PD, CCH	6	180	30/0/30	120	E					6	
ERG656	The device of electric vehicles	1	PD, CCH	6	180	30/0/30	120	E					6	
ERG663	Calculation and design of ground transport charging systems	2	PD, CCH	5	150	30/0/15	105	E					5	

ERG664	Methods of calculation and design of traction batteries	2	PD, CCH	5	150	30/0/15	105	E					5		
ERG665	Methods of calculation and design of DC and AC electric motors	2	PD, CCH	5	150	30/0/15	105	E					5		
ERG510	Calculation and projecting of systems of automated electrical drive	2	PD, CCH	5	150	30/0/15	105	C					5		ERG447
ERG657	Repair and maintenance of electric vehicles	1	PD, CCH	5	150	15/15/15	105	E						5	
TRA641	Technology of production and repair of ground electric transport	1	PD, CCH	5	150	15/15/15	105	E						5	
ERG658	Renewable energy sources in electric transport	1	PD, CCH	5	150	15/15/15	105	E						5	
TRA638	Electrical equipment of ground electric transport	2	PD, CCH	5	150	30/0/15	105	E						5	
ERG660	Special purpose electric transport	2	PD, CCH	5	150	30/15/0	105	E						5	
ERG661	Charging stations for electric vehicles based on renewable energy sources	3	PD, CCH	5	150	15/0/30	105	E						5	
ERG662	Hybrid energy complexes based on renewable energy sources with different types of charging stations	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:										34	31	30	30	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. B.

Head of Department - Department of Educational Program
Management and Academic-Methodological Work

Zhumagaliyeva A. S.

Director of the Institute - A.Burkitbaev Institute of Energy
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Yelemesov K. .

Department Chair - Power Engineering

Sarsenbayev Y. .

Representative of the Academic Committee from Employers
____Acknowledged____

Abdykalykov G. Y.

