

Profile of the educational program
“Unconventional and Renewable Energy Sources” in specialty
141 Electrical Energetics, Electrical Engineering and Electromechanics

1 – General information	
Full name of higher educational institution	O. M. Beketov National University of Urban Economy in Kharkiv
Higher education degree and the title of qualification in the original language	Bachelor of the Electrical Energetics, Electrical Engineering and Electromechanics
Official title of the educational program	Unconventional and Renewable Energy Sources
Type of diploma and the scope of the educational program	Bachelor’s diploma, single, 240 ECTS credits, 3 year 10 months
Accreditation certificate	Ministry of Education and Science of Ukraine Certificate of accreditation UD №21008296 Validity of the certificate until 01.07.2028
Cycle/level	First (Bachelor) level the National Qualification Framework – level 6 FQ-EHEA – first cycle EQF-LLL – level 6
Admission requirements	Having a complete general secondary education or an associate's degree
Language (s) of teaching	Ukrainian
Duration of the educational program	5 years
Internet address of permanent placement of the educational program description	http://toe.kname.edu.ua
2 – Object of the educational program	
Preparation of highly qualified specialists for the electric power industry and the urban economy, who are able to solve specialized tasks to ensure territorial development at the national, regional and local levels in the field of electrical engineering, which involves the use of non-traditional and renewable energy sources in electrical complexes and systems to increase their efficiency and reduce the impact on the environment	
3 – Description of the educational program	
Subject area	<i>Objects of study and activities:</i> – enterprises of the electric power complex, electrical engineering and electromechanical services of organizations; – the production, transmission, distribution and transformation of

	<p>electricity at power plants, power grids and systems; electrical engineering equipment, electromechanical and switching equipment, electromechanical and electrical engineering complexes and systems.</p> <p><i>Learning aim:</i> Preparation of specialists capable to solve specialized and practical problems of electric power engineering, electrical engineering and electromechanics, involves the application of theories and methods of physics and engineering sciences and is characterized by complexity and uncertainty of conditions.</p> <p><i>Theoretical content of the subject area:</i> Basic concepts of the theory of electric and electromagnetic circuits, their application for modeling, optimization and analysis of operation's modes of power stations, networks and systems, electric machines, electric drives, electrical and electromechanical systems and complexes using traditional and renewable energy sources.</p> <p><i>Methods, tools and technologies</i> – analytical methods for calculating electrical circuits, power supply systems, electrical machines and appliances, control systems for electrical and electromechanical systems, electrical loads with specialized laboratory equipment, personal computers and other equipment.</p> <p><i>Tools and equipment</i> – controls, electrical and electronic devices, microcontrollers, computers.</p>
Orientation of the educational program	Educational and professional
The key focus of the educational program and specialization	<p>Special education in the subject area of unconventional and renewable energy sources.</p> <p>Keywords: electroenergy, electrical engineering and electromechanics systems, complexes, devices and equipments, control system and distribution of electric energy of transmission, unconventional, renewable energy sources, solar thermal power, hydrogen energy.</p>
Features of the program	Preparation of a specialist in the field of electrical engineering for urban infrastructure, who understands and can use modern technologies and energy processes in electric power and heat engineering, based on the use of renewable energy sources.
4 – Graduate employability and further academic education	
Employability	<p>Occupations, professional titles of works (according to the current version of the National Classifier of Ukraine: Classifier of professions (ДК 003:2010).</p> <p>Technical electrical specialists (3113):</p> <ul style="list-style-type: none"> - power substation dispatcher; - site electrician; - shop electrician; - power engineer; - power engineer of the production; - power engineer of the site; - power engineer of the shop; - energy dispatcher; - technician for operation of bioenergy installations; - technician for operation of hydropower plants; - technician for operation of wind power plants; - technician-electrician; - technician-power engineer;

	<ul style="list-style-type: none"> - specialist in the operation of electrical stations, power plants and networks; - specialist in the energy management.
Further academic education	Opportunity to continue studying at the second (master's) level of higher education. Acquisition of additional qualifications in the system of postgraduate education, advanced training.
5 – Instruction and assessment	
Instruction and learning	<p>Student-centered studies, application-oriented studies, lectures, practical employments, laboratory works, independent work, consultations, project work, preparation of qualifying work.</p> <p>Methods of studies: problem exposition, illustration and demonstration, partly-searching, research, practical.</p>
Assessment	<p>Current control: verbal and writing questioning, tests, presentations of individual tasks.</p> <p>Final control: writing examinations and differential tests, defense of term papers and reports on practice.</p> <p>Attestation: public defense of qualifying work.</p>
6 – Program competences	
Integral competence	The ability to solve specialized problems and solve practical problems during professional activities in the field of electrical engineering, electrical engineering and electromechanics or in the process of education, involves the application of theories and methods of physics and engineering sciences, characterized by the complexity and uncertainty of the conditions.
General competences (GC) defined by the standard of higher education of the specialty	<p>GC 01. The ability to think abstractly, analyze and synthesize.</p> <p>GC 02. The ability to apply knowledge in practical situations.</p> <p>GC 03. The ability to communicate in the official language, both orally and in writing.</p> <p>GC 04. The ability to communicate in a foreign language.</p> <p>GC 05. The ability to search process and analyze information from various sources.</p> <p>GC 06. The ability to identify, ask and solve problems.</p> <p>GC 07. The ability to work as a team.</p> <p>GC 08. The ability to work autonomously.</p> <p>GC 09. The ability to realize their rights and responsibilities as a member of society, to realize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of man and citizen in Ukraine.</p> <p>GC 10. The ability to preserve and multiply moral, cultural, scientific values and achievements of society on the basis of understanding of history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, to use different types and forms of motor activity for active rest and healthy living.</p>
Professional competences of the specialty (PC) defined by the standard of higher education of the specialty	<p>PC 01. The ability to solve practical problems using computer aided design and calculation (CAD) systems.</p> <p>PC 02. The ability to solve practical problems involving the methods of mathematics, physics and electrical engineering.</p> <p>PC 03. The ability to solve complex specialized and practical problems related to the operation of electrical systems and networks, the electrical part of stations and substations and high voltage engineering.</p> <p>PC 04. The ability to solve complex specialized and practical problems</p>

	<p>related to problems of metrology, electrical measurements, operation of devices of automatic control, relay protection and automatics.</p> <p>PC 05. The ability to solve complex specialized problems and practical problems related to the operation of electric machines, apparatus and automated electric drive.</p> <p>PC 06. The ability to solve complex specialized and practical problems related to the problems of production, transmission and distribution of electricity.</p> <p>PC 07. The ability to develop projects of electric power, electrical engineering and electromechanical equipment in compliance with the requirements of legislation, standards and terms of reference.</p> <p>PC 08. The ability to perform professional duties in compliance with the requirements of safety, occupational, industrial and environmental regulations.</p> <p>PC 09. Awareness of the need to increase the efficiency of power, electrical engineering and electromechanical equipment.</p> <p>PC 10. Awareness of the need to constantly expand our knowledge of new technologies in power electrical engineering, electrical engineering and electromechanics.</p> <p>PC 11. The ability to quickly take effective measures in the event of emergencies in power and electromechanical systems.</p>
7 – Program learning outcomes	
<p>Program learning outcomes (PLO) defined by the standard of higher education of the specialty</p>	<p>PLO 01. To know and understand the principles of operation of electrical systems and networks, power equipment of power plants and substations, protective grounding and lightning protection devices and be able to use them to solve practical problems in professional activity.</p> <p>PLO 02. To know and understand the theoretical basics of metrology and electrical measurements, the principles of operation of automatic control devices, relay protection and automation, have the skills to make appropriate measurements and use these devices to solve professional problems.</p> <p>PLO 03. To know the principles of operation of electric machines, apparatus and automated electric drives and be able to use them to solve practical problems in their professional activities.</p> <p>PLO 04. To know the principles of bioenergy, wind power, hydropower and solar power plants.</p> <p>PLO 05. To know the basics of electromagnetic field theory, methods for calculating electric circuits, and be able to use them to solve practical problems in your professional activity.</p> <p>PLO 06. To apply application software, microcontrollers and microprocessor technology to solve practical problems in professional activities.</p> <p>PLO 07. To carry out the analysis of processes in the electric power engineering, electrical engineering and electromechanical equipment, corresponding complexes and systems.</p> <p>PLO 08. To select and apply suitable methods for the analysis and synthesis of electromechanical and power electrical engineering systems with specified parameters.</p> <p>PLO 09. To be able to evaluate the energy efficiency and reliability of power electrical engineering, electrical engineering and electromechanical systems.</p> <p>PLO 10. To find the necessary information in the scientific and</p>

	<p>technical literature, databases and other sources of information, to evaluate its relevance and reliability.</p> <p>PLO 11. To communicate freely with professional problems in the state and foreign languages orally and in writing, to discuss the results of professional activity with specialists and non-specialists, to substantiate their position on discussion issues.</p> <p>PLO 12. To understand the basic principles and objectives of technical and environmental safety objects of electrical engineering and electromechanics, take them into account when making decisions.</p> <p>PLO 13. To understand the importance of traditional and renewable energy for the successful economic development of the country.</p> <p>PLO 14. To understand the principles of European democracy and respect for citizens' rights and take them into account when making decisions.</p> <p>PLO 15. To understand and demonstrate good professional, social and emotional behavior, adhere to a healthy lifestyle.</p> <p>PLO 16. To know the requirements of regulatory acts relating to engineering activities, protection of intellectual property, labor protection, safety and industrial sanitation, and take them into account when making decisions.</p> <p>PLO 17. To solve complex specialized tasks in the design and maintenance of electromechanical systems, electrical equipment of power stations, substations, systems and networks.</p> <p>PLO 18. To be able to learn independently, acquire new knowledge and improve the skills of working with modern equipment, measuring equipment and application software.</p> <p>PLO 19. To apply suitable empirical and theoretical methods to reduce electricity losses in process of its production, transportation, distribution and use.</p> <p>PLO 20. Understand and be able to calculate the thermal and transient processes occurring in installations using renewable energy sources, as well as the principles of energy storage and transmission over a distance.</p> <p>PLO 21. Know modern technologies for obtaining, storing, transporting and using renewable energy sources, such as biofuels and hydrogen, for the production of electrical and thermal energy.</p>
8 – Resource support for program implementation	
Staffing	<p>All scientifically-pedagogical workers have qualification accordingly of educational components, experience of practical and scientifically-pedagogical activity, regularly promote the qualification through participating in scientific projects, conferences, internship in establishments of Ukraine.</p>
Material and technical support	<p>Logistical support of the educational program answers requirements and provides possibility of effective preparation of applicants.</p> <p>The specialized laboratories are used in an educational process:</p> <ul style="list-style-type: none"> - laboratory of the basics of metrology and electrical measurements; - laboratory of electric machines; - laboratory of theoretical foundations of electrical engineering; - laboratory of industrial electronics, microcircuitry and microprocessor technology; - laboratory of the alternative power energy, that provides laboratory workshops on the selective professional disciplines of the educational

	<p>program and contains the laboratory stand for the study of the rational use of solar energy by the solar battery (SRUSES); the laboratory stands for the study of the rational use of wind energy (SRUWE); the laboratory stands for the study of the rational use of solar energy by the solar energy collector of (SRUSESEC), the laboratory wind generator "Leleka".</p>
<p>Information, educational and methodological support</p>	<p>Statute about academic mobility of students, graduate students.</p> <p>All educational components are provided with educational and methodical materials accommodated in corresponding courses on the platform of the controlled from distance studies of Moodle. Applicants have a free access to modern professional literature and journals that is kept in collection of O.M. Beketov National University of Urban Economy in Kharkiv scientific library; bases given of Scopus and Web of Science; resources of SpringerLink, ScienceDirect from a publishing house "Elsevier", in particular on the platform of ScienceDirect – to the almost 40 thousand electronic journals and to collection over 2000 electronic monographs 2019 – 2020 edition.</p> <p>An official web-site functions in the university, where important information, electronic repository, spreads. Access is provided students and lecturers to the corporate system and world network of Internet.</p>
<p>9 – Academic mobility</p>	
<p>National credit mobility</p>	<p>Opportunity to participate in national credit mobility programs in other higher educational establishments of Ukraine, in which bachelors are trained in the specialty 141 Electrical power engineering, electrical engineering and electromechanics, to Statute about academic mobility of students, graduate students, doctoral students, scientifically-pedagogical and scientific workers of O.M. Beketov National University of Urban Economy in Kharkiv.</p>
<p>International credit mobility</p>	<p>Opportunity to participate in Erasmus+ International Credit Mobility international credit mobility programs with Middle Eastern University of Technology (Ankara, Turkey), Lodz Technical University (Lodz, Poland).</p>
<p>Training of foreign applicants for higher education</p>	<p>According to the Rules of admission to O. M. Beketov National University of Urban Economy in Kharkiv</p>