

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**  
**Electric Power Engineering, Electrical Engineering and Electromechanics**

**NATIONAL TECHNICAL UNIVERSITY**  
**«KHARKIV POLYTECHNIC INSTITUTE»**

**APPROVED BY**

Rector of NTU "KhPI"

\_\_\_\_\_ Ye.Sokol

« \_\_\_\_ » \_\_\_\_\_ 20 \_\_\_\_.

**EDUCATIONALLY - PROFESSIONAL PROGRAM**

**«ELECTRIC POWER ENGINEERING»**

**The First (Bachelor) Level**

by specialty 141 **«Electric Power Engineering, Electrical Engineering and Electromechanics»**

Knowledge field title 14 **«Electrical engineering»**

Qualification: **Bachelor of Electric Power Engineering, Electrical Engineering and Electromechanics**

**APPROVED BY**

**Academic Council of NTU "KhPI"**

Chairman of the Scientific Council

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Protocol № \_\_\_\_\_

« \_\_\_\_ » \_\_\_\_\_ 20 \_\_\_\_.

## INTRODUCTION

**Developed by the working group on specialty 141 "Electric Power Engineering, Electrical Engineering and Electromechanics" on the basis of the draft higher education standard developed by the scientific-methodical subcommittee of the Ministry of Education and Science of Ukraine.**

Members of the working group:

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- Rezinkin Oleg Lukyanovich, Doctor of Technical Sciences, Professor, Head of the Department of Engineering Electrophysics,
- Omelyanenko Galina Viktorovna, Candidate of Technical Sciences, Professor of the Department of Transmission of Electric Energy.

Head of the security group of specialty 141 "Electric Power Engineering, Electrical Engineering and Electromechanics ":

Lazurenko Alexander Pavlovich, Ph.D., Professor,  
Head of the Department of Electric Power Stations \_\_\_\_\_

**APPROVAL PAGE**

educationally - professional program «ENERGETICS»

<b>Higher education level</b>	<b>The First (Bachelor) Level</b>
<b>Knowledge field title</b>	<b>14 Electrical engineering</b>
<b>Specialty</b>	<b>141 « Electric Power Engineering, Electrical Engineering and Electromechanics »</b>
<b>Specializations</b>	<b>141-01 "Electric Power Stations" 141-02 «Electrical systems and networks» 141-03 "Electricity Production and Distribution Management Systems" 141-04 «Electrical Insulation, Cable and fiber optic technique» 141-05 "Energy Management and Energy Efficient Technologies" 141-12 "Renewable energy sources, technique and high-voltage electrical physics" 141-15 «Cybersecurity technologies in electric power industry»</b>
<b>Qualification</b>	<b>Bachelor of Electric Power Engineering, Electrical Engineering and Electromechanics</b>

**APPROVED**

Chairman of the support group  
for the specialty

Head \_\_\_\_\_ O.P. Lazurenko

« \_\_\_\_ » \_\_\_\_\_ 20 \_\_\_\_.

**APPROVED AND PROVIDED**

By order of the rector of the National Technical University "Kharkiv Polytechnic Institute"  
from « \_\_\_\_ » \_\_\_\_\_ 20 \_\_\_\_ . № \_\_\_\_\_

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**RECOMMENDED**

Methodical Council of NTU "KhPI"

\_\_\_\_\_ R.P. Mygushchenko

« \_\_\_\_ » \_\_\_\_\_ 20 \_\_\_\_.

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**1. Profile of the educational program «Energetics»  
by specialty 141 « Electric Power Engineering,  
Electrical Engineering and Electromechanics »**

<b>1 – General information</b>	
Full name of higher educational institution and structural unit	National Technical University "Kharkiv Polytechnic Institute" Institute of Education and Science in Power Engineering, Electronics and Electromechanics Departments: electric power stations, transmission of electric energy, automation and cyber security of power systems, electrical insulation and cable engineering, engineering electrophysics
The degree of Higher education and the name of the qualification in the original language title	Bachelor's degree in higher education Educational qualification - a bachelor of Electric Power Engineering, Electrical Engineering and Electromechanics Diploma qualification is a junior electrical engineer
The official name of the educational program	educationally - professional program of The First (Bachelor) Level of the «Energetics» higher educational level.
Type of diploma and volume of educational program	Bachelor's degree, unitary, 240 ECTS credits, term of training 4 years
Availability of accreditation	- Certificate of Accreditation: НД-IV №2158893: - Ministry of education and science of Ukraine; - Validity: until July 1, 2023
Cycle / Level	FQ-EHEA – first cycle, EQF LLL – 6 level, NQF Ukraine – 6 level (Bachelor)
Prerequisites	Complete general secondary education or secondary specialized education By results of external testing The remaining requirements are determined by the rules of admission to the educational and professional program of the bachelor.
Language (s) of teaching	Ukrainian, Russian, English
The validity of the educational program	According to the validity period of the certificate of accreditation
Internet address of the educational program	<a href="http://www.kpi.kharkov.ua/ukr/">http://www.kpi.kharkov.ua/ukr/</a> <a href="http://www.kpi.kharkov.ua/rus/faculty/e/">http://www.kpi.kharkov.ua/rus/faculty/e/</a>

**2 – The purpose of the educational program**

The combination of a high level of professional training in the specialty " Electric Power Engineering, Electrical Engineering and Electromechanics " in the field of electrical engineering with the formation of scientific and technical outlook among specialists and the provision of a broad outlook in the social, humanitarian, fundamental (natural science) and professional fields. The achievement of this purpose is based on the principles of continuity and individualization of training, the fundamental nature and integrity of the knowledge, practical orientation and awareness of the place of the obtained competences, the symbiosis of scientific and systemic approaches.

The purpose of the educational program is to train specialists who can count, design, operate, produce, assemble, adjust and repair equipment and introduce energy efficient and energy saving technologies in thermal and nuclear power engineering, industry, transport (ground, sea and river, aviation, special, including armored vehicles), household and agricultural sectors of the economy.

<b>3 - Characteristics of the educational program</b>	
<b>Subject area (area of knowledge, specialty, specialization)</b>	<p>Knowledge field title: 14 «Electrical engineering»  Specialty title: 141 « Electric Power Engineering, Electrical Engineering and Electromechanics »  Specializations:  Block 01 "Electric Power Stations"  Block 02 «Electrical systems and networks»  Block 03 "Electricity Production and Distribution Management Systems"  Block 04 «Electrical Insulation, Cable and fiber optic technique»  Block 05 "Energy Management and Energy Efficient Technologies"  Block 12 "Renewable energy sources, technique and high-voltage electrical physics"</p>
<b>Orientation of the educational program</b>	<p>The educational-professional program is focused on the formation of the broadest scientific and technical outlook of the future specialist in specialties: electric power stations, energy management and energy-efficient technologies, electric systems and networks, control systems for production and distribution of electricity, electrical insulation, cable and fiber optic technology, renewable energy sources, and technology and high-voltage electrophysics, cybersecurity technologies in electric power engineering.</p>
<b>The main focus of the educational program and specialization</b>	<p>General, special education and training in the field of electrical engineering, electrical engineering with the ability to acquire the necessary practical skills for further study or professional careers.  <b>Keywords:</b> electrical and electrical systems, complexes, devices and equipment, electric power stations, systems and networks, systems of relay protection and control, energy efficiency and energy saving, electrical insulating and cable engineering, cybersecurity.</p>
<b>Features of the program</b>	<p>The program is balanced with regard to the social and humanitarian, fundamental and professional components of training. The key aspect of the program is a broad, selective component of training in specialization units.</p>
<b>4 – Suitability graduates for employment and further education</b>	
<b>Suitability for employment</b>	<p>Graduates can successfully work in industrial enterprises of electric power, electrical and electromechanical industries and can occupy positions of specialists in the services of chief power engineer, chief mechanic, chief designer, in electrical and electromechanical workshops and subdivisions, in branch scientific, design and design organizations and institutions. . The list of positions corresponds to the acting profession qualifier in the country in the electric power, electrotechnical and electromechanical sectors.  Types of economic activity according to DK003: 2010.</p>
<b>Further education</b>	<p>Ability to study under the second cycle program FQ-EHEA, level 7 EQF-LLL and 7th level of HPK, that is, applicants of higher education as a result of this educational program have the right to continue education at the educational level "master" in higher educational institutions of Ukraine and abroad and to</p>

	increase their qualification at the level of "bachelor" in the system of postgraduate qualification improvement.
<b>5 – Teaching and Assessment</b>	
<b>Teaching and learning</b>	Lectures, practical and laboratory classes, computer workshops; individual classes, consultations, baccalaureate work. The use of blended learning technologies: information and communication, student-centric, modular, practical training technologies, distance learning technologies, self-study.
<b>Assessment</b>	Evaluation of students' educational achievements is carried out according to the ECTS system (with grades A, B, C, D, E, F), the national system (with grades “excellent”, “good”, “satisfactory” and “unsatisfactory”), as well as 100 point system of universities with an established system of compliance. <i>Current control</i> - speech and written poll, assessment of work in small groups, testing, defense of group and individual research tasks and projects. <i>Final control</i> - speech and written examinations, tests taking into account accumulated points of current control, defense of practice reports, defense of coursework. <i>State attestation</i> - preparation and public defense (presentation) of final qualification work.

<b>6 – Program competencies</b>	
<b>Integral competence</b>	The ability to solve complex problems and problems in the field of power engineering or in the learning process involves the use of theories of heat and mass transfer, technical thermodynamics, fluid dynamics, energy transformation, technical mechanics and methods of the relevant sciences and is characterized by complexity and uncertainty of conditions. The ability to solve complex specialized problems and practical problems of heat power engineering in professional activities or in the learning process, involves the use of mathematical theories, methods, algorithms, information technologies and specialized software and is characterized by complexity and uncertainty of conditions.
<b>General competencies (GC)</b>	<b>GC 1.</b> The ability to realize their rights and obligations as a member of society, to realize the values of civil society and the need for its sustainable development, the rule of law, human and citizen rights and freedoms in Ukraine. <b>GC 2.</b> The ability to preserve and enhance moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and the development of society, technic and technology, use various types and forms of physical activity for active recreation and maintaining a healthy lifestyle. <b>GC 3.</b> The ability to apply knowledge in practical situations. <b>GC 4.</b> Knowledge and understanding of the subject area and understanding of professional activity. <b>GC 5.</b> The ability to communicate in the state language both verbally and in writing. <b>GC 6.</b> Ability to use a foreign language in professional activities. <b>GC 7.</b> Skills of using information and communication tech-

	<p>nologies.</p> <p><b>GC 8.</b> The ability to learn and master modern knowledge.</p> <p><b>GC 9.</b> Ability to search, process and analyze information from various sources.</p> <p><b>GC 10.</b> Ability to work in a team.</p> <p><b>GC 11.</b> To have the basics of historical thinking, to have an idea of history as a science, its place in the system of humanities, to know the historical sources. Understand the driving forces and regularities of the historical process, the main stages in the history of mankind and their chronology, be able to analyze historical events and trends that allow responsible participation in the political life of society.</p> <p><b>GC 12.</b> Understand the essence of culture, its place and role in the life of man and society, to have an understanding of the forms of culture, their origin and development, the creation of cultural norms and values, the mechanisms of preservation and transfer of them as a socio-cultural experience, to know the main achievements in various areas of cultural practice.</p> <p><b>GC 13.</b> To have an idea of the peculiarity of philosophy, its place in culture, scientific, philosophical and religious pictures of the universe, the essence, purpose and meaning of human life, the forms and methods of scientific knowledge.</p> <p><b>GC 14.</b> Ability to demonstrate basic knowledge in the field of natural sciences and readiness to use the methods of fundamental sciences for solving general engineering and professional problems.</p> <p><b>GC 15.</b> To have information about the unity of all ecological systems of biospheres, methods of detecting changes in environmental indicators under the influence of human activity.</p> <p><b>GC 16.</b> Ability to use methods and skills of execution and drawing of drawings for different purposes.</p> <p><b>GC 17.</b> Ability to understand the role of science in the development of civilization and the interaction of science and technology.</p> <p><b>GC 18.</b> Ability and readiness to understand and analyze economic problems and social processes, to be an active subject of economic activity.</p>
<p><b>Special (professional, subject) competence (PC)</b> <b>(Determined by the standard of higher education by specialty)</b></p>	<p><b>PC 1.</b> Ability to use computer-aided design (CAD), manufacturing (CAM) and engineering calculations (CAE) and related application software packages.</p> <p><b>PC 2.</b> The ability to theoretical substantiation of the decisions taken in the process of performing design and research works within the limits of a kind of occupations at the level of a specialist with the qualification of the first cycle of higher education in the field of electrical engineering.</p> <p><b>PC 3.</b> Ability to use basic knowledge of general physics, higher mathematics, theoretical foundations of electrical engineering and electrical materials for solving practical problems in the field of electric power engineering, electrical engineering and electromechanics.</p> <p><b>PC 4.</b> Ability to use professional knowledge in the basics of electric power: electrical part of stations and substations, electrical systems and networks, relay protection and automatics of power systems and high voltage equipment for solving practical</p>



problems in the field of electric power engineering, electrical engineering and electromechanics.

**PC 5.** Ability to use knowledge in metrology and electrical measurements, the theory of automatic control and electronics to solve problems of measurement, design, control and control in power engineering, electrical engineering and electrical engineering.

**PC 6.** Ability to use knowledge of the basics of electromechanics: the theory of electric machines, apparatus and automated electric drive for solving practical problems in the field of electric power engineering, electrical engineering and electromechanics.

**PC 7.** Ability to observe international standards, norms and technical conditions in projects of electric power, electrotechnical and electromechanical equipment.

**PC 8.** Ability to use modern methods of calculations, modeling and analysis of modes of operation of electric power, electrotechnical and electromechanical equipment and design of electric and electromechanical systems.

**PC 9.** Ability to determine and provide optimal, energy-efficient and economic modes of operation of electric power, electrical and electromechanical equipment.

**PC 10.** Ability to compile and execute operational and other documentation, provided by the rules of operation of equipment and organization of work at the objects of electric power, electrical engineering and electromechanics.

**PC 11.** Ability to observe the requirements of the rules of safety and occupational safety and norms of industrial sanitation when working at the enterprises of electrical and electromechanical complexes.

**PC 12.** Ability to study and analyze scientific and technical information in the field of electric power engineering, electrical engineering and electromechanics.

**PC 13.** Ability to carry out experimental (model) research of operating modes of electric power, electrotechnical and electromechanical equipment.

**PC 14.** Ability to develop simple designs of electrical and electrical objects and to assess the mechanical strength of designed structures.

**PC 15.** Understanding the principles of organizing electricity generation processes based on traditional and renewable energy sources, meeting the specified technological parameters of power plants and the quality of electricity

**PC 16.** Receipt and use of professional knowledge and understanding related to transmission, distribution and electricity distribution processes, observing specified parameters of technological processes and quality of electric power.

**PC 17.** Receiving and using professional knowledge and understanding related to the operation of relay protection devices and automation of power systems.

**PC 18.** Receiving and using professional knowledge and insights related to the processes of creation and use of safe and efficient electrical insulation, cable and fiber systems.

**PC 19.** Receiving and using professional knowledge and in-

	<p>sights related to conducting energy audits, developing and implementing energy conservation and energy efficiency measures, developing and implementing a system of energy management.</p> <p><b>PC 20.</b> Receiving and using professional knowledge and understanding related to the processes of electro-physical high-voltage installations for scientific research and industrial technologies, as well as renewable energy installations.</p> <p><b>PC 21.</b> Receipt and use of professional knowledge and understanding related to the information protection of power systems with the use of modern information and computer technologies.</p>
<b>7 – Program results of training</b>	
<p><b>Program results of training in the specialty (defined by the standard of higher education by specialty) (PRT)</b></p>	<p><b>PRT 1.</b> To find the necessary information in the information space.</p> <p><b>PRT 2.</b> Discuss professional topics</p> <p><b>PRT 3.</b> Read professional literature in native and foreign languages</p> <p><b>PRT 4.</b> Adhere to the principles of European democracy and respect for the rights of citizens</p> <p><b>PRT 5.</b> Combine personal and social interests</p> <p><b>PRT 6.</b> Demonstrate good professional, social and emotional behavior, adhere to a healthy lifestyle</p> <p><b>PRT 7.</b> Adhere to the requirements of professional ethics.</p> <p><b>PRT 8</b> Observe the requirements of regulatory enactments on occupational safety, safety and industrial sanitation</p> <p><b>PRT 9.</b> Know the basics of historical thinking, have an idea of the sources of historical knowledge and how to work with them</p> <p><b>PRT 10.</b> Know the conditions for the formation of a person, his freedom, responsibility for preserving life, nature, culture, moral obligations of man in relation to others and himself, about spiritual values, their significance in creativity and everyday life.</p> <p><b>PRT 11.</b> Know the scientific, philosophical and religious pictures of the universe, the essence of the purpose and meaning of human life, have an idea of the originality of philosophy</p> <p><b>PRT 12.</b> Know and use the methods of fundamental sciences to solve the general engineering and professional tasks.</p> <p><b>PRT 13.</b> Know the basics of the construction of drawings, be able to solve positional, metric and spatial problems</p> <p><b>PRT 14.</b> Know the structure, forms and methods of scientific knowledge and their evolution, understand the value of scientific rationality and its historical types.</p> <p><b>PRT 15.</b> Know the essence of the main economic categories, scientific foundations and ways of increasing production, saving resources</p> <p><b>PRT 16.</b> To define principles of construction and normal functioning of elements of electric power, electrotechnical electromechanical complexes and systems</p> <p><b>PRT 17.</b> To define the principles of construction and functioning of elements of control, control and automation systems of electric power, electrical and electromechanical complexes</p> <p><b>PRT 18.</b> To evaluate the parameters of the electrical, electrical and electromechanical equipment and related complexes and</p>

systems work and to develop measures to increase their energy efficiency and reliability.

**PRT 19.** Solving professional tasks in the design, installation and operation of electric power, electrical engineering, electromechanical complexes and systems

**PRT 20.** To analyze processes in electric power, electrotechnical and electromechanical equipment and corresponding complexes and systems

**PRT 21.** To collect and analyze information on abnormal regimes and emergency situations in the electric field in order to prevent their recurrence in the future.

**PRT 22.** To possess methods of synthesis of electric power, electrotechnical and electromechanical installations and systems with given parameters

**PRT 23.** Assess the dangers when performing work in electrical installations

**PRT 24.** Assess the reliability of electrical, electrical and electromechanical systems.

**PRT 25.** Follow the basic principles and objectives of environmental safety of electric power engineering, electrical engineering and electromechanics.

**PRT 26.** Understand and explain the importance of traditional and renewable energy for successful economic development of the country.

**PRT 27.** Observe the requirements of safety and health at the enterprises and objects of electric power engineering, electrical engineering and electromechanics

**PRT 28.** Follow the patterns of action, strategy and tactics for solving professional tasks by experienced workers in the field of electric power engineering, electrical engineering and electromechanics.

**PRT 29.** Carry out tasks for maintenance of electrical equipment of electric stations, substations, systems and networks, power supply systems and electromechanical systems with the help of appropriate instructions and practical skills.

**PRT 30.** To improve the skills of working with modern equipment and software when performing calculations of operating modes of electrical, electrical and electromechanical equipment, corresponding complexes and systems

**PRT 31.** Combine the methods of empirical and theoretical research to find ways to reduce the loss of electric energy in its production, transportation, distribution and use

**PRT 32.** To invent new ways of solving the problem of energy-efficient transformation, distribution, transmission and use of electric energy

**PRT 33.** To know the legal protection of the natural environment, to be able to carry out instrumental measurements of the numerical values of normalized indicators of the state of the environment and production environment

**PRT 34.** Know and be able to develop simple designs of electrical and electrical objects and evaluate the mechanical strength of the designs.

**PRT 35.** To know and understand the principles of organization of processes of electric power production on the basis of tradi-

	<p>tional and renewable energy sources, observing the given technological parameters of power facilities and quality of electric power</p> <p><b>PRT 36.</b> To know and understand the processes of transmission, distribution of electricity and electricity supply, observing the specified parameters of technological processes and quality of electricity.</p> <p><b>PRT 37.</b> Know and understand the processes of operation and operation of relay protection devices and automation of power systems.</p> <p><b>PRT 38.</b> Know and understand processes for the creation and use of safe and efficient electrical insulation, cable and fiber optic systems.</p> <p><b>PRT 39.</b> Know and understand the processes of energy audit, development and implementation of energy saving and energy efficiency measures, development and implementation of energy management system.</p> <p><b>PRT 40.</b> Know and understand the processes of operation of electro-physical high-voltage installations for scientific research and industrial technologies, as well as renewable energy installations.</p> <p><b>PRT 41.</b> Know and understand the processes related to the information protection of power systems using modern information and computer technologies.</p>
<b>8 – Resource support for the implementation of the program</b>	
<b>Staffing</b>	All the scientific and pedagogical staff providing the educational-professional program in accordance with the qualification correspond to the profile and the direction of the disciplines being taught, have the necessary experience of teaching work and experience of practical work. In the process of organizing the learning process, professionals with experience in research / management / innovation / creative work and / or work in the specialty are involved. 100% of the teachers who provide educational activities in English, have certificates in accordance with the European Linguistic Recommendations (at level B2) or qualification documents related to the use of a foreign language.
<b>Material and technical support</b>	Material and technical support allows you to fully provide the educational process throughout the training cycle for the educational program. The condition of the premises is certified by sanitary and technical passports, which correspond to the existing normative acts.
<b>Information and educational support</b>	Information support is provided by textbooks, study aids, etc. and electronic resources (the library is provided with at least five titles of national and foreign professional periodical professional editions of the corresponding or related profile, including in electronic form). Methodical support is realized by obligatory accompaniment of educational activity with the corresponding educational and methodological materials for each educational discipline of the curriculum.
<b>9 – Academic mobility</b>	
<b>National Credit Mobility</b>	On the basis of bilateral agreements between the National Technical University "Kharkiv Polytechnic Institute" and higher ed-

	educational institutions of Ukraine
<b>International Credit Mobility</b>	On the basis of bilateral agreements between the National Technical University "KPI" and educational institutions of the partner countries.
<b>Training foreign applicants for higher education</b>	Occurs with the parallel teaching of the course of Ukrainian as a foreign language on a separate curriculum.

## 2. LIST OF EDUCATIONAL PROGRAM COMPONENTS

### 2.1 List of educational program components

Key	Educational program components (disciplines, projects / work, practice, qualification work)	Credits ECTS	Form of final control
1	2	3	4
<b>REQUIRED COMPONENTS OF THE EDUCATIONAL PROGRAM</b>			
<b>1. Required components of the educational program</b>			
<i>General training</i>			
GT1	Foreign language	8	Test (3, 7,8), Exam (4)
GT2	History and Culture of Ukraine	4	Exam
GT3	Language as a medium of training	10	Test (1), Exam (2)
GT4	Ukrainian as a foreign language	19	Test (3, 4), Exam (5)
GT5	Chemistry	4	Exam
GT6	Higher Mathematics	14	Exam (1,2,3)
GT7	Physics	14	Exam (1,2,3)
GT 8	Physical Education	12	Test (1-6)
<i>Professional training</i>			
	Descriptive Geometry, Engineering and Computer Graphics	4,0	Exam (1) Test (2)
PT 1	Descriptive Geometry, Engineering and Computer Graphics	4,0	Exam
PT 2	Electrotechnical Materials	5,0	Exam
PT 3	Fundamentals of Metrology and Electrical Measurements	6,0	Exam
PT 4	Theoretical Foundations of Electrical Engineering p.1	5,0	Exam
PT 5	Theoretical Foundations of Electrical Engineering p.2	5,0	Exam
PT 6	Fundamentals of Electronics	4,0	Test
PT 7	Technical Mechanics	6,0	Test
PT 8	Electric Machines	3,0	Exam
PT 9	Fundamentals of Professional and Personal Safety	3,0	Test
PT 10	Company Economics	4,0	Exam
PT 11	Practice	6,0	Test
PT 12	Attestation (Diploma project)	6,0	Attestation
<b>Total volume of Required components</b>		<b>136</b>	

<b>2. Optional disciplines of the educational program</b>			
<b>(applicants for education are citizens of Ukraine and foreigners)</b>			
<b>Discipline block 01 "Electric Power Stations"</b>			
OB 1.1	Introduction to Speciality	3,0	Test
OB 1.2	Fundamentals of information technology in electric power industry	6,0	Exam
OB 1.3	Theory of Automatic Control	4,0	Test
OB 1.4	Fundamentals Of Electric Power Industry	6,0	Test
OB 1.5	Theoretical Foundations of Electrical Engineering p.3	4,0	Exam
OB 1.6	Electrical Systems and Networks	6,0	Exam
OB 1.7	Mathematical Problems Of Power Engineering	5,0	Exam
OB 1.8	Electrical Part Of Stations And Substations p.1	6,0	Exam

OB 1.9	Electromagnetic Transient Processes	6,0	Exam
OB 1.10	Fundamentals of Energy Management	5,0	Exam
OB 1.11	Heat Power Facilities	4,0	Exam
OB 1.12	High Voltage Equipment	4,0	Exam
OB 1.13	Fundamentals of Relay Protection and Automation of Power Systems	5,0	Exam
OB 1.14	Electromechanical transient processes	4,0	Exam
OB 1.15	Microprocessor technology	3,0	Exam
OB 1.16	Electrical Part Of Stations And Substations p.2	5,0	Exam
OB 1.17	Electrical Part Of Stations And Substations p.3	4,0	Exam
OB 1.18	Power Supply Systems	4,0	Exam
OB 1.19	Automatization of Electric Power Stations	4,0	Exam
OB 1.20	Operation and Operating Modes of Electric Equipment of Electric Power Stations	4,0	Test/ Exam
	<b>Total:</b>	<b>92</b>	
<b>Discipline block 02 " Electrical systems and networks "</b>			
OB 2.1	Fundamentals of information technology in electric power systems	3,0	Test
OB 2.2	Theory of Automatic Control	6,0	Exam
OB 2.3	Electrical Distribution Networks	4,0	Exam
OB 2.4	Electrostatic field theory	6,0	Exam
OB 2.5	Electrical Systems and Networks p.1	4,0	Exam
OB 2.6	Mathematical Problems Of Power Engineering	6,0	Exam
OB 2.7	Electrical Part of Station and Substations	5,0	Exam
OB 2.8	Electromagnetic Transient Processes	6,0	Exam
OB 2.9	Electrical Systems and Networks p.2	5,0	Exam
OB 2.10	Power Facilities	6,0	Exam
OB 2.11	High Voltage Equipment	4,0	Exam
OB 2.12	Fundamentals of Relay Protection and Automation of Power Systems	4,0	Exam
OB 2.13	Electromechanical transient processes	5,0	Exam
OB 2.14	Microprocessor technology	4,0	Exam
OB 2.15	Backbone Networks and their Modes	3,0	Exam
OB 2.16	Mode Optimization of Electric Power Systems	5,0	Exam
OB 2.17	Electrical installation grounding devices	4,0	Exam
OB 2.18	Impact of Objects Fields of Electric Power Systems on the Environment	4,0	Exam
OB 2.19	Overvoltage in Electric Power Systems	4,0	Test
OB 2.20	Fundamentals of information technology in electric power systems	4,0	Exam
	<b>Total:</b>	<b>92</b>	
<b>Discipline block 03 " Systems of control of production and distribution of electric power "</b>			
OB 3.1	Introduction to Specialty	3,0	Test
OB 3.2	Fundamentals of information technology in control systems	6,0	Exam
OB 3.3	Theory of Automatic Control	4,0	Test
OB 3.4	Fundamental Physical Processes in Electric Power Engineering Systems	6,0	Exam
OB 3.5	Theoretical Foundations of Electrical Engineering p.3	4,0	Exam
OB 3.6	Electrical Systems and Networks	6,0	Exam
OB 3.7	Elements of Automation Systems	5,0	Test
OB 3.8	Electrical Part of Station and Substations	6,0	Exam
OB 3.9	Electromagnetic Transient Processes	6,0	Exam

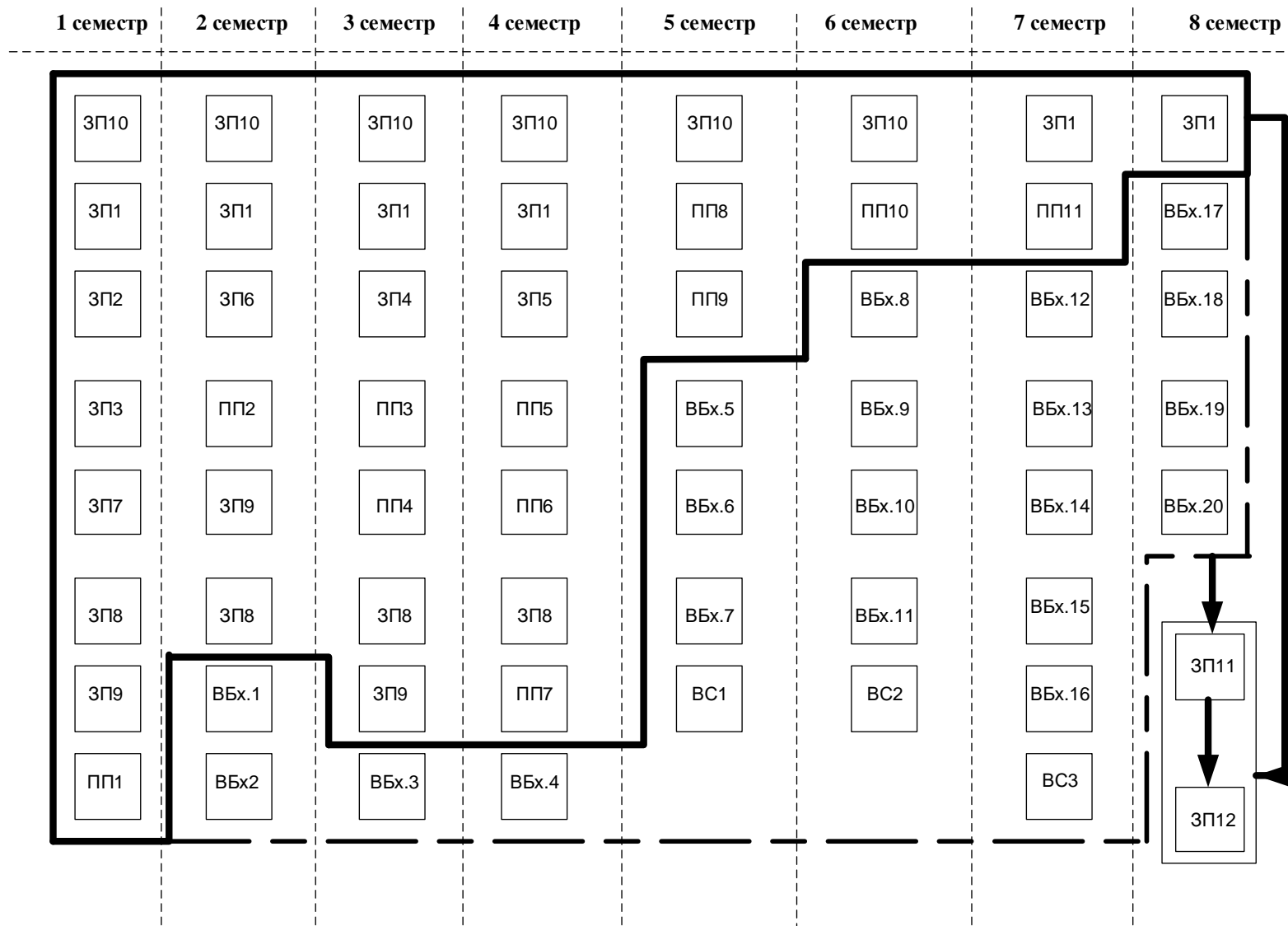
OB 3.10	Fundamentals of Relay Protection of Power Systems	5,0	Exam
OB 3.11	Power Facilities	4,0	Test
OB 3.12	High Voltage Equipment	4,0	Exam
OB 3.13	Fundamentals of Relay Protection Designing of Power Engineering Systems	5,0	Exam
OB 3.14	Microprocessor technology	4,0	Exam
OB 3.15	Mathematical Problems Of Power Engineering	3,0	Exam
OB 3.16	Electromechanical transient processes	5,0	Exam
OB 3.17	Automatization of Power Engineering Systems	4,0	Exam
OB 3.18	Fundamentals of Power Supply and Energy Saving	4,0	Exam
OB 3.19	Electricity accounting and quality control systems	4,0	Exam
OB 3.20	Operation of Relay Protection Devices for Power Engineerig Systems	4,0	Test
	<b>Total:</b>	<b>92</b>	
<b>Discipline block 04 " Electrical Insulation, Cable and Optical Fiber Equipment "</b>			
OB 4.1	Introduction to Speciality	3,0	Test
OB 4.2	Applied Programming in Electrical Insulation and Cable Engineering	6,0	Exam
OB 4.3	Chemistry of dielectrics	4,0	Test
OB 4.4	Physics of dielectrics	6,0	Exam
OB 4.5	Theory of Electromagnetic Fields in Electrical Insulation,Cable and Optical Fiber Engineering	5,0	Exam
OB 4.6	Fundamentals of Electrical Insulation Engineering	6,0	Exam
OB 4.7	Control and Diagnostics of Technological Processes	4,0	Test
OB 4.8	Calculation and Design of Insulation Structures	6,0	Exam
OB 4.9	Mathematical Modelling in Electrical Insulation, Cable and Optical Fiber Engineering	6,0	Exam
OB 4.10	High Voltage Equipment	5,0	Exam
OB 4.11	Fundamentals of Thermal Physics in Electrical Insulation and Cable Engineering	4,0	Test
OB 45.12	Cable Equipment Part 1	5,0	Exam
OB 4.13	Fundamentals of Fiber Optical Engineering: Communication Cables Part.1	5,0	Exam
OB 4.14	Calculation and Technology of Power Cables and Wires Manufacturing	4,0	Exam
OB 4.15	Calculation and Technology of Optical Cables Manufacturing	4,0	Exam
OB 4.16	Technological Lines of Power and Optical Cables Production	3,0	Exam
OB 4.17	Cable Equipment Part 2	4,0	Exam
OB 4.18	Fundamentals of Optical Fiber Engineering: Communication Cables Part 2	4,0	Exam
OB 4.19	Condenser Equipment	4,0	Exam
OB 4.20	Installation, Operation and Diagnostics of Cable Systems	4,0	Test
	<b>Total:</b>	<b>92</b>	
<b>Discipline block 05 "Energy Management and Energy-Efficient Technologies"</b>			
OB 5.1	Introduction to Speciality	3,0	Test
OB 5.2	Fundamentals of information technology in electric power industry	6,0	Exam
OB 5.3	Theory of Automatic Control	4,0	Test
OB 5.4	Fundamentals Of Electric Power Industry	6,0	Test
OB 5.5	Theoretical Fundamentals of Heat Engineering	4,0	Exam
OB 5.6	Electrical Systems and	6,0	Exam



	Networks		
OB 5.7	Mathematical Problems Of Power Engineering	5,0	Exam
OB 5.8	Electrical Part Of Stations And Substations	6,0	Exam
OB 5.9	Transients in Power Systems	6,0	Exam
OB 5.10	Energy Management Part 1	5,0	Exam
OB 5.11	Consumers of Electricity	4,0	Exam
OB 5.12	Energy Efficient Technologies	4,0	Exam
OB 5.13	Fundamentals of Power Supply Systems	5,0	Exam
OB 5.14	Heat Engineering Systems and Complexes	4,0	Exam
OB 5.15	Microprocessor technology	3,0	Exam
OB 5.16	Energy Management Part 2	5,0	Exam
OB 5.17	Fundamentals of Energy Audit	4,0	Exam
OB 5.18	Accounting and Management of Power Consumption	4,0	Exam
OB 5.19	Economic Assessment of Energy Saving Problems	4,0	Exam
OB 5.20	Intelligent Management Systems of Power Consumption	4,0	Test
OB 5.1	<b>Total:</b>	<b>92</b>	
<b>Discipline block 12 "Renewable sources of energy and technique and electrophysics of high voltages"</b>			
OB 12.1	Introduction to Speciality	3,0	Test
OB 12.2	Fundamentals of Information Technology in High Voltage Equipment and Renewable Power Engineering	6,0	Exam
OB 12.3	Fundamentals of Computer Design and Modelling of Renewable Power Systems	4,0	Test
OB 12.4	Theoretical Foundations of Heat Engineering	6,0	Exam
OB 12.5	Theory of Electric and Magnetic Fields in Electrophysical and Power Devices	4,0	Test
OB 12.6	Electrical Systems and Networks	6,0	Exam
OB 12.7	Mathematical Physics	5,0	Exam
OB 12.8	High Voltage Equipment	6,0	Exam
OB 12.9	Power Storage	6,0	Exam
OB 12.10	Electrical Equipment in Renewable Energy Installations	5,0	Exam
OB 12.11	High Voltage Pulse Equipment	4,0	Exam
OB 12.12	Application of Solar Energy	3,0	Exam
OB 12.13	High Voltage Equipment of Stations and Substations	5,0	Exam
OB 12.14	High Voltage Measurements	5,0	Exam
OB 12.15	Electromagnetic Compatibility and Protection of Electrophysical Devices	4,0	Exam
OB 12.16	Power Equipment of Renewable Energy Installations	4,0	Exam
OB 12.17	Fundamentals of High Voltage Pulse Installations Designing	4,0	Exam
OB 12.18	Wind Power Engineering	4,0	Exam
OB 12.19	Electrophysical Technological Installations	4,0	Exam
OB 12.20	Bio Power Engineering complexes	4,0	Test
	<b>Total:</b>	<b>92</b>	
<b>Discipline block 15 "Cybersecurity Technologies in Electric Power Engineering"</b>			
OB 15.1	Introduction to Speciality	3,0	Test
OB 15.2	Fundamentals of Information Technology in Cybersecurity	6,0	Exam
OB 15.3	Theory of Automatic Control	4,0	Test
OB 15.4	Fundamental Physical Processes in Electric Power Engineering Systems	6,0	Exam
OB 15.5	Theoretical Fundamentals of Electrical Engineering Part 3	4,0	Test
OB 15.6	Electrical Systems and Networks	6,0	Exam

OB 15.7	Operation system Security	5,0	Exam
OB 15.8	Electrical Part of Stations and Substations	6,0	Exam
OB 15.9	Electromagnetic Transient Processes	6,0	Exam
OB 15.10	Fundamentals of Relay Protection of Power Systems	5,0	Exam
OB 15.11	Power Facilities	4,0	Exam
OB 15.12	High Voltage Equipment	3,0	Exam
OB 15.13	Computer Networks Security	5,0	Exam
OB 15.14	Microprocessor technology	5,0	Exam
OB 15.15	Mathematical Problems Of Power Engineering	4,0	Exam
OB 15.16	Electromechanical transient processes	4,0	Exam
OB 15.17	Automatization of Power Engineering Systems	4,0	Exam
OB 15.18	Fundamentals of Power Supply and Energy Saving	4,0	Exam
OB 15.19	Electricity accounting and quality control systems	4,0	Exam
OB 15.20	Software and Hardware Means of Information Security of Power Engineering Systems	4,0	Test
	<b>Total:</b>	<b>92</b>	
<b>Student optional disciplines</b>			
<b>Student optional disciplines</b>			
OS 1	<b>Optional discipline 1</b>	4	Test
OS 2	<b>Optional discipline 2</b>	4	Test
OS 3	<b>Optional discipline 3</b>	4	Test
	<b>Total:</b>	<b>12</b>	
<b>Total amount of sample components:</b>		<b>104</b>	
<b>TOTAL VOLUME OF EDUCATIONAL PROGRAM</b>		<b>240</b>	

## 2.2 Structural-logical scheme of the educational program



### **3. Form of certification of applicants for higher education**

Certification of graduates of the educational program of **specialty 141 " Electric Power Engineering, Electrical Engineering and Electromechanics "** is carried out in the form of defense of qualification work and ends with the issuance of a standard document on awarding a bachelor's degree with conferring the qualification **"Bachelor of Electric Power Engineering, Electrical Engineering and Electromechanics "** in the relevant specializations.

The certification is carried out openly and publicly.

Final qualifying work is being tested for plagiarism.

**4. Matrix of compliance of program competencies to the components of the educational program**

	GT	GT1	GT2	GT3	GT4	GT5	GT6	GT7	GT8	GT9	PT 1	PT 2	PT 3	PT 4	PT 5	PT 6	PT 7	PT 8	PT 9	PT 10	PT 11	PT 12	PT 13	OB1.1	OB1.2	OB1.3	OB1.4	OB1.5	OB1.6
GC 1																		•				•	•						
GC 2			•																				•						
GC 3	•							•															•						
GC 4									•														•	•					
GC 5					•																		•	•					
GC 6					•																		•	•					
GC 7				•	•												•		•				•	•					
GC 8				•															•	•			•	•					
GC 9	•		•	•				•															•	•					
GC 10		•		•	•	•			•											•		•	•	•					
GC 11		•															•							•					
GC 12		•																						•					
GC 13					•																			•					
GC 14							•						•	•									•	•					
GC 15						•			•														•	•					
GC 16										•													•	•					
GC 17					•												•						•	•					
GC 18																			•				•	•					



	GC1	GC2	GC3	GC4	GC5	GC6	GC7	GC8	GC9	PT1	PT2	PT3	PT4	PT5	PT6	PT7	PT8	PT9	PT10	PT11	GC10	GC11	GC12						
PC 1																							•	•					
PC 2																							•	•					
PC 3					•	•	•				•		•	•									•	•					
PC 4																							•	•					
PC 5												•			•								•	•					
PC 6																			•				•	•					
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