

**MINISTRY OF LABOUR AND SOCIAL PROTECTION OF THE
POPULATION OF THE REPUBLIC OF KAZAKHSTAN**

**“DEVELOPMENT OF LABOR SKILLS AND STIMULATION OF
WORKPLACES” PROJECT**

EDUCATIONAL PROGRAMME

0916000 – Hybrid Energy
(code and name of the specialty)

Level of professional training: mid-level specialist

Duration of training: 3 years 10 months

Astana, 2018

The educational programme was reviewed and recommended by the Republican Educational and Methodological Council of the Ministry of Education and Science of the Republic of Kazakhstan

Record No. __3_ dated “__18__” __08__ 2018 y.

Authors - developers:

1. Meruert N. Moldubaeva – a teacher of special disciplines of Aktyubinsk Polytechnic College
2. A.M. Balgynova – a teacher of special disciplines of Aktyubinsk Polytechnic College
3. Zeynegul A. Baimakhanov – Ph.D., a teacher of special disciplines of college No.12 “Taraz” under akimat of Zhambyl region.
4. G.K. Izimov - a teacher of special disciplines of Aktyubinsk Polytechnic College
5. Urzada A. Abdukadirova – a teacher of special disciplines of the South Kazakhstan Polytechnic College.

Experts:

- A.B. Abdrassil – a Teacher of Special Disciplines of Almaty College of Energy and Electronic TechnoloHEs, Almaty
- T.N. Sharipov – a Teacher of special disciplines of Almaty College of Energy and Electronic TechnoloHEs, Almaty

CONTENT

	Introduction	4
1	Used abbreviations and designations	5
2	Passport of education program	6
3	Competency profile	7
4	List of modules and learning outcomes	10
4.1	Specification of the basic module 1 “Application of professional vocabulary, the preparation of business papers in the field of professional activity”	32
4.2	Specification of the basic module 2 “Application of the basics of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce”	34
4.3	Specification of the basic module 3 “Understanding the history, role and place of Kazakhstan in the world community, respectful and caring attitude to historical heritage”	36
4.4	Specification of the basic module 4 “Application of basic knowledge of the economy and knowledge of labor laws and regulations to protect their rights in their professional activities”	38
4.5	Specification of the basic module 5 “Development and improvement of physical qualities”	40
4.6	Specification of the basic module 6 “Execution, execution, reading of design and technological documentation using application programs”	42
4.7	Specification of the professional module1 “Performance of work on the maintenance of station equipment with traditional new and renewable energy sources”	44
4.8	Specification of the professional module 2 “Ensuring work on the power supply, management and control of automated systems and energy equipment based on HES”	47
4.9	Specification of the professional module of module 3 “Carrying out technical operation, repair and modernization of power plants based on HES”	51
4.10	Specification of the professional module of module 4 “Implementation of the commissioning and monitoring of the operation of the operated energy equipment based on HES”	54
4.11	Specification of the professional module of module 5 “Organization of work on production planning and ensuring safe operation”	56
5	Education Process Plan	59

INTRODUCTION

The present educational programme in the specialty “0916000 - Hybrid Energy” was developed in accordance with the State Compulsory Standard of Post-Secondary Education, approved by the Resolution of the Government of the Republic of Kazakhstan No. 1080 on August 23, 2012; the national qualifications framework of the Republic of Kazakhstan (joint order of the Minister of Labor and Social Protection of Population of the Republic of Kazakhstan of September dated September 24, 2012 No. 373-o-m and the Minister of Education and Science of the Republic of Kazakhstan dated September 28, 2012 No. 444); the branch qualifications framework in the field of “Electric Power industry”, approved by the protocol on November 17, 2016 No. 12-03-333; The project on the professional standard “Electrical equipment of power plants and networks (by types)” was developed by the Legal Entities Association “Kazakhstan Association of Oil and Gas and Energy Complexes “KAZENERGY”, version 1, 2015, the date of the tentative revision is 2018 and taking into account the Order of the Minister of Education and Science of the Republic of Kazakhstan dated October 31, 2017 № 553 “On the approval of standard curricula and model curricula for the specialties of technical and vocational education”.

The programme is designed to implement the principles of the democratic nature of education management, expand the boundaries of academic freedom and the authority of educational institutions, which will ensure the adaptation of the system of technical and vocational education to the changing needs of society, the economy and the labor market. Flexibility of the programme will allow to take into account the abilities and needs of the individual, production and society.

The modular-competence approach is based on the development of training and evaluation of training outcomes in the form of students’ competencies, as well as on the possibility to use a differentiated approach to training.

The competency-based program is in line with the concept of lifelong training, as it aims to build highly qualified professionals who are able to adapt to the changing situation in the world of work, on the one hand, and to continue professional growth and education on the other one. This approach to training makes it possible to create a sense of success for each student, which is created by the training process organization, in which the student can and must manage his/her own training, which teaches him/her to take responsibility for his/her own training, and further - for his/her own professional growth and career. Thus, the consumer will be satisfied with the education; he/she can improve it during his/her life, responding to changes in the labor market.

The developed educational programme allows to organize educational process with use of credit technology of training.

Based on this EP, the education institution develops working curricula and programs using the appropriate methodological recommendations for working training and planning documentation.

LIST OF SYMBOLS AND ABBREVIATIONS

BC	Basic Competence
BM	Basic Module
HE	Higher Education
SCES	State compulsory education standard
EQF	European Qualification Framework
K&S	Knowledge & skills
NCO	National Classification of Occupations
NQF	National Qualifications Framework
NQS	National Qualifications System
GHM	General Humanitarian Module
GCEA	General Classifier of Economic Activities
GM	General Module
EP	Education Program
GPM	General Professional Module
IQF	Industrial Qualifications Framework
PS	Professional Standard
PC	Professional Competence
PM	Professional Module
RK	Republic of Kazakhstan
LO	Learning Outcome
SM	Special Module
TVE	Technical and Vocational Education
HES	Hybrid Energy Source
NC&RE	Non-Conventional & Renewable Energy

THE PASSPORT OF THE EDUCATIONAL PROGRAM

The name (*code and name of the specialty*) 0916000 - Hybrid energy

Name and qualification code 0916001 – “Operator of a new and renewable energy source”, “Power Engineering Technician”

The purpose of the working educational program is the training of qualified specialists with knowledge on the technically possible potential of hybrid energy, on the principles of operation of devices for transforming non-conventional energy resources, and the implementation ways of energy-efficient technologies on their basis.

Level of education is technical and professional

The professional qualification level is an elevated level, a middle-level specialist

Levels of qualifications for NQF/SQF 3, 4

Area of professional activity Electricity production (organization and performance of works on maintenance, operation, repair, adjustment and testing of electrical equipment of a hybrid power station)

Type (s) of labor activity (*according to SQF and PS*) ** Organization of technical maintenance, installation, adjustment, testing, repair, operation and diagnostics of electrical equipment of power plants, control and management of technological processes of electric power production.

Object(s) of professional activity (*for the NCO, the initial group*) *** Power plants, energy companies, production workshops, equipment repair areas

Features of the program **** Ability to use the dual form of training, credit training system

Form of education Full-time

Terms of training 3 years 10 months

Language of instruction: Kazakh, Russian

Volume 6588 hours.

credits / hours

Requirements for students***** **persons having** a basic secondary / general secondary education

* To be indicated by the parameters of the SQF (Methodological recommendations for the development and design of the sectorial qualifications framework, Astana, 2016).

** To be indicated according to PS (Methodological recommendations on development and registration of professional standards, Astana, 2017)

*** The systems, items (objects), phenomena, processes, technologies for which activity is directed are indicated.

**** To be indicated dual education / distance training / credit technology

***** The previous education is indicated: basic secondary / general secondary / technical and vocational education

COMPETENCY PROFILE

The purpose of training <i>(the result of the training the program seeks to achieve)</i>		After completing the training, the trainee performs the qualification of the “Operator of a new and renewable energy source” and “Power Technician” for the production of electric power based on the use of power equipment based on HES
The names of the section, section, group, class and subclass according to GCEA * <i>(by PS)</i>		Section: [D] Power supply, gas and steam supply and air conditioning Section: [35] Power supply, gas and steam supply and air conditioning Group: [351] Electricity production, transmission and distribution Class: [3511] Electricity production
Areas of competence <i>(on the basic labor functions of the professional standard or the analysis of the profession) **</i>		1. Maintenance of power plants equipment with conventional new and renewable energy sources 2. Carrying out of works to provide power supply, management and control of automated systems and power equipment with the introduction of hybrid energy sources 3. Technical operation, repair and modernization of the main power and auxiliary equipment, power structures of power plants based on hybrid energy sources 4. Control organization over the operation of energy equipment and power structures of power installations, power plants and energy complexes based on hybrid energy sources
List of competencies and modules in the context of academic degree / qualification / profession		
Competence code	Competence Competencies (in accordance with labor functions and skill levels)	Modules
Basic Competences		
BC 1	Apply professional vocabulary, draw up and execute business documents in the field of activity to solve problems of interpersonal and intercultural interaction	BM 1. Application of professional vocabulary, drawing up business papers in the field of professional activity
BC 2	Use the basics of philosophical knowledge, be aware of oneself and one’s place in society, tolerate the social, political, ethnic, confessional and cultural development	BM 2. Use of the basics of philosophical knowledge and social sciences for socialization

		and adaptation in society and work collective
BC 3	Understand the history, role and place of Kazakhstan in the world community	BM 3. Understanding the history, role and place of Kazakhstan in the world community, respectful and caring attitude to historical heritage and cultural traditions
BC 4	Understand the basic laws and mechanisms of the functioning of the modern economic system	BM 4. Application of basic knowledge of the economy and knowledge of labor laws and regulations to protect their rights in their professional activities
BC 5	Maintain and develop an adequate level of physical fitness to ensure the full social and professional activities	BM 5. Development and improvement of physical qualities
BC 6	Know the basics of entrepreneurial activity and features of entrepreneurship in the professional sphere	BM 6. Performance, design, reading of design and technological documentation using application programs
Professional Competences		
PC 1.	Perform maintenance of station equipment with traditional new and renewable energy sources	PM 1. Maintenance of station equipment with traditional new and renewable energy sources
PC 2.	Provide work on power supply, management and control of automated systems and power equipment based on HES	PM 2. Ensuring work on power supply, control and monitoring of automated systems and power equipment based on HES
PC 3.	Perform technical operation, repair and modernization of power plants based on HES	PM 3. Carrying out technical maintenance, repair and modernization of power plants based on HES
PC 4.	Carry out the commissioning and monitoring of the operation of the	PM 4. Implementation of the commissioning and control of the work of

	operated power equipment based on HES	the operated power equipment based on HES
PC 5.	Perform the main types of work within the qualification	PM 5 Organization of work on production, planning and ensuring safe operation

* The general classifier of economic activities (GCEA) is a document intended for the classification and coding of all types of economic activity.

** A brief description of the work functions that enable you to achieve the main purpose of the specialty / profession. The number of functions depends on the complexity of the profession.

LIST OF MODULES AND LEARNING OUTCOMES

Module name	Learning outcomes (in accordance with professional objectives)	Criteria Assessment of learning outcomes	Disciplines that form the module
Professional Modules			
PM 1. Application of professional vocabulary, the preparation of business papers in the field of professional activity	LO 1. To know the grammar and terminology of the Kazakh (Russian) and foreign languages for communication in the sphere of their professional activities	1. Possession of lexical and grammatical material in the specialty necessary for professional communication.	Professional Kazakh (Russian) language Professional English
		2. Understanding the value of written and oral communication in Kazakh (Russian) and foreign languages.	
		3. The use of communication skills to establish and develop relations of cooperation and partnership	
		4. Writing texts using various presentation forms.	
	LO 2. To know a translation technique (with a dictionary) of professional-oriented texts.	1. Reading and translation (with a dictionary) of professional texts.	
		2. Independent compilation of coherent, logical reasoned statements in accordance with the proposed topic.	

		3. Understanding of the discussion topics and participation in its discussion.	
	LO3. To work with organizational, administrative, information and reference documents using computer technologies	1. Drawing up in Kazakh (Russian) and foreign languages a resume, autobiography, description, statement, complaint, power of attorney, receipt.	
		2. Compliance with the basic requirements for the text of the document.	
		3. Creation of documents on the computer that meet modern requirements and established regulations.	
BC 2. Application of the basics of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce	LO 1. To determine the ratio in the life of a person of such philosophical categories as freedom and responsibility, material and spiritual values.	1. Understanding the essence of social and ethical problems associated with the development and use of the achievements of science, technology and technology. 2. Understanding the essence of the process of knowledge and different points of view on the process of knowledge in the history of philosophy.	Basic philosophy Fundamentals of sociology and political science

		3. Application of skills to analyze the main world outlook and methodological problems arising in science at the present stage of its development.	
	LO 2. Understand international political processes, geopolitical situation	1. The use of political science knowledge in everyday life and in their professional activities.	
		2. Participation in discussions on current issues, problems and prospects for development, etc.	
		3. The use of social, moral and legal norms governing the attitude of a person to a person, society, environment.	
	LO 3. Understand the moral values and norms that form tolerance and an active personal position.	1. Understanding the role and place of culture of the peoples of the Republic of Kazakhstan in the world civilization.	
		2. The use of approaches and methods of critical analysis in relation to various cultural forms and processes of modern life of society.	
		3. Application of national traditions and customs of	

		various countries in their professional activities.	
BC 3. Understanding the history, the role and place of Kazakhstan in the world community, respectful and caring attitude to historical heritage and cultural traditions	LO 1. To understand the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization	1. Knowledge of the history of national culture, the values of traditional Kazakh culture	History of Kazakhstan
		2. Understanding of the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization.	
		3. Characteristics of the cultural achievements of independent Kazakhstan.	
	LO 2. To understand the moral values and norms that form tolerance and an active personal position.	1. Knowledge of characteristics of the forms, types and history of different cultures and civilizations.	
		2. Knowledge of the history and understands the current state of the world and traditional religions.	
		3. Distinguishing of extremist radical and terrorist ideology.	
		4. Tolerantly perceivment social, ethnic, confessional and cultural differences.	
	LO 3. To understand major historical events	1. Knowledge of the chronology and understands the essence of the	

		historical events that occurred from antiquity to the present.	
		2. Revealing of the role and place of the Kazakh people in the common Turkic community, in the system of a nomadic civilization, in the development of the historical and cultural community of the peoples of the Eurasian world.	
		3. Understanding of the nature and purpose of political and social changes taking place in the Republic of Kazakhstan after independence.	
		4. Knowledge of characteristics of the achievements of the independent Kazakhstan.	
	LO 4. To determine causal relationships of historical events.	1. Identification of the basic facts, processes and phenomena that reflect and characterize the integrity and consistency of the history of Kazakhstan.	
		2. Establishment of the connection between historical events.	

		3. Use of historical sources.	
PM 4. Application of basic knowledge of economics and knowledge of labor laws and regulations to protect their rights in their professional activities	LO 1. To determine the forms and types of property, types of plans, basic economic indicators of an enterprise	1. Perform the necessary economic calculations using mathematical methods.	Basics of Economics Law basics
		2. Discussion of the main economic indicators of the enterprise.	
		3. Conducting measurements of the cost of working time to perform a certain work.	
		4. Definition of methods to reduce costs and increase profitability	
	LO 2. To understand the development trends of the world economy, the main objectives of the state's transition to a green economy	1. Understanding the main objectives of the state transition to a "green" economy.	
		2. Use of basic methods for calculating gross domestic product and gross national product.	
		3. Definition of global economic problems, ways to overcome them	
	LO 3. To protect your rights in accordance with labor laws	1. Understanding of the legal status in the formation of the identity of a citizen in accordance with the provisions of the Constitution of the Republic of Kazakhstan.	

		2. Application of evidence-based argumentation of one's own position in specific legal situations using normative acts.	
		3. Understanding of responsibility for administrative and corruption offenses.	
BC 5. The development and improvement of physical qualities	LO 1. To strengthen health and abide by the principles of a healthy lifestyle.	1. Understanding the importance of physical culture for health promotion, the role of physical culture and sports in the development of the country.	Electrical Safety Energy Economics Undergraduate work
		2. Performing a set of exercises for general physical training.	
		3. Application of the rule of a healthy lifestyle in everyday life.	
	LO 2. To improve physical qualities and psycho-physiological abilities	1. Mastering the technique of doing the exercise.	
		2. Compliance with the rules of team sports.	
		3. Application of the studied methods of games and individual tactical tasks in the educational game.	
4. Implementation of control standards and tests provided by the program.			

	LO 3. Provide first aid for injuries and accidents.	1. Understanding the causes of injury during exercise, methods of injury prevention. 2. Providing medical care for injuries. 3. Evaluation of the difficulties and risks arising during the execution of various physical activities, own and others' physical capabilities.	
BC 6. Performance, design, reading of design and technological documentation using application programs	LO 1. To comply with the rules for design documentation	1. Understanding of the rules of documentation design 2. Registration of drawings according to the rules of a unified system of design documentation 3. Definition of the purpose and scale of the drawing technical details 4. Compliance with the requirements of the unified system of design documentation (ESKD).	Engineering graphics. Computer design
	LO 2. To have projection skills on a plane	1. Execution and design of the necessary cuts in the drawings. 2. Perform axonometric projection 3. Execution of drawings of diagrams according	

		to symbols in accordance with a single system of design documentation.	
		4. Application of computer graphics techniques	
	LO 3. To develop and design schemes for the specialty with the help of the application package	1. Drawing of specialty schemes using technical drawing tools	
		2. The use of modern computer applications	
		3. Possession of computer graphics, the use of 3D-graphics.	
Professional Modules			
PM 1. Performing maintenance of station equipment with traditional new and renewable energy sources.	LO 1. To have an idea about the chosen specialty, about the methods and physical processes of energy conversion	1. Explanation of the main types of NC&RE energy resources, methods and physical processes of the conversion of NC &RE into electrical and thermal energy	Introduction to the specialty
		2. Description of the composition of the NC&RE and installations and the appointment of individual nodes	The physical basis of alternative and renewable energy Electrical measurements Basics of Computer Literacy
	LO 2. To determine by individual signs and indications of equipment malfunctions	1. Performing electrical measurements and checking meter readings and alarms and applying the rules of electrical equipment maintenance and	Drawing Organization of works on maintenance of the station's electrical equipment

		determining the main causes of electrical failure	Health and Safety
		2. Filling in technological documentation and execution of work progress reports	Industrial Training
		3. The search, storage, processing and analysis of information from	
	LO3. To carry out maintenance and preventive inspections of station equipment with traditional new and renewable energy sources	1. Determination of the main types of electrical equipment malfunctions, device characteristics and safe operation of station equipment	
		2. The use of safe methods of work on electrical equipment and the use of devices, tools, equipment and measuring instruments when servicing electrical equipment	
		3. Performing inspection, performance checks and determination of damage to electrical equipment and execution of technical documentation for electrical equipment maintenance	

		4. Compliance with the rules and requirements of industrial sanitation, electrical safety, fire safety, an explanation of the types and purpose of personal and collective protection and the application of safety regulations, maintenance of electrical installations	
PM2. Provision of works on power supply, management and control of automated systems and energy equipment based on HIE	LO 1. To apply the equilibrium conditions in the systems of forces, the main provisions of the resistance of materials and methods for calculating machine parts	1. Possession of the basic concepts and axioms of statistics, equilibrium conditions in the systems of forces.	Theoretical mechanics
		2. Determination of the moment of force relative to a point and axis, the reaction of a bar and beam system, the center of gravity of flat geometric figures and standard profiles.	Theoretical foundations of electrical engineering Theoretical foundations of alternative and renewable energy Electric cars
		3. Possession of skills for calculating the cut-off and collapse, the use of the geometric characteristics of flat sections of parts, understanding the actions of dynamic and re-variable loads, performing design	Power supply GIE Automatic control in power engineering Internship

		<p>calculations for gears and shafts and mastering the methods of calculating parts, gears, connections and devices.</p> <p>4. Possession of basic concepts about machine parts, types of mechanical gears and their characteristics, shafts, axles, bearings, couplings, connections of machine parts and their characteristics.</p>	
	<p>LO 2. To analyze the basic laws and characteristics, calculate electrical circuits by analytical and graphical methods</p>	<p>1. Analysis of the main components of the electrical circuit, the appointment of sources and consumers of electrical energy, the definition of the basic laws and properties of electrical and magnetic circuits, features of DC and AC circuits, linear and non-linear circuits.</p> <p>2. Calculation of linear and nonlinear DC circuits, single-phase AC circuits, symmetrical and asymmetric three-phase AC circuits.</p>	
	<p>LO 3. To understand the basics of alternative</p>	<p>1. Knowledge of the physical principles on which the</p>	

	energy, modern renewable energy and other aspects of professional activity	operation of facilities for the generation of non-conventional types of energy is based, understanding of typical electro-technological processes of energy conversion	
		2. The introduction of electrical technology ways to convert non-conventional types of energy;	
		3. Operation of Electrotechnological power and energy installations	
	LO 4. To determine the type of electric cars by design and passport data	1. Understanding the purpose, classification, scope, design and principles of operation of electric machines	
		2. Application of calculation methods and	
	LO 5. To provide uninterrupted power supply and perform a selection of protection and electrical equipment for power supply networks	1. Knowledge of general information about the power supply systems of various objects and their characteristic features, the main types of power consumers, their modes of operation, power consumption modes in power supply systems for various purposes	

		<p>2. Knowledge of methods for calculating the integral characteristics of the modes and determining the calculated values of loads</p>	
		<p>3. Ensuring the quality of electricity in systems of power supply</p>	
		<p>4. Understanding the devices and principles of operation of various types of relays used in relay protection circuits and the definition of types of relay protection, understanding of the protection scheme of individual elements of power supply systems, electrical equipment control circuit and characterization of types, assignments and basic requirements for automation devices in power supply systems, selection of protection and electrical automation for power supply networks</p>	

PM 3. Carrying out technical maintenance, repair and modernization of power plants based on the HES	LO 1. To make the selection of the main energy and auxiliary equipment of plants based on HES	1. Selection of the main energy and auxiliary equipment of plants based on HES and their main energy, economic and environmental characteristics	Main power equipment HES installations
		2. Understanding the purpose, classification, design and physical basis of the main energy and auxiliary equipment of plants based on the HES	Auxiliary equipment for HES installations Electrical equipment of power stations and substations
		3. Knowledge of the main energy, environmental and economic characteristics of generating facilities based on GIE and the use of methods for calculating parameters and choosing the composition of the main energy and auxiliary equipment of installations based on HES	Operation and repair of electrical equipment of stations based on HES New energy technologies Internship
	LO2. To apply the basic rules of technical operation of power plants based on HES	1. Work with technical documentation on acceptance of equipment into operation of installations based on HES and drawing up protocols for testing and testing of electrical equipment	

		<p>2. The application of the rules for the implementation of operational switching in practice and filling out forms of switching for the withdrawal of electrical equipment in repair in normal and emergency modes</p>	
		<p>3. Decision making in case of liquidation of accidents at HES stations</p>	
	<p>LO 3. To perform repairs of equipment of electrical installations based on HES</p>	<p>1. Reading the signs in electrical circuits and electrical circuits</p>	
		<p>2. Implementation of technological processes of repair of the main energy and auxiliary equipment of plants based on HES</p>	
		<p>3. Definition of names of markings, properties of material, products, tools, devices and mechanisms for the production of repair</p>	
		<p>4. Compliance with the safety requirements of the repair work and the repair in accordance with the project of production of works, working</p>	

		drawings, the requirements of regulatory documents	
	LO 4. To carry out work on the modernization of power plants based on HES	1. Knowledge of the principles of development of energy-saving technologies and the development of measures for the implementation of the energy-saving potential of the main technological objects of production	
		2. Introduction of innovations in the energy supply of the enterprise and the use of modern technology and equipment	
		3. Recommendation of low-waste and resource-saving technologies	
PM 4. Implementation of the commissioning and monitoring of the operation of the operating energy equipment based on HES	LO 1. To apply the basic methods and means of measuring electrical and electrical quantities, choose measuring equipment	1. Determination of the values of the measured value and indicators of measurement accuracy 2. Drawing up a measuring circuit and a choice of measuring instruments and measuring with a given accuracy various electrical quantities	Information and measuring equipment and electronics Relay Protection and Automation Energy Saving Technologies

		3. The use of computer technology for processing and analyzing measurement results	
	LO 2. To monitor the operation of the operated power equipment based on HES	1. Characteristics and scope of the relay; relay connection schemes, knowledge of the functions, requirements for relay protection and the choice of relay types and methods for regulating the parameters of relay protection and automation	
		2. Reading the differential protection circuit, its action, scope and circuit of relay protection and automation of electrical machines and apparatus, power lines and transformers	
		3. Analysis of the relay protection circuit of power lines, transformers, compensators, electric motors, busbars, blocks	
	LO 3. To know the ways of organizing and conducting energy efficient and energy-saving	1. To know legislative acts of state policy on the effective use of fuel energy resources in the Republic of	

	technologies in the industrial sector	<p>Kazakhstan and ways to save resources, energy-saving technologies</p> <p>2. Description and explanation of the main directions of rational and unsustainable nature management, methods of generating electrical energy in various types of power plants</p> <p>3. Using the simplest methods of reducing heat losses in buildings and structures</p>	
<p>PM 5 Organization of work on planning and safe work</p>	<p>LO 1. To comply with occupational health and safety requirements</p>	<p>1. Knowledge of requirements for employees allowed to perform work in electrical installations, organizational and technical measures when working in electrical installations</p> <p>2. Registration attire - admission to work in electrical installations</p> <p>3. The use of personal and collective protection in the production of works in electrical installations and the implementation of</p>	<p>Electrical safety and labor protection</p> <p>Energy Economics</p> <p>Prediploma work</p>

		operational switching, work in existing electrical installations	
		4. Providing first aid to victims of electric shock, the classification of electrical rooms	
	LO 2. To apply the results of economic analysis of industrial and energy organizations psychophysiological abilities	1. Understanding the essence of market reforms, awareness of the structure of enterprise management, mastering the basics of planning	
		2. The calculation of technical and economic indicators	
		3. Understanding of the ways of development of the economy of the Republic of Kazakhstan, analysis of the effectiveness of reforms and planning in the Republic of Kazakhstan	
		4. Orientation in the management hierarchy and the implementation of the calculation of the investment in capital construction	

	<p>LO 3. Perform the main types of work appliances-energy service of the enterprise on the GIE</p>	<p>1. Characteristics of the process for the technical operation, maintenance and repair of electrical and electromechanical equipment of HES.</p>	
		<p>2. Application of management skills of a separate production unit within the functions assigned to mid-level specialists</p>	
		<p>3. Execution and organization of operation of the main electrical and auxiliary equipment of plants based on GIE and the work of the production unit for technical operation, maintenance and repair of the main electrical and auxiliary equipment of plants based on HES.</p>	
	<p>LO 4. To carry out the collection of source material for the graduation design of objects GIE.</p>	<p>1. Collection of source material for the degree design in accordance with the regulatory and technical documentation of the objects of the GIE and the task for the degree design</p>	
		<p>2. Acquisition of skills in working with regulatory and</p>	

		technical documentation, reference books	
--	--	--	--

SPECIFICATION OF THE BASIC MODULE BM 1

“Application of professional vocabulary, the preparation of business papers in the field of professional activity”

Scope of competence	
Module name and code	The use of professional vocabulary, the preparation of business papers in the field of professional activity
Purpose of the module	Formation and development of communicative speech competence of students, improving the speech culture of future specialists and promptly carry out tasks and competently issue official business papers.
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1 To know the grammar and terminology of the Kazakh (Russian) and foreign languages for communication in the sphere of their professional activities 2. To master the translation technique (with a dictionary) of professional-oriented texts 3. To work with organizational, administrative, information and reference documents using computer technologies.
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of lexical and grammatical material in the specialty necessary for professional communication. 2. Understanding the value of written and oral communication in Kazakh (Russian) and foreign languages. 3. The use of communication skills to establish and develop relations of cooperation and partnership 4. Writing texts using various presentation forms. 5. Reading and translating (with a dictionary) texts of professional orientation. 6. Independent compilation of coherent, logical reasoned statements in accordance with the proposed topic. 7. Understanding of the discussion topics and participation in its discussion.

	<p>8. Drawing up in Kazakh (Russian) and foreign languages a summary, autobiography, description, statement, complaint, power of attorney, receipt.</p> <p>9. Compliance with the basic requirements for the text of the document.</p> <p>10. Creation of documents on the computer that meet modern requirements and established regulations.</p>
Prerequisites	School program: Kazakh (Russian) language, Foreign language
Disciplines forming the module	Professional Kazakh (Russian) language, Professional foreign language, Professionally-oriented foreign language, Office work in the state language
Module type (mandatory, optional)	Mandatory
Labor intensity (credit RK / academic hours)	6 credits/ 18- hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional methods of teaching - lecture, practical classes, problematic teaching methods, interactive teaching methods
Form of control	Pass fail exam, exam
Required resources	Personal Computer; software; presentations; electronic media; support maps; handouts.
Language of instruction	Kazakh, Russian
Post-requisites	PM 1- PM 6 Professional Modules

SPECIFICATION OF THE BASIC MODULE BM 2

“Application of the foundations of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce”

Scope of competence	
Module name and code	Application of the basics of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce
Purpose of the module	Formation of students' system of knowledge about the political, legal and socio-spiritual foundations of the functioning and development of society
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To determine the ratio in the life of a person of such philosophical categories as freedom and responsibility, material and spiritual values. 2. To understand international political processes, geopolitical situation 3. To understand the moral values and norms that form tolerance and an active personal position.
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Understanding the essence of social and ethical problems associated with the development and use of the achievements of science, technology and technology. 2. Understanding the essence of the process of knowledge and different points of view on the process of knowledge in the history of philosophy. 3. Application of skills to analyze the main world outlook and methodological problems arising in science at the present stage of its development. 4. The use of political science knowledge in everyday life and in their professional activities. 5. Participation in discussions on topical issues, problems and prospects for development, etc. 6. The use of social, moral and legal norms governing the attitude of a person to a person, society, environment.

	<p>7. Understanding the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization.</p> <p>8. The use of approaches and methods of critical analysis in relation to various cultural forms and processes of modern life of society.</p> <p>9. Application of national traditions and customs of various countries in their professional activities.</p>
Prerequisites	School Program: History, Man and Society, Literature, Geography
Disciplines forming the module	Fundamentals of philosophy Fundamentals of Sociology and Political Science
Module type (mandatory, optional)	Mandatory
Labor intensity (credit RK / academic hours)	6 credits /180 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional methods of teaching - lecture, practical classes, problematic teaching methods, interactive teaching methods
Form of control	Pass fail exam, exam
Required resources	Personal Computer; software; presentations; electronic media; support maps; handouts.
Language of instruction	Kazakh, Russian
Post-requisites	Modern History of Kazakhstan, Culturology, Basics of Economics

SPECIFICATION OF THE BASIC MODULE BM 3

“Understanding of the history, role and place of Kazakhstan in the world community, respectful and caring attitude to historical heritage and cultural traditions”

Scope of competence	
Module name and code	Understanding of the history, role and place of Kazakhstan in the world community, respectful and caring attitude to historical heritage and cultural traditions
Purpose of the module	Show scientifically - proven facts, continuity and consistency of historical and cultural development from ancient times to the present day
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To understand the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization 2. To understand the moral values and norms that form tolerance and active personal position 3. To understand the main historical events 4. To determine the causal relationships of historical events.
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of the history of national culture, the values of traditional Kazakh culture 2. Understanding of the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization. 3. Characteristics of the cultural achievements of independent Kazakhstan. 4. Characteristics of the forms, types and history of various cultures and civilizations. 5. Knowledge of the history and understands the current state of the world and traditional religions. 6. Distinguishing of the extremist radical and terrorist ideology. 7. Tolerant perception of social, ethnic, confessional and cultural differences.

	<p>8. Knowledge of the chronology and understands the essence of historical events that occurred from antiquity to the present.</p> <p>9. Identification of the role and place of the Kazakh people in the common Turkic community, in the system of nomadic civilization, in the development of the historical and cultural community of the peoples of the Eurasian world.</p> <p>10. Understanding the nature and purpose of political and social changes in the Republic of Kazakhstan after independence.</p> <p>11. Characteristics the achievements of an independent Kazakhstan.</p> <p>12. Definition the basic facts, processes and phenomena that reflect and characterize the integrity and consistency of the history of Kazakhstan.</p> <p>13. Establishment of the connection between historical events.</p> <p>14. Use of historical sources.</p>
Prerequisites	School Program: History, Man and Society, Fundamentals of Law
Disciplines forming the module	The modern history of Kazakhstan, Culturology
Module type (mandatory, optional)	Mandatory
Labor intensity (credit RK / academic hours)	4 credits/ 120 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional methods of teaching - lecture, practical classes, problematic teaching methods, interactive teaching methods
Form of control	Pass fail exam
Required resources	Personal Computer; software; presentations; electronic media; support maps; handouts.
Language of instruction	Kazakh, Russian
Post-requisites	Fundamentals of Philosophy, Fundamentals of Sociology and Political Science

SPECIFICATION OF THE BASIC MODULE BM 4

"Application of basic knowledge of the economy and knowledge of laws on labour and regulations to protect their rights in their professional activities"

Scope of competence	
Module name and code	BM 4. Application of basic knowledge of the economy and knowledge of labor laws and regulations to protect their rights in professional activities
Purpose of the module	To familiarize with the basic theoretical positions of economic activity of the power enterprise in the conditions of market economy, the basic economic categories and concepts, the existing system of economic indicators and methods for their calculation
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To determine the forms and types of ownership, types of plans, the main economic indicators of the enterprise 2. Understand the development trends of the world economy, the main objectives of the state's transition to a green economy 3. Protect your rights in accordance with the law on labour
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Perform necessary economic calculations using mathematical methods. 2. Discussion of the main economic indicators of the enterprise. 3. Conducting measurements of the cost of working time to perform a certain work. 4. Definition of methods to reduce costs and increase profitability 5. Understanding the main objectives of the state's transition to a "green" economy. 6. The use of basic methods of calculating gross domestic product and gross national product. 7. Definition of global economic problems, ways to overcome them

	<p>8. Understanding of the legal status in the formation of the identity of a citizen in accordance with the provisions of the Constitution of the Republic of Kazakhstan.</p> <p>9. Application of evidence-based argumentation of one's own position in specific legal situations using normative acts.</p> <p>10. Understanding of responsibility for administrative and corruption offenses.</p>
Prerequisites	School Program: Man and Society, Fundamentals of Law, Geography
Disciplines forming the module	Fundamentals of Economics Fundamentals of Law
Module type (mandatory, optional)	Mandatory
Labor intensity (credit / academic hours)	4 credits / 120 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional teaching methods - lectures, practical classes, problem teaching methods, interactive teaching methods
Form of control	Pass fail exam, exam
Required resources	Personal Computer; software; presentations; electronic media; support maps; handouts.
Language of instruction	Kazakh, Russian
Post-requisites	Fundamentals of Philosophy, Labor Law of the Republic of Kazakhstan, Family Law of the Republic of Kazakhstan

SPECIFICATION OF THE BASIC MODULE BM 5
"Development and improvement of physical qualities"

Scope of competence	
Module name and code	BM 5. Development and improvement of physical qualities
Purpose of the module	Formation of physical culture of pupils and abilities to realize it in social-professional, physical culture and sports activity
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. Strengthen health and follow the principles of healthy lifestyles 2. To improve physical qualities and psychophysiological abilities 3. To provide first aid for injuries and accidents
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Understanding the importance of physical culture for health promotion, the role of physical culture and sports in the development of the country. 2. Performing a set of exercises for general physical training. 3. Application of the rule of a healthy lifestyle in everyday life. 4. Mastering the technique of doing the exercise. 5. Compliance with the rules of team sports. 6. Application of the studied methods of games and individual tactical tasks in the educational game. 7. Implementation of control standards and tests provided by the program. 8. Understanding the causes of injury during exercise, methods of injury prevention. 9. Providing medical care for injuries. 10. Evaluation of the difficulties and risks arising during the execution of various physical activities, own and others' physical capabilities.
Prerequisites	Knowledge of the school course of physical culture
Disciplines forming the module	Physical Culture
Module type (mandatory, optional)	Mandatory
Labor intensity (credit / academic hours)	6 credits / 180 hours
Duration of the module	3-8 semester

Form of training	Full-time
Technology of training	Practical work
Form of control	Pass fail exam, exam
Required resources	Sports hall and sports inventory
Language of instruction	Kazakh, Russian
Post-requisites	Groups of sports perfection

SPECIFICATION OF THE BASIC MODULE BM 6
“Performance, design, reading of design and technological documentation
using application programmes”

Scope of competence	-
Module name and code	Performance, design, reading of design and technological documentation using application programs
Purpose of the module	After studying this module, the student will be able to perform, design, read the design and technological documentation using application programs.
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To follow the rules of design documentation. 2. To have the skills of projecting on the plane. 3. To develop and design schemes for the specialty with the help of the application package.
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Understanding the rules for design documentation. 2. Design drawings according to the rules of a single system of design documentation. 3. Definition of the purpose and scale of the drawing technical details. 4. Compliance with the requirements of the unified system of design documentation (ESKD). 5. Execution and registration of the necessary cuts on the drawings. 6. Perform axonometric projection. 7. Execution of drawings of schemes according to symbols according to a single system of design documentation. 8. Application of computer graphics techniques. 9. Implementation of schemes in the specialty, using the means of technical drawing. 10. The use of modern software applications.

	11. Possession of computer graphics, the use of 3D-graphics.
Prerequisites	Mathematics, geometry and stereometry of the school program; Computer science; Object Oriented Programming.
Disciplines forming the module	Engineering graphics; Computer design.
Module type (mandatory, optional)	Mandatory
Labor intensity (credit RK / academic hours)	4 credits/ 120 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Verbal (conversation, lecture); visual practical; problem search; reproductive; inductive; case method
Form of control	Pass fail exam
Required resources	Personal Computer; software; presentations; electronic media; support maps; handouts.
Language of instruction	Kazakh, Russian
Post-requisites	Basics of computer simulation.

SPECIFICATION OF THE PROFESSIONAL MODULE PM 1
"Maintenance of station equipment with traditional new and renewable energy sources"

Scope of competence	Maintenance of station and substation equipment
Module name and code	PM 1. Performance of maintenance of equipment of the station with traditional new and renewable energy sources
Purpose of the module	After studying this module, the student will be able to perform maintenance work on the equipment of the station with traditional new and renewable energy sources.
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To have an idea of the chosen specialty, about the methods and physical processes of energy conversion 2. To determine the malfunctioning of the equipment in terms of certain characteristics and indications of the devices 3. To carry out maintenance and preventive inspections of station facilities with traditional new and renewable energy sources 4. To perform the main types of work on the qualification “Operator of a new and renewable energy source»
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Explanation of the main types of NV &RE energy resources, methods and physical processes of the conversion of NV&RE into electrical and thermal energy 2. Description of the composition of the NV&RE and installations 3. Performing electrical measurements and verifying meter readings and alarms and applying electrical equipment maintenance rules and determining the main causes of electrical failure 4. Filling in technological documentation and execution of work progress reports

	<p>5. The search, storage, processing and analysis of information from various sources and databases, basic, system, service software products, application packages and knowledge of the rules for constructing and reading drawings and diagrams</p> <p>6. Determination of the main types of electrical equipment malfunctions, characteristics of devices and safe operation of station equipment</p> <p>7. The use of safe methods of work on electrical equipment and the use of devices, tools, equipment and measuring instruments when servicing electrical equipment</p> <p>8. Inspection, performance check and determination of damage to electrical equipment and execution of technical documentation for electrical equipment maintenance.</p> <p>9. Compliance with the rules and requirements of industrial sanitation, electrical safety, fire safety, an explanation of the types and purpose of personal and collective protection and the application of safety regulations, maintenance of electrical installations</p> <p>10. Possession of knowledge about the structure and main tasks of the site for servicing equipment, compliance with the working hours of the enterprise and a description of the rules of internal labor regulations.</p> <p>11. Compliance with the primary instruction on safety.</p> <p>12. Familiarization with the types of maintenance and preventive inspection of plant equipment and warning of possible accidents and equipment malfunction, and if they occur, the rapid application of measures to eliminate them</p>
Prerequisites	School knowledge of mathematics, physics, drawing

Disciplines forming the module	Introduction to the specialty Physical basis of non-conventional and renewable energy Electrical measurements Basics of Computer Literacy Drawing Organization of maintenance of electrical equipment of the station Occupational safety and health
Module type (mandatory, optional)	Mandatory
Labor intensity (credit RK / academic hours)	16 credits/ 480 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional methods of teaching - lecture, practical and laboratory classes, problematic teaching methods, interactive teaching methods.
Form of control	Pass fail exam, exam
Required resources	Technical literature, Internet classes, standard training, laboratory equipment, workshops, practice bases, electronic educational resources
Language of instruction	Kazakh, Russian
Post-requisites	Theoretical Mechanics Theoretical Foundations of Electrical Engineering Theoretical Foundations of Unconventional and Renewable Energy Electric cars Power supply of HES Automatic control in power engineering

SPECIFICATION OF THE PROFESSIONAL MODULE PM 2
“Ensuring work on the power supply, management and control of automated systems and energy equipment based on HES”

Scope of competence	Power supply, control and monitoring
Module name and code	PM 2. Maintenance of works on power supply, management and the control of the automated systems and the power equipment based on HE
Purpose of the module	After studying this module, the student will be able to provide work on electricity supply, management and control of automated systems and energy equipment based on HES
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To apply the equilibrium conditions in the systems of forces, the main provisions of the resistance of materials and methods for calculating machine parts 2. Analyze the basic laws and characteristics, calculate electrical circuits by analytical and graphical methods 3. Understand the basics of alternative energy, modern renewable energy and other aspects of professional activity 4. Determine the type of electric cars on the design and passport data 5. To ensure uninterrupted power supply and to make a choice of protection and electrics for power supply networks
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of the basic concepts and axioms of statistics, equilibrium conditions in systems of forces, determination of the moment of force relative to a point and axis, the response of a bar and beam system, the center of gravity of plane geometric figures and standard profiles. 2. Mastering the skills of calculating the cut-off and collapse, applying the geometric characteristics of flat sections of parts, understanding the actions of dynamic and re-variable loads,

	<p>performing design calculations for gears and shafts and owning methods for calculating parts, gears, connections and devices.</p> <p>3. Knowledge of basic concepts about machine parts, types of mechanical gears and their characteristics, shafts, axles, bearings, couplings, connections of machine parts and their characteristics.</p> <p>4. Analysis of the main components of the electrical circuit, the appointment of sources and consumers of electrical energy, the definition of the basic laws and properties of electrical and magnetic circuits, features of DC and AC circuits, linear and non-linear circuits, calculations of linear and non-linear DC circuits, single-phase AC circuits current, symmetric and asymmetrical three-phase AC circuits.</p> <p>5. Knowledge of the physical principles on which the work of facilities for the production of non-conventional types of energy is based, an understanding of typical electro-technological processes of energy conversion</p> <p>6. The introduction of electrical technology ways to convert non-conventional types of energy;</p> <p>7. Operation of electrotechnological power and energy installations</p> <p>8. Understanding the purpose, classification, scope, design and principles of operation of electric machines, the use of calculation methods and the construction of characteristics of electric machines.</p> <p>9. Knowledge of general information about the power supply systems of various objects and their characteristic features, the main types of power consumers, their operation modes, power consumption</p>
--	--

	<p>modes in power supply systems for various purposes</p> <p>10. Knowledge of methods for calculating the integral characteristics of modes and determining the design values of loads, ensuring the quality of electricity in systems</p> <p>power supply</p> <p>11. Understanding the devices and principles of operation of various types of relays used in relay protection circuits and identification of types of relay protection, understanding the protection scheme of individual elements of power supply systems, electrical equipment control circuits and characterization of types, assignments and basic requirements for automation devices in power supply systems, making a choice protection and electrical automation for power supply networks</p>
Prerequisites	<p>Introduction to the specialty</p> <p>Physical basis of non-conventional and renewable energy</p> <p>Electrical measurements</p> <p>Basics of Computer Literacy</p> <p>Drawing</p> <p>Organization of maintenance of electrical equipment of the station</p> <p>Occupational safety and health</p>
Disciplines forming the module	<p>Theoretical Mechanics</p> <p>Theoretical Foundations of Electrical Engineering</p> <p>Theoretical Foundations of Unconventional and Renewable Energy</p> <p>Electric cars</p> <p>Power supply of HE</p> <p>Automatic control in power engineering</p>
Module type (mandatory, optional)	Mandatory
Labor intensity (credit / academic hours)	15/450 hours
Duration of the module	3-8 semester
Form of training	Full-time

Technology of training	Traditional methods of teaching - lecture, practical and laboratory classes, problematic teaching methods, interactive teaching methods.
Form of control	Pass fail exam, exam
Required resources	Library fund, Internet classes, standard educational, laboratory equipment, workshops, practical bases, electronic and educational resources
Language of instruction	Kazakh, Russian
Post-requisites	Basic power equipment of HES installations Ancillary equipment of HES installations Electrical equipment of power plants and substations Operation and repair of electrical equipment of stations based on HES New technologies in power engineering

SPECIFICATION OF THE MODULE PM 3
“Carrying out technical operation, repair and modernization of power plants based on HES”

Scope of competence	Technical operation, repair and modernization of power plants based on HE
Module name and code	PM 3. Carrying out of technical operation, repair and modernization of power plants based on HES
Purpose of the module	After studying this module, the student will be able to carry out the technical operation, repair and modernization of power plants based on the HES
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To make selection of the main power and auxiliary equipment of units based on HES 2. To apply the basic rules for the technical operation of power plants based on HES 3. To make repair work of electrical equipment based on HES 4. To carry out works on modernization of power plants based on HES
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Selection of the main energy and auxiliary equipment of plants based on HES and their main energy, economic and environmental characteristics 2. Understanding the purpose, classification, design and physical basis of the main energy and auxiliary equipment of plants based on the HES 3. Knowledge of the main energy, environmental and economic characteristics of generating facilities based on HES and the use of methods for calculating parameters and choosing the composition of the main energy and auxiliary equipment of installations based on HES 4. Work with technical documentation on acceptance of equipment into operation of installations on the basis of HES and drawing up protocols for checking and testing electrical equipment

	<p>5. Application of the rules for performing operational switching in practical activities and filling in switching forms for putting electrical equipment into repair in normal and emergency modes, making decisions in case of liquidation of accidents at HES stations</p> <p>6. Reading the legend in electrical circuits and electrical circuits</p> <p>7. Implementation of technological processes of repair of the main energy and auxiliary equipment of plants based on the HES</p> <p>8. Definition of names of markings, properties of material, products, tools, devices and mechanisms for the production of repair</p> <p>9. Compliance with the safety requirements of the repair work and the repair in accordance with the project of work, working drawings, the requirements of regulatory documents</p> <p>10. Possession of the principles of development of energy-saving technologies and the development of measures for the implementation of the energy-saving potential of the main technological objects of production</p> <p>12. The introduction of innovations in the energy supply of the enterprise and the use of modern technologies and equipment</p> <p>13. Recommendation of low-waste and resource-saving technologies.</p>
<p>Prerequisites</p>	<p>Theoretical Mechanics</p> <p>Theoretical Foundations of Electrical Engineering</p> <p>Theoretical Foundations of Unconventional and Renewable Energy</p> <p>Electric cars</p> <p>Power supply of HES</p> <p>Automatic control in power engineering</p>
<p>Disciplines forming the module</p>	<p>The main power equipment of HES plants</p> <p>Ancillary equipment of HES plants</p>

	Electrical equipment of power plants and substations Operation and repair of electrical equipment of stations based on HES New technologies in power engineering
Module type (mandatory, optional)	Optional
Labor intensity (credit / academic hours)	17 credits / 510 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional methods of teaching - lecture, practical and laboratory classes, problematic teaching methods, interactive teaching methods.
Form of control	Pass fail exam, exam
Required resources	Library fund, Internet classes, standard educational, laboratory equipment, workshops, practical bases, electronic and educational resources
Language of instruction	Kazakh, Russian
Post-requisites	Information and measuring technology and electronics Relay protection and automation Energy Saving Technologies

SPECIFICATION OF THE PROFESSIONAL MODULE PM 4
"Implementation of the commissioning and monitoring of the operation of the operated energy equipment based on HES"

Scope of competence	Operation and monitoring of power equipment
Module name and code	PM 4. Implementation of commissioning and monitoring of operation of operated power equipment based on HE
Purpose of the module	After studying this module, the student will be able to perform commissioning and monitoring the operation of the operating energy equipment based on HES
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To apply the basic methods and means of measuring electrical and electrical quantities, select measuring equipment 2. To carry out the control of operation of the operated power equipment on the basis of HE 3. To know ways to organize and conduct energy-efficient and energy-saving technologies in the production sector
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Drawing up a measuring circuit and selection of measuring instruments, and measuring with a given accuracy various electrical quantities, determining the values of the measured quantity and measuring accuracy, and using computer tools for processing and analyzing measurement results 2. Characteristics of appointments and scope of the relay; relay connection schemes, knowledge of the functions, requirements for relay protection and selection of relay types and methods for regulating the parameters of relay protection and automation 3. Reading the differential protection circuit, their action, scope and circuit of relay protection and automation of electrical machines and apparatus, power lines and transformers 4. Analysis of the relay protection circuit of power lines, transformers, compensators, electric motors, busbars, blocks 5. Knowing legislative and regulatory acts of the state policy on the effective use of fuel

	<p>energy resources in the Republic of Kazakhstan and ways to save resources, energy-saving technologies</p> <p>6. Description and explanation of the main directions of rational and unsustainable nature management, methods of generating electrical energy in various types of power plants</p> <p>7. Using the simplest methods to reduce heat losses in buildings and structures</p>
Prerequisites	<p>The main power equipment of HES plants</p> <p>Ancillary equipment of HES plants</p> <p>Electrical equipment of power plants and substations</p> <p>Operation and repair of electrical equipment of stations based on HES</p> <p>New technologies in power engineering</p>
Disciplines forming the module	<p>Information and measuring technology and electronics</p> <p>Relay protection and automation</p> <p>Energy Saving Technologies</p>
Module type (mandatory, optional)	Optional
Labor intensity (credit / academic hours)	21 credits / 630 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Traditional methods of teaching - lecture, practical and laboratory classes, problematic teaching methods, interactive teaching methods.
Form of control	Pass fail exam / exam
Required resources	Library fund, Internet classes, standard educational, laboratory equipment, workshops, practical bases, electronic and educational resources
Language of instruction	Kazakh, Russian
Post-requisites	<p>Electrical safety</p> <p>Energy Economics</p>

SPECIFICATION OF THE PROFESSIONAL MODULE PM 5
"Organization of work on production planning and ensuring safe operation"

Scope of competence	Production planning and ensuring safe operation
Module name and code	Organization of work planning and safe work
Purpose of the module	After studying this module, the student will be able to organize work planning and production safety work.
Level of professional qualifications	3,4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To carry out electrical safety requirements 2. To apply the results of the economic analysis of the activities of the organizations of industry and energy 3. To perform the main types of work of the technician-power engineering of the enterprise service in HES 4. To collect source material for diploma design of renewable energy objects
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of requirements for employees allowed to perform work in electrical installations, organizational and technical measures when working in electrical installations 2. Registration attire - admission to work in electrical installations 3. The use of personal and collective protection in the production of works in electrical installations and the implementation of operational switching, work in existing electrical installations 4. Providing first aid to victims of electric shock, the classification of electrical rooms 5. Understanding the essence of market reforms, awareness of the structure of enterprise management, mastering the basics of planning, performing the calculation of technical and economic indicators

	<p>6. Understanding of the ways of development of the economy of the Republic of Kazakhstan, analysis of the effectiveness of reforms and planning in the Republic of Kazakhstan</p> <p>7. Orientation in the hierarchy of management and the implementation of the calculation of investments in capital construction</p> <p>8. Characteristics of the process for technical operation, maintenance and repair of electrical and electromechanical equipment HES.</p> <p>9. Application of management skills of a separate production unit within the functions assigned to mid-level specialists</p> <p>10. Implementation and organization of operation of the main electrical and auxiliary equipment of plants based on the GIE and the work of the production unit for technical operation, maintenance and repair of the main electrical and auxiliary equipment of plants based on HES</p> <p>11. Collection of source material for the degree design in accordance with the regulatory and technical documentation of the objects of HES and the task for the degree design</p> <p>12. Acquisition of skills in working with regulatory and technical documentation, reference books</p>
Prerequisites	<p>Information and measuring equipment and electronics</p> <p>Relay Protection and Automation</p> <p>Energy Saving Technologies</p>
Disciplines forming the module	<p>Electrical safety and labor protection</p> <p>Energy Economics, Pre-diploma practice</p>
Module type (mandatory, optional)	Mandatory
Labor intensity (credit / academic hours)	14 credits/ 420 hours
Duration of the module	3-8 semester
Form of training	Full-time
Technology of training	Creative work (development of creative abilities of students, formation of skills of

	purposeful independent work, expansion and deepening of knowledge, ability to use them when performing specific tasks)
Form of control	Pass fail exam, exam
Required resources	Library fund, Internet classes, practical bases, electronic and educational resources
Language of instruction	Kazakh, Russian
Post-requisites	Graduation Project

EDUCATION PROCESS PLAN

Code and profile of education 0900000 – Power Engineering.
 Specialty 0916000 – Hybrid Energy
 Qualification 091600 1 – Operator of a new and renewable energy source
 091600 3- Power-Technician

Form of training: full-time
 Normative period of study: 3 years 10 months based
 on the basic secondary education

Module code	Name of cycles, disciplines / modules, practices	Credit	Differential pass	Fail exam	Exam	Amount of study time (clock)					Distribution by
						TOTAL	From them:				
							Theoretical training	Theoretical training	Theoretical training	Theoretical training	
GED	General educational disciplines	48				1448	1448				1-4
BM	Basic Modules	30				900	480	-	360	60	3-8
BM 1	Application of professional vocabulary, drafting of business papers in the sphere of professional activity	6	+		+	180	90		60	30	3-8
BM 2	Application of the basics of philosophical knowledge, social sciences for socialization and adaptation in society and the work collective	6	+			180	180	-	-	-	3-8
BM 3	Understanding of the history, role and place of Kazakhstan in the world community, respectful and	4			+	120	120	-	-	-	3-8

	careful attitude to historical heritage and cultural traditions									
BM 4	Applying basic knowledge of the economy and knowledge of labor laws and regulations to protect their rights in professional activities	4	+		120	60	-	60		3-8
BM 5	Development and improvement of physical qualities	6		+	180	-	-	180	-	3-8
BM 6	Performance, design, reading of design and technological documentation using application programmes	4	+		120	30		60	30	3-8
PM	Professional modules on working qualifications (including industrial training and professional practice)	48			1440	360	720	270	90	3-8
PM 1	Execution of maintenance of equipment of the station with conventional new and renewable energy sources	16	+	+	480	120	240	90	30	3-8
PM 2	Provision of works on power supply, management and control of automated systems and power equipment based on HE	15	+	+	450	120	240	60	30	3-8
PM 3	Carrying out of technical operation, repair and modernization of power plants based on HES	17	+	+	510	120	240	120	30	3-8
PM	Professional modules for mid-level specialist qualifications (including in-service training and professional practice)	35			1050	330	420	210	90	3-8
PM 4	Implementation of the commissioning and monitoring of the operation of the operating energy equipment based on GIE	21	+	+	630	210	240	120	60	3-8
PM 5	Organization of work planning and safe work	14	+	+	420	120	180	90	30	3-8
	Total:	161			4838	2618	1140	840	240	
PP	Prediploma practice	10			300		300			8
DP	Diploma project	9			270	180			90	8

IC	Intermediate certification	10		300	300				1-8
FE	Final examination	2		60	60				8
	Total for compulsory education			5768	3158	1440	840	330	
C	Consultations	13		400	400				1-8
O	Optional lessons	14		420	420				1-8
	Total:	219		6588	3978	1440	840	330	

Note:

* The forms of control (the number of course papers, examinations), the order of studying the disciplines (distribution by semester) are exemplary and can vary depending on the forms of study, the specifics of specialties, local and other conditions (circumstances), including, in accordance with the needs of employers.

** In accordance with the State compulsory education standard the Technical and Vocational Education, educational institutions can change up to 50% of the amount of study time allocated for the development of educational material for modules, up to 50% for each module and up to 60% (up to 80% for dual training) of vocational training and professional practice with keeping the total number of hours for compulsory education.