

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

“DEVELOPMENT OF LABOR SKILLS AND STIMULATION OF
WORKPLACES” PROJECT

EDUCATIONAL PROGRAM

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

Qualifications: Applied Bachelor

Duration of training: 2 years 10 months

Astana, 2018

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INTRODUCTION

This educational program for Applied Bachelor on specialty 0916000 – Hybrid Energy belongs to level after secondary education (5 level of the national qualifications framework of the Republic of Kazakhstan) which provides professional practice-oriented training and aims to install communication between educational institutions and employers, and as a result, the provision of staff in accordance with economy labour market trends.

Legislative and normative acts of the Republic of Kazakhstan, domestic and foreign scientific and methodical work in this area, materials on the state of the economy, the labor market and vocational education Kazakhstan are used when developing the education program on specialty 0916000 – Hybrid Energy.

The basic normative documents for the development education programs are:

- Law of the Republic of Kazakhstan “On Education” dated July 27, 2007 No. 319-III (as amended and with additions as of 09.04.2016);
- National qualifications framework of the Republic of Kazakhstan (joint order of the Minister of labour and social protection of population of the Republic of Kazakhstan 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 classifier of professions and specialities of technical and vocational, after secondary education;
- Integrated classifier of professions and specialties of technical and vocational education, after secondary and higher education;
- Decree of The Government of The Republic of Kazakhstan “State General Education Standard for appropriate education levels” No. 1080 dated August 23, 2012;
- Order of the Minister of education and science of the Republic of Kazakhstan dated March 18, 2008, No. 125 “On approval of the Model rules for the ongoing monitoring of school performance, intermediate and final appraisal of students”;
- Order of the Minister of education and science of the Republic of Kazakhstan dated October 31, 2017 No. 553 “On approval of model curricula for technical and vocational occupations”;
- Methodical recommendation on the development of model curricula and programs for technical and vocational occupations, after secondary education;
- Methodical recommendations on the development and implementation of education programs for applied Bachelor;
- Order of the Ministry of education and science of the Republic of Kazakhstan “Rules for the educational process Organization on credit technology of education” No. 152 dated April 20, 2011.

The program is designed to implement the principles of a democratic management nature of education, expanding the boundaries of academic freedom

and the authority of the educational institutions that will ensure the adaptation of the system of technical and vocational, post-secondary education to the changing needs of society, the labour market economy. The flexibility of the program will take into account the ability and needs of the individual, production and society.

This educational program foresees the use of module-competence approach, based on development of training criteria and assessment of training outcomes in the form of basic and professional competences of students, as well as the possibility to use a differentiated approach to teaching.

In accordance with this educational program, the training process in technical and vocational organizations, post-secondary education is based on the modular credit system of education.

The Applied Bachelor's degree Program applies an individual approach to students, freedom to choose teaching methods by engineers-teachers, forms of organization and cooperation of educational institutions (Institute of higher education-college) with the active participation of representatives of the real sector of the economy.

Development of education programs for applied Bachelor's degree will contribute to the improvement and development of the system of continuing professional education, improve the quality of training, taking into account the requirements of the labour market and employers' inquiries.

Abbreviations and symbols

HE	Higher education
WEI	Wind energy installation
HES	Hybrid Energy Source
SCES	The State Compulsory Education Standard
SCO RK	State classifier of occupations in the Republic of Kazakhstan
AM	Additional module
DOE	Discipline, defined by the Organization of education
EQF	European qualification frame
K&S	Knowledge & skills
NOC	National occupations classifier
NQF	National Qualifications framework
NQS	National qualifications system
GHM	General Humanitarian Module
GCEA	General classifier of economic activity types
GM	General module
CM	Compulsory module
EP	Education program
GVM	General Vocational Module
SQF	Sectorial Qualifications framework
LEPKQ	Level evaluation of professional skills and qualification;
IC	Intermediate certification
PA	Professional activities
IT	Industrial training
GE	Graduate education
PC	Professional competence
PM	Professional module
PP	Professional practice
WG	Working Group
RK	The Republic of Kazakhstan
LO	Learning Outcome
SPI	Solar-power installation
SM	Special module
QMS	Quality management system
SEM	Socio-economic module
TVE	Technical and vocational education
TVE&PS	Technical and professional education and Post-Secondary Education

PASSPORT OF THE EDUCATIONAL PROGRAM

Title of the specialty (*the code and name of the speciality*) 0916000-Hybrid Energy.

Title and qualification code 0916034 - Applied Bachelor of hybrid energy.

Purpose of the educational programme for training applied bachelors, that performs maintenance, technical maintenance, repair and control of hybrid energy generating equipment operated.

Level of education technical and vocational, post-secondary.

Level of professional qualification is applied Bachelor

Qualification levels according to NQF/SQF 5

Professional Area activities * Electric-Power Industry

Type (s) of employment (*by SQF and PS*) **

A. perform maintenance work on the station equipment with conventional new and renewable sources of energy

B. provide the primary energy and auxiliary equipment of power plants based on HE

C. carry out maintenance, repair and modernization of power plants based on HE

D. carry out commissioning and monitoring the work of operated power equipment based on HE

E. Diagnostics, monitoring of power equipment and evaluations of energy resources of HE

F. Carry out analysis and modes management of energy equipment and erections of HE with the essential works on qualification

Object (s) of professional activity (*by NOC, the initial group*) *** power plants, power stations and complex energy and energetic-technological complexes based on them, related to the integrated use of nonconventional renewable energy to supply the joint or autonomous consumer, subject to social and environmental factors.

Program Features **** The possibility to use the dual form of vocational training, modular technology and credit system training.

Form of training - full-time

Training terms 2 years 10 months

Language of instruction Kazakh, Russian

Volume of credits/hours 165 credits /4950 hours

Requirements for students ***** persons with basic secondary education and technical and vocational education.

*Specifies according to SQF parameters (methodical recommendations on the development and design of sectorial qualification frameworks, Astana, 2016).

** Specifies according to PS (methodical recommendations on the design and execution of professional standards, Astana, 2017)

*** Specifies the systems, articles (objects), phenomena, processes, and technology that aims activities.

**** Specifies the dual education/distance training/credit technology

***** Specifies the previous education: basic secondary / general secondary / technical and vocational education

COMPETENCY PROFILE

<p>The aim of the training: performing maintenance, technical maintenance , repair and control of hybrid energy generating equipment operated.</p>	<p>Result: Perform maintenance, technical operation, repair and control of the operating energy equipment of hybrid energy.</p>
<p>Section names, section, group, class and subclass according to GCEA* (SAR)</p>	<p>Section D: electricity supply, gas, steam supply and air conditioning Section [35]: electricity supply, gas, steam supply and air conditioning Group [351]: electric power generation, transmission and distribution Class [3512]: transmission of electricity</p>
<p>Scope of competences (<i>on core labour standard or professional functions or profession analysis</i>)**</p>	<p>A. Maintenance of equipment for power plants with traditional new and renewable energy sources B. Power supply, management and control of the operating power equipment and hybrid energy power plants B. Technical operation, repair and modernization of the main energy and auxiliary equipment, energy structures of power plants based on hybrid energy sources G. Organization of control over the operation of the operated power equipment and power facilities of power plants, power plants and power complexes of hybrid energy D. Diagnostics, monitoring of power equipment and assessment of energy resources of HES E. Planning of optimal technological regimes and development of project elements for power plants, power plants and energy complexes based on HES</p>

List of competencies and modules in the context of an academic degree/qualifications/vocations		
Code of competence	Competence (in line with labor functions and skill levels)	Modules
Basic Competence		
BC 1	Use of professional vocabulary, design business papers in the field of professional activity	BM 1. Application of professional vocabulary, preparation of business papers in the field of professional activity
BC 2	Understand the history, role and place of Kazakhstan in the world community	BM 2. Understanding the history, role and place of Kazakhstan in the world community
BC3	Develop and improve the physical qualities	BM 3. Development and improvement of physical qualities
BC 4	Apply the basics of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce	BM 4. Application of the fundamentals of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce
BC 5	Understand the basic laws and mechanisms of the functioning of the modern economic system	BM 5. Understanding the basic laws and mechanisms of the functioning of the modern economic system
BC6	Performance, design, reading of design and technological documentation using application programs	BM 6. Performance, design, reading of design and technology documentation using application programs

Professional competence		
PC1	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
PC2	Perform work on power supply, management and control of operating power equipment and power plants of hybrid energy	PM 2. Work on power supply, control and management of operated power equipment and power plants of hybrid energy

PC3	Perform work on technical operation, repair and modernization of energy equipment, energy structures of the Hybrid Energy Source (HES)	PM 3. Performance of work on technical operation, repair and modernization of energy equipment, energy structures of the HES
PC 4	Perform technical diagnostics of electrical installations of consumers of hybrid energy	PM 4 Performance of technical diagnostics of electrical installations of consumers of hybrid energy
PC 5	Monitor the operation of the hybrid power plants	PM5. Monitoring the operation of hybrid power plants
PC 6	Evaluate the technical potential of hybrid power plants	PM 6. Evaluation of the technical potential of hybrid power plants
PC 7	Perform work on planning the optimal technological regimes of power plants, power plants and energy complexes based on HES	PM 7 Planning the optimal technological modes of power plants, power plants and energy complexes based on HES
PC 8	Develop elements of power plant, power plant and energy complex projects based on HES	PM 8 Development of project elements of power plant, power plants and energy complexes based on HES

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

** A brief description of labour functions that allow you to achieve the main objectives of the specialty/profession. Number of functions depends on the complexity of the profession.

THE LIST OF MODULES AND LEARNING OUTCOMES

Module name	Learning outcomes	Assessment Criteria	Disciplines forming the module
BASIC MODULES			
BM 1. Application of professional vocabulary, drawing up official papers in the field of professional activity activities	LO1. To know Grammar and terminology of Kazakh (Russian) and foreign languages for communication in the sphere of their professional activity	1. Knowledge of Lexico-grammatical material and technology transfer (with dictionary) professionally oriented texts	Professional Kazakh (Russian) language Professional foreign language Professionally-oriented foreign language Business correspondence in Kazakh
		2. Maintenance professional Dialogic speech in Kazakh (Russian) and foreign languages	
		3. Determination of the meaning of unfamiliar words and phrases using dictionaries and reference books.	
	LO2. To apply translation technique (with dictionary) professionally oriented texts	1. Using of dictionaries to translate text.	
		2. Application of the terminology majoring in specialty in the State and other languages	

		3. Reading and translation (with dictionary) of professionally orientation texts	
BM 2. Understanding the history, role and place of Kazakhstan in the world community	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, values of traditional Kazakh culture	Modern history of Kazakhstan, Culturology
		2. Understanding of the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization.	
		3. Knowledge of the main achievements of independent Kazakhstan.	
	LO 2. To understand the moral values and norms that form tolerance and an active personal position.	1. Knowledge of forms, types and history of various cultures and civilizations.	
		2. Understanding the current state of the world and traditional religions.	
		3. Tolerant perception of social, ethnic, religious and	

		cultural differences.	
	LO3. To identify causal relationships of historical events.	1. Knowledge 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.	
		2. Understanding the nature and purpose of the political and social changes taking place in the Republic of Kazakhstan after independence.	
		3. Definition of basic facts, processes and phenomena, reflecting and characterizing the integrity and consistency of the history of Kazakhstan.	

BM 3. The development and improvement of physical qualities	LO 1. To strengthen health and abide by the principles of a healthy lifestyle.	1. Understanding the basics and rules of healthy lifestyle	Physical culture
		2. Performing a set of exercises for general physical training.	
		3. Compliance with the rules of a healthy lifestyle in everyday life.	
	LO 2. To improve physical qualities and psycho-physiological abilities	1. Compliance with the rules of team sports.	
		2. Mastering the technique of doing exercises	
		3. Application of the learned techniques of the game and individual tactical tasks in the training school.	
		4. Performance of control standards and tests provided by the program	
	LO 3. To provide first aid for injuries and accidents.	1. Understanding the cause of injury and how to prevent injury.	

		2. Providing first aid for injuries and accidents.	
BM 4. Application of the foundations of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce.	LO 1. To be guided in the most general philosophical questions.	1. Possession of basic philosophical concepts	Fundamentals of Philosophy, Fundamentals of Sociology and Political Science
		2. Identification of the relationship between the main categories of philosophy.	
		3. Knowledge of the features of the scientific, philosophical and religious picture of the world.	
	LO 2. To determine the correlation in the life of a person of such philosophical categories as freedom and responsibility, material and spiritual values.	1. Awareness of the degree of personal responsibility for the preservation of life, culture and the natural environment.	
		2. Understanding the essence of social and ethical problems associated with the development and use of the	

		achievements of science, technology and technology.	
		3. Formulating one's own opinion on the relationship between material and spiritual values.	
	LO 3. Possess basic concepts of sociology and political science	1. Possession of the main political science sociological concepts.	
		2. Understanding the nature and laws of the functioning of political culture.	
		3. Understanding international political processes and the geopolitical environment	
BM 5. The application of basic knowledge economy and knowledge of labour legislation in	LO 1. To know the major issues in the field of economic theory	1. Knowledge of economic terms, understandings of regularities and principles of market economy.	Essentials of Economics Fundamentals of law

the sphere of professional activity		2. Definition of forms and types of property, plans, main economic indicators of the company.
		3. Understanding of trends in the world economy, the main tasks of the State transition to the “green” economy.
		4. Determination of success possibility and business risk
	LO 2. To know concepts of law and State-legal phenomena	1. Know key concepts and main characteristics of the right in accordance with the principles of legality and the rule of law.
		2. Understanding the legal status in the formation of identity and responsibility for administrative and corruption offences
		3. Knowledge of basic provisions of civil and family law

	LO 3. To protect rights in accordance with labour legislation	1. Compliance of the rights and obligations of the employee under the labour code.	
		2. Understanding material and disciplinary responsibility of the employee and the employer.	
		3. Understanding of criminal responsibility and the founding of its occurrence.	
BM 6. Execution, design, reading of design and technological documentation using application programs	LO 1. To follow the rules of design documentation	1. Understanding design documentation rules	Engineering graphics. Computer design
		2. Making drawings according to the rules of a unified system of design documentation.	
		3. Determination of the purpose and scale of the drawing technical details.	
		4. Meeting the requirements of the unified system for	

		design documentation (ESKD).	
	LO 2. To have projection skills on a plane	1. Execution and design of the necessary cuts on the drawings.	
		2. Perform axonometric projection.	
		3. Execution of drawings of schemes according to symbols according to 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. Execution of specialty schemes using technical drawing tools.	
		2. The use of modern software applications.	
		3. Computer graphics, 3D graphics.	
PROFESSIONAL MODULES			
PM 01. Works on servicing equipment of stations with	LO 1. To study the designs and characteristics of the main and auxiliary power equipment of HES	1. Description of the structures and characteristics	1. Engineering graphics 2. Fundamentals

traditional new and renewable energy sources		of the main and auxiliary power equipment GIE	of computer technology 3. Theoretical bases of electrical engineering 4. Theoretical and applied mechanics 5. Theoretical bases of HES 6. Electrical machinery 7. Power and auxiliary equipment installations HES Teaching and training-evaluation practice
		2. Description of the composition	
		3. Installations of S & E and the appointment of individual nodes	
		4. Possession of the basics of auxiliary equipment design automation	
LO 2. To determine the operability and the general condition of the equipment of stations with traditional new and renewable energy sources		1. Formulation of the rules of maintenance of electrical equipment	
		2. Verification of meter readings and alarms and electrical measurements	
		3. Knowledge of the rules for constructing and reading	

	drawings and diagrams
	4. Determination of the main types of malfunctions, causes of failure of electrical equipment of the stations and filling in the process documentation
LO 3. To perform the main types of maintenance of station equipment with traditional new and renewable energy sources.	KO 1. The use of devices, instruments, equipment and measuring instruments when servicing electrical equipment
	CO 2. The difference in the types of maintenance and preventive inspection of station equipment
	KO 3. Implementation of the main types of

		<p>maintenance of station equipment with traditional new and renewable energy sources</p>	
<p>PM2. Implementation of the supply, management and monitoring of power equipment and power plants operated by the hybrid energy</p>	<p>LO1. To master main types of power plants and ways of generating heat and electric energy</p>	<p>1. Analysis of environmental problems in the field of energy and assessment of prospects for the use of GIE</p>	<p>1. Total power engineering 2. Basics of electricity 3. Automated electric drive 4. Industrial Electronics 5. Fundamentals of metrology</p>
		<p>2. Definition, classification, principle of operation and characteristics of the main types of power plants based on hybrid energy sources</p>	
		<p>3. Knowledge of methods for the conversion of HIE to electric and thermal energy</p>	
	<p>4. Methods of obtaining heat and electricity</p>		
	<p>LO 2. To perform electrical work on the operating power equipment and hybrid energy power plants</p>	<p>1. Analysis and understanding of technological schemes for the production of electrical and thermal energy of thermal (TPP), nuclear (NPP),</p>	

		hydroelectric power plants (HPP) and steam turbine thermal power plants
		2. Understanding the basic elements of electrical networks, schemes and principles of operation of the main electrical and switching equipment and their constructive implementation
		3. Conducting basic electrical calculations with the design of their results in accordance with the requirements of ESKD.
		4. Choice of electrical equipment: electrical apparatus, machinery, electric drive
		5. Performing the calculation of the parameters of electrical devices and electrical

	<p>installations, protection and automation systems using application programs and computer-aided design tools</p>
<p>LO 3. To analyze and describe the physical processes occurring in electrical machines and in electric drive</p>	<ol style="list-style-type: none"> 1. Knowledge of methods of mathematical and physical modeling of modes, processes, states of electric power facilities 2. Definition of the purpose, element base, characteristics and adjusting properties of electric drives with DC and AC motors 3. Determination of the element base of electrical equipment and installations, their functional purpose and device

	LO 4. To determine the types and applications of semiconductor devices and make calculations	1. The use of the element base of information and energy industrial electronics in the generation (production), transfer, distribution
		2. Calculation of DC and AC circuits with diodes and circuits on operational amplifiers using the assumption of their ideality
		3. Calculation for the choice of equipment in the development of single-phase and multi-phase controlled and unmanaged rectifiers
	LO 5. Apply analog and digital control devices	1. Knowledge of the main characteristics, indicators and parameters of operating, non-inverting and inverting amplifiers
		2. Use in devices of a delay of impulses the inverting integrator
		3. Application of the scheme, processes of multivibrators at the OU to control the frequency and duty cycle.
	LO 6. To analyze the operation of network and autonomous converters	1. Knowledge of the basic concepts, types and types of converting equipment
		2. Execution of rectifier circuits, removal of external and adjustment characteristics
		3. Analysis of emergency modes and functional capabilities of DC-voltage pulse converters

		4. Principle of operation, application areas of resonant inverters and autonomous voltage and current inverters	
	LO 7. Knowledge of the basics of metrology, standardization and certification	1. Knowledge of theoretical foundations of metrology, historical and legal framework for standardization and certification	
		2. Understanding the conditions for certification, the rules and procedures for certification	
		3. Application of methodological foundations of metrological assurance and measurement uniformity	
	LO 8. To provide management, control of the system of automated control systems for the facility	1. Knowledge of the basics of managing technological objects and functions of an automated process control system	
		2. Knowledge of the main methods of measurement, processing of results and evaluation of measurement errors	
		3. Knowledge of the basic principles of work and the composition of the ASU object	
PM 3. Performance of work on the technical operation, repair and	LO 1. To organize work on the operation of electrical equipment of	1. Understanding of modern electrical equipment and its characteristics, design features of switchgears of various types	1. Electrical stations and substations 2. Operation of power supply

modernization of energy equipment, energy structures HES	power plants and substations	2. Analysis of the basic electrical connection diagrams of power plants and substations	systems 3. Wind energy 4. Hydropower 5. Hybrid technology to use RES
		3. Performance of work on the electrical equipment of power plants and substations	
	LO 2. To perform work on the technical operation of energy equipment and energy installations of HES.	1. Participation in the operation and management of traditional and small GEM	
		2. Performance of work on the operation of solar power plants (CЭY), solar power plants (CЭC) and photo power plants	
		3. Participation in work on operation of wind turbines and wind farms and energy complexes using different types of power plants GIE	
		4. Turning on and off the main electrical and auxiliary equipment and other technological schemes of the service area	
	LO 3. To repair power equipment and power plants	1. Knowledge of classification of works on repair, materials, technology and repair techniques	
		2. Knowledge of the main systems to repair equipment	
		3. Evaluation efficiency overhaul equipment and	

		provision of equipment spare parts	
		4. Work on maintenance and repair of energy equipment, installations and energy networks	
		5. Preparation of operational technical documentation	
		6. Following the security guidelines when organizing and conducting repairs	
	LO 4 To modernize power equipment and power plants	1. Study of the modes of operation of the modernized power equipment	
		2. Study of the modes of power supply systems in modern terms and techniques to enhance their effectiveness	
		3. Application of modern technology to enable the use of new materials in electric power industry	
	LO 5. To know peculiarities of the operation and maintenance of Wind Turbines	1. Knowledge of classification and model Wind Turbines structures of different power	
		2. Testing and inspection of Wind Turbines.	
		3. Operation features, services and selection of Wind Turbines.	
		4. Designing the placement of wind turbines in the wind farms, their	

		connection to the electricity grid	
	LO 6. Selection and operation of hydropower plants	1. Knowledge of the main schemes, the composition and the appointment of general purpose hydraulic structures (dams, spillways, water).	
		2. Selection of installed capacity of hydropower stations, the choice of aggregates of Hydroelectric Power Station and operation of hydropower plants	
		3. Selection of the most rational diagram to obtain flow and layout of hydro-energetic unit	
		4. Conduction of the major hydraulic and static calculations related to the design and operation of the Hydroelectric Power Plant main structures.	
	LO 7. To know characteristics of GRID technologies in the field of renewable energy	1. Definition of the modes and parameters of ВИЭ technologies	
		2. Application of methods of integration of ВИЭ in centralized and decentralized energy systems	
		3. Knowledge of characteristics of GRID technologies in the field of renewable energy	
		4. Application of professional computer program RETScreen and EnergyPro; 13 OSVO 1-43	

		81 01-2014 integrate RES in centralized and decentralized power grids	
	LO 8. To master the structural and operational features of solar systems and heat pumps	1. Knowledge of types and designs of solar collectors, solar systems and heat pumps	
		2. Fulfillment automation systems based on photoelectricity	
		3. Build automation scheme heating and hot water supply systems	
		4. Evaluation the effectiveness of technical solutions and the prospect of their application in specific locations	
PM 4. Performing technical diagnostics of electrical installations of consumers of hybrid energy	LO 1. To predict the technical condition of power plants	1. Mastery of basic concepts and definitions of equipment diagnostics	1. Monitoring and diagnostics of power equipment 2. Energy facilities HIE 3. Theoretical basis of GIE
		2. Definition and prediction of the type of technical condition of power plants	
		3. Setting indicators and characteristics of diagnosing	
		4. Ensuring the suitability of electrical installations for technical diagnostics	
	LO 2. Diagnose and apply power software	1. Checking the object of diagnosis	
		2. Analysis of the diagnostic information obtained	
		3. Practical solutions for the use of diagnostic information	
		4. Regulation of the procedure for technical	

		diagnosis of electrical installations of consumers	
		5. Compliance with the technical requirements for the performance of diagnostic operations	
		6. Conducting the processing of the results of technical diagnostics	
PM5. Monitoring of operation of hybrid power plants	LO 1. To know composition and content monitoring system installations HE	1. Ownership of the composition and purpose of the monitoring system for HIE installations and the atmosphere	Physics, general energy, electricity, industry economics
		2. Understanding the characteristics of monitoring the operation of wind power plants. and installations that use solar energy to generate heat	
		3. Application of monitoring features of photovoltaic plants	
	LO 2 To monitor the work of wind turbines	1. Definition and technical characteristics of the equipment for organizing of data collection from wind turbines	
		2. Connection of equipment to the scheme of wind turbines	
		3. Analysis of main equipment of wind turbines	
	LO 3 To monitor installations that use the Sun's energy to heat energy	1. Determination of the composition and technical characteristics of equipment for organizing data collection from a solar collector	

		2. Possession of connecting the equipment to the solar collector	
		3. Determination of equipment and technical characteristics for organizing data collection from a solar concentrator	
PM 6 Assessment of technical potential of hybrid power plants	LO 1. To assess the technical potential of hybrid systems of wind turbines	1. Definition of the main categories of potential HES	Theoretical foundations of HES, Economics, life safety
		2. The calculation of the main categories of the energy potential of solar and wind energy	
		3. Performance of calculation of the potential of hybrid systems of renewable energy and assessment of the technical potential of hybrid systems of renewable energy	
		4. Application of various types of unconventional energy systems, taking into account regional features	
	LO 2. To know a theoretical basis of hybrid energy	1. Use of major sources and capacities of small and conventional energy	
2. Perform approximate methods of calculation and selection of the main categories of potential			

		small and conventional energy	
		3. Orientation in fundamental types, kinds and technological features small and conventional energy	
PM 7. Performance of works on planning of optimum technological modes of power plants, power stations and energy complexes based on HE	LO 1. To know the principles of electricity transmission and distribution	1. Knowledge of principles of electricity transmission and distribution	1. Modes of use plants HE 2. Electric power systems and networks 3. Relay protection and automation of electric power systems 4. High voltage technique
		2. Constructive implementation of air and cable transmission lines	
		3. Analysis schemes of electric systems and networks	
		4. Definition of equivalent circuit parameters core elements electric systems and networks	
		5. Choice of voltage regulation on step-down substations and rational variants of network diagrams	
	LO 2. To obtain the basic principles of protection devices and automation of electric power facilities	1. Understanding of the basic principles implementation of relay protection	
		2. Understanding features of protection relay for protection of individual components of the electrical system	
		3. Understanding of the principles of protection with relative selectivity lines in a network with one or more power supplies	
		4. Knowledge of principles run primary and backup protection for power facilities	

	LO3. To apply types of relay protection and automatic devices for energy facilities	1. Possession of automation devices for power supply systems and protection with absolute selectivity of power lines
		2. Performance of protection of power transformers
		3. Application of motor protection and redundancy protection failures and switches
	LO4. To know voltage withstand assessment methods, reliability of lightning protection	1. Following the requirements of the regulations in connection with the selection of the electric installations insulation distances and surge protection devices and guidance document "volume and test standards of electrical equipment"
		2. Evaluation of reliability of lightning protection of outdoor switchgear and overhead transmission lines
	LO5. To define diagnostic parameters of high-voltage equipment	1. Definition of necessary parameters of nonlinear overvoltage limiters and valve surge arrestors
		2. Conducting measurement and analysis of diagnostic parameters of HV equipment isolation
		3. Performing practical tasks of high voltage equipment by using specialized software
	LO 6. To characterize the modes of operation of power plants	1. Understanding of the role of installations based on renewable energy sources in power system development in Kazakhstan

		2. Determination of normal and emergency modes of operation of power plants
		3. Combining modes installations on energy indicators
	LO 7. To optimize operating modes of installations based on HE in electric power systems	1. Understanding of installations modes based on HE
		2. Using methods of harmonizing installations based on HE with regimes other power plants power system
		3. Using optimization criteria for the planning regime at different time intervals
	LO8. To plan the operation modes of electric systems in the context of the electricity market and power	1. Understanding of the structure of the electricity market and power, stages of development and management features
		2. Accounting regimes of power plants and transmission lines to conclude contracts for the supply of electricity and power
		3. Use of commercial dispatching objects
	LO 9. To analyze the results of operation modes of electric systems and networks	1. Knowledge of methods of calculation of parameters of electric devices and electrical installations, electricity networks and systems
		2. Techno-economic calculation of indicators of

		network options, using references	
		3 Analysis of results of calculation modes of electric systems and networks	
PM 8 Development of designed elements of power plants, power stations and energy complexes based on HE	LO 1. To perform works on designing and operation of new power plants and substations	1. Designing and operation of an electric part of power plants and substations	1. Design and operation of HIE installations 2. Internet technologies in power supply design 3. Energy-saving technologies in the electric power industry and automation 4. Economics of non-conventional and renewable energy sources 5. Pre-diploma practice
		2. Study of physical processes occurring in electrical equipment in his work	
	LO2. To present the main information search systems on the Internet.	1. Implementation requirements computer systems to search for the source data.	
		2. Informing about the sites of major manufacturers of electrical power supply systems.	
		3. Performing an Internet search of the necessary information on a specific phase of the project work	
	LO3. To know the design principles of energy saving technologies	4. Search technical information about modern electrical equipment, produced by different manufacturers	
1. Possession of general information on the formation and use of energy resources, energy-saving technologies and equipment 2. Use of forms and methods of conducting energy audits of various appointments 3. Knowledge of principles of heat and power-using equipment			
LO 4. To analyze	1. Being familiar with the current state of the		

	economic development of non-conventional forms of energy	resources of the HE and their use	
		2. Knowledge of terminology in the field of Economics HE	
		3. Analysis in terms of economy, information on new technologies in the field of HES	
		4. Application information on the technical parameters of the equipment when designing plants HE	
	LO 5. To apply methods of economic-financial justification of investments in the conditions of market economy	1. Understanding fixed and circulating assets of energy enterprises	
		2. Calculation the cost of electricity at the sites of HE	
		3. Knowledge of calculation of tariffs for energy products and simple methodology and integrated performance evaluation	
		4. Conduction Techno-economic calculation of investment projects in the field of HES	
		5. Rationale specific techno-economic solutions when designing facilities using HES	
	LO6. To meet the requirements of pre-diploma practices on energy facilities	1. Consolidating prior knowledge on professional disciplines of Bachelor preparation	
		2. Collection of factual material on the theme of graduation qualification works, acquaintance with the functional responsibilities of the officials on the profile of the hybrid energy	

		3. Study modern advances in technology and production technologies in the field of hybrid energy	
		4. Knowledge of main methods to protect employees and the public from the consequences of possible accidents, catastrophes, natural disasters	
		5. Following the rules of safety , industrial sanitation, fire safety and norms labour protection .	

Specification of Base module 1

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

Scope of competence	-
Module name	Application of professional vocabulary in the field of professional activity
Purpose of the module	After training of the module the student will be able to apply the professional vocabulary in the field of professional activity
Level of professional qualification	4
Learning outcomes by module	<ol style="list-style-type: none"> 1. To know grammar and terminology of Kazakh (Russian) and foreign languages for communication in the sphere of their professional activity 2. To know technique of translation (with dictionary) professionally oriented texts 3. To conduct professional dialogues and business negotiations in Kazakh (Russian) and foreign languages
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Mastering of Lexico-grammatical material of Kazakh (Russian) language required for professional communication 2. The use of terminology in speciality 3. Reading professional orientation 4. Translation (with dictionary) texts of professional orientation 5. Practice in the development of a special dictionary foreign terminology of professional orientation 6. Dialogue in the process of professional communication
Prerequisites	Kazakh, Russian, foreign language.
Discipline module makers	<ul style="list-style-type: none"> - Professional Kazakh (Russian) language - Professional foreign language
Module type (mandatory, optional)	Mandatory
Labor Intensity (credits RK/academic hours)	6 credits / 180 hours
Duration of the module	3-5 semester
Form of teaching	Full-time
Education technology	modular

Form of organization of educational process	Lecture, practical exercises, labs, independent work, practical classes
Teaching methods	business games, testing, presentation, report, summary, post, interviews, creative task, colloquium, case study
Forms of control	Pass fail exam, exam
Required Resources	Personal computer software.
Language of instruction	Russian, Kazakh, English
Post-requisites	Secretarial studies, cultural studies, practical language course, introduction to the field

Specification of basic module 2

“Understanding the history, role and place of Kazakhstan in the world community”

Scope of competence	-
Module name	Understanding the history, role and place of Kazakhstan in the world community
Purpose of the module	After studying this module, the student will understand the history, role and place of Kazakhstan in the world community.
Level of professional qualification	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, values of traditional Kazakh culture 2. Understanding the role and place of culture of the peoples of the Republic of Kazakhstan in world civilization 3. Knowledge of the main achievements of independent Kazakhstan 4. Possession of forms, types and history of different cultures and civilizations 5. Understanding the current state of the world and traditional religions 6. Tolerant perception of social, ethnic, religious and cultural differences. 7. Knowledge 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 8. Understanding the nature and purpose of political and social changes taking place in the Republic of Kazakhstan after independence 9. Determination of the main facts, processes and phenomena, reflecting and characterizing the integrity and consistency of the history of Kazakhstan

Prerequisites	School program: History of Kazakhstan, Man and Society, Basics of Law
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Modules forming the discipline	Modern history of Kazakhstan Culturology
Type of the module (required, optionally available)	Mandatory
Labor Intensity (credits RK/academic hours)	4 credits/ 120 hours
Duration of the module	3 semester
Form of teaching	Full-time
Training technologies	modular
Form of organization of educational process	Lecture, independent work, practical lessons
Teaching methods	Oral questioning, testing, report, summary, creative task
Forms control	Pass fail exam, exam
Required Resources	Library fund, Internet classes, typical educational, electronic educational resources
Language of instruction	Russian, Kazakh
Post-requisites	Basics of Law

Specification of basic module 3
"Development and improvement of physical qualities"

Scope of competence	-
Module name	Development and improvement of physical qualities
Purpose of the module	After studying this module, the student will be able to develop and improve physical qualities.
Level of professional qualification	3
Learning outcomes for the module	<ol style="list-style-type: none"> 1. To promote health and abide by the principles of a healthy lifestyle 2. To improve physical qualities and psycho-physiological abilities 3. To provide first aid for injuries and accidents.
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Understanding the basics and culture of a healthy lifestyle 2. Characterization of the physiological bases of the activity of the respiratory, circulatory and energy supply systems under muscle loads 3. Performing a set of exercises for general physical training. 4. Compliance with the culture of a healthy lifestyle in everyday life 5. Compliance with the rules of team sports 6. Characteristics of the basics of physical activity and methods of its regulation 7. Mastering the technique of doing exercises 8. Application of the learned game techniques and individual tactical tasks in an educational game. 9. Implementation of control standards and tests provided by the program 10. Understanding the causes of injury during exercise 11. Provision of first aid for injuries. 12. Understanding injury prevention
Prerequisites	Biology Valeology
Disciplines forming the module	Physical education

Type of the module (required, optionally available)	Mandatory
Labor Intensity (credits /academic hours)	6 credits / 180 hours
Duration of the module	1-4 semester
Form of teaching	Full-time
Training technologies	modular
Form of organization of educational process	Practical lessons
Teaching methods	Report, essay, creative task
Forms control	Pass fail exam
Required Resources	Gymnasium and sports equipment
Language of instruction	Russian, Kazakh
Post-requisites	Basics of life safety

Specification of basic module 3

“Application of fundamentals of philosophical knowledge, social sciences for socialization and adaptation in society and in workers’ association”

Scope of competence	-
Module name	Application frameworks of philosophical knowledge, social sciences for socialization and adaptation in the society and the workers’ association
Purpose of the module	After studying this module the participant will be able to apply the basics of philosophical knowledge, social sciences for socialization and adaptation in the society and the workers’ association
Level of professional qualification	4
Learning outcomes for the module	<ol style="list-style-type: none"> 1. To navigate to the most common philosophical questions 2. To understand the role and place of the culture of the peoples of the Republic of Kazakhstan in the world civilization 3. To be aware of basic concepts of sociology, political science and law 4. To determine the ratio of a person's life such philosophical categories as freedom and responsibility, material and spiritual values 5. To know the basic concepts of sociology and political science
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of the basic philosophical concepts 2. Identify the relationship of the main categories of philosophy 3. Knowledge of scientific, philosophical and religious paintings of the world 4. Awareness of the degree of responsibility of the individual for the preservation of life, culture and natural environment 5. Understanding of the social and ethical issues related to the development and use of science, engineering and technology 6. Formulating opinions on the relation between material and spiritual values 7. Knowledge of major political and sociological concepts

	8. Understanding the essence and laws of functioning of political culture 9. Understanding international political processes and the geopolitical situation
Prerequisites	World history History Of Kazakhstan Basics of economic theory
Discipline module makers	Basics of philosophy, Foundations of sociology, The foundations of political science,
Type of the module (required, optionally available)	Mandatory
Labor Intensity (credits RK/academic hours)	6 credits / 180 hours
Duration of the module	5 semester
Form of teaching	Full-time
Training technologies	modular
Form of organization of educational process	Lecture, independent work, practical lessons, labs, practices
Teaching methods	Oral questioning, testing, report, summary, creative task
Forms control	Pass fail exam
Required Resources	Personal computer, educational-methodical literature in disciplines: foundations of philosophy, Foundations of sociology, bases of political science.
Language of instruction	Russian, Kazakh
Post-requisites	Modern history of Kazakhstan, Cultural studies

Specification of the basic module 5

"The application of basic knowledge of the economy and knowledge of labor legislation in the field of professional activity"

Scope of competence	-
Title and code of the module	The use of basic knowledge of Economics and labor legislation knowledge in their professional activities
Purpose of the module	After studying this module the participant will be able to apply basic knowledge economy and knowledge of labour legislation and legal norms for the protection of their rights in professional activity
Level of professional qualification	5
Learning outcomes by module	<ol style="list-style-type: none"> 1. To be aware of basic issues of economic theory 2. To determine the forms and types of ownership, types of plans, basic economic indicators of enterprises 3. To understand the development trends of the world economy, the main tasks of the State transition to a green economy 4. To determine the possibility of success and business risk 5. To be aware of basic concepts on the right and State-legal phenomena 6. To possess information about key areas of law 7. To protect his/her rights in accordance with labour legislation
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of economic terms, understandings of regularities and principles of market economy 2. Definition of forms and types of property, plans, basic economic indicators of enterprises 3. Understanding of trends in the world economy, the main tasks of the State's transition to a green economy 4. Definition of possibility of success and business risk 5. Knowledge of key concepts and main characteristics of the right in accordance

	<p>with the principles of legality and the rule of law</p> <p>6. Understanding the legal status in the formation of identity and responsibility for Administration and corruption offences</p> <p>7. knowledge of basic provisions of civil and family law</p> <p>8. Following the rights and obligations of the employee under the labour code</p> <p>9. Understanding of the material and disciplinary responsibility of employer and employee</p> <p>10. Understanding of criminal responsibility and the founding of its occurrence</p>
Prerequisites	School program: people and society, geography
Discipline module makers	Essentials of Economics Fundamentals of law
Module type (mandatory, optional)	Mandatory
Labor Intensity (credits RK/academic hours)	4 credits /120 hours
Duration of the module	1-3
Form of teaching	Full-time
Education technology	modular
Form of organization of educational process	Lecture, independent work, practical exercises
Teaching methods	Problem solution methods, interactive teaching methods
Forms control	Pass fail exam
Required Resources	Library Fund, online classes, generic training, e-training resources
Language of instruction	Kazakh, Russian
Post-requisites	Basics of philosophy, employment law, family law RK

Specification of base module 6

“Performance, design, reading of design and technological documentation using application programs”

Scope of competence	-
Title and code of the module	Execution, 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 design and technological documentation using application programs.
Level of professional qualification	5
Learning outcomes by module	<ol style="list-style-type: none"> 1. To follow the rules of design documentation. 2. To possess 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. Performance and registration of the necessary cuts on the drawings. 6. Performance of an 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. Knowledge of computer graphics, the use of 3D-graphics.
Prerequisites	Mathematics, geometry and stereometry of the school program; Computer science; Object Oriented Programming.
Discipline module makers	- Engineering graphics; - Computer design.
Module type (mandatory, optional)	Mandatory
Labor Intensity (credits RK/academic hours)	4 credits / 120 hours
Duration of the module	1 semester
Form of teaching	Full-time
Education technology	Modular (local), different leveled
Form of organization of educational process	Practical exercises
Teaching methods	Verbal (conversation, lecture); visual practical; problem search; reproductive; inductive; case method
Forms control	Pass fail exam
Required Resources	Personal Computer; software; presentations; electronic resources; support cards; handouts.
Language of instruction	Kazakh, Russian
Post-requisites	Basics of computer simulation

Specification of Professional module 1
“Works performance on maintenance of power stations equipment with conventional new and renewable sources of energy”

Scope of competence	Perform maintenance work on the station with conventional equipment new and renewable sources of energy
Title and code of the module	Performance of works on maintenance of equipment stations with conventional new and renewable sources of energy
Purpose of the module	After studying this module the participant will be able to maintain station equipment from conventional to new and renewable sources of energy
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To read and make drawings in accordance with the normative and legal documents 2. To perform of drawing of simple and medium complexity 3. To Be aware of basic methods, ways and means of receipt, storage, processing information 4. To understand the essence and value of information in the development of the modern information society 5. To use of computer equipment and information technology in their professional activities 6. To apply of the methods of analysis and simulation of linear and nonlinear circuits DC and AC 7. To understand the substance of the tasks of analysis and synthesis of technical environment 8. To study methods for the application of the laws of mechanics to solve specific tasks in line with future specialty 9. To prepare the design diagrams, calculations for the strength and stiffness of the model elements 10. To learn general principles of design and construction, building models and algorithms of calculations

	<p>11. To classify of electric machines and describe the essence of what is happening in these electromechanical energy conversion</p> <p>12. To conduct calculations on determination of parameters and characteristics of electric machines and testing</p> <p>13. To apply of electrical and structural materials</p> <p>14. To fulfill of calculations with respect to the use of electrical and structural materials</p> <p>15. To study of design and characteristics of main power equipment HE</p> <p>16. To study of design and characteristics of auxiliary equipment HE</p> <p>17 . To master the power plants ways to calculate HES</p>
Summary of content (sections, topics)	<p>1. Performance of diagrams and drawings using information technology</p> <p>2. Mastering the theoretical foundations and principles of operation of technological and electrical machines, apparatuses and hybrid power plants</p> <p>3. Use of components of electrical and structural materials in the design of the equipment of power installations HES</p> <p>4. Performing calculations in relation to the use of electrical and structural materials</p> <p>5. Study of the design and characteristics of the main energy equipment HES</p> <p>6. Study of the design and characteristics of auxiliary equipment HES</p> <p>7. Mastering the methods of calculating energy installations HES</p>
Prerequisites	Physics, mathematics, engineering graphics, applied mechanics
Disciplines forming the module	<p>1. Engineering graphics</p> <p>2. Fundamentals of computer technology 3. Theoretical bases of electrical engineering</p> <p>4. Applied Mechanics</p> <p>5. Electrical machinery</p> <p>6. Electrical and structural materials science</p>

	7. Basic power and auxiliary equipment for HES installations
Module type (mandatory, optional)	Mandatory
Labor Intensity (credits RK/academic hours)	10 credits / 300 hours
Duration of the module	2-4 semester
Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical, lab exercises
Teaching methods	Tests, control quiz, oral work, defense of laboratory work and calculation tasks defense
Forms control	Pass fail exam, exam
Required Resources	<p>Technical literature:</p> <ol style="list-style-type: none"> 1. Mogilev A.V., Listratova L.V. Text processing technology. Technology processing of graphic and multimedia information. Publishing house BHV-Petersburg. 2010 2. Mikheeva E.V. Information technology in professional activities: studies. allowance for stud. n prof. education. 5th ed. - M.: Academy, 2006. 3. Ugrinovich N.D. Workshop on Informatics and Information Technologies: A manual for educational institutions - 4th ed. - M.: BINOM. 2006. - 394 pp., Ill. 4. Theoretical fundamentals of electrical engineering part 1: guidelines / S.V Pustynnikov; A.G. Sipailov; 5. E.B. Shandarova. - Tomsk: Publishing house of Tomsk Polytechnic University, 2014. - 92 p. 6. Iosilevich G. B., Stroganov G. B., Maslov G. S. Applied mechanics: A textbook for non-engineering specialties in technical colleges. M.: Higher School, 1989. - 351 p. 7. MM Katzman "Electric cars" - M.: Academy. 2008 8. MM Katzman "Electrical Machines" -M.: Academy 2005

	<p>9. MM. Katzman “Electronic Drive” - Moscow: Akademiya 2005</p> <p>10. Electrotechnical Materials Science: study guide / EE Privalov . - M.-Berlin: Direct Media, 2015. - 234s</p> <p>11. Taev I.S. Electrical apparatus. - M.: Energy, 2004. - 300 p.</p> <p>12. Chunikhin A.A. Electrical apparatus. - M.: Energoizdat, 2005. - 645s.</p> <p>13. Electric devices. / edited by Yu.K. Rozanov - Moscow: Energoatomizdat, 2006. - 645 p.</p> <p>14. http://window.edu.ru/resource/621/47621</p> <p>Gaisarov R.V. Selection of electrical devices and conductors:</p> <p>15. Manual - Chelyabinsk: SUSU, 2006. - 58 p.</p> <p>16. Belyaev V.L. Features of work and designs of multi-ampere electrical apparatus: Tutorial - SPb.: SZTU, 2005. - 274 p.</p> <p>17. http://window.edu.ru/resource/771/56771</p> <p>Nabatov KA, Afonin V.V. Low Voltage Switchgear Electrical Apparatus: Study Guide - Tambov: TSTU Publishing House, 2007. - 96 p.</p> <p>Internet resources:</p> <p>1. Lectures on electric cars http://www.twirpx.com/files/tek/emachines/lectures/</p> <p>2. Electric cars - Lecture notes http://student.ucoz.net/load/konspekty_lekcij/ehlekticheskie_mashiny/69</p> <p>3. Electric Machines Handbook. Lectures of electric cars / http://favorit-grand.narod.ru/ presentations, service computer programs MathCAD, MathLab to perform a billing task</p>
Language of instruction	Russian, Kazakh
Post-requisites	Electricity, General Energy, Power stations and substations, Electric power systems and networks.

Specification of Professional module 2
“Implementation of the power supply, management and monitoring of power equipment operated and power plants of hybrid energy”

Scope of competence	Electricity, management and control of power equipment and power plants operated by the hybrid energy
Title and code of the module	Implementation of the supply, management and monitoring of power equipment and power plants operated by the hybrid energy
Purpose of the module	After studying this module the participant will be able to perform supply, management and monitoring of power equipment and power plants operated by the hybrid energy
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To master the main types of power plants and methods for producing heat and electricity 2. To analyze the technological scheme of production of electrical and thermal energy. 3. To have information on environmental issues in the field of energy 4. To study the terminology, the basic elements of electrical networks, schemes and constructive implementation of electrical and switching equipment 5. To conduct basic electrical calculations with the design of their results in accordance with the requirements of ESKD 6. To analyze and describe the physical processes occurring in electrical machines and in the electric drive 7. To make a selection and calculation of electrical devices and electrical installations, protection systems and automation 8. To have information about the types and fields of application of semiconductor devices and to calculate them. 9. To apply analog and digital control devices. 10. To analyze the operation of network and autonomous converters

	<p>11. To master the basics of metrology, standardization and certification</p> <p>12. To provide management, control of the system of ACY facility</p>
Summary of content (sections, topics)	<p>1. Mastering the main types of power plants and methods for producing heat and electricity based on renewable and non-renewable energy sources;</p> <p>2. The study of terminology, the basic elements of electrical networks, schemes and constructive implementation of electrical and switching equipment;</p> <p>3. Carrying out the basic electrical calculations with the design of their results in accordance with the requirements of ESKD;</p> <p>4. Analysis and description of the physical processes in electrical machines and in the electric drive;</p> <p>5. Selection and calculation of electrical devices and electrical installations, protection systems and automation;</p> <p>6. Information on the types, fields of application of semiconductor devices and their calculations;</p> <p>7. Analog and digital control devices</p> <p>8. Analysis of network and autonomous converters;</p> <p>9. Basics of metrology, standardization and certification;</p> <p>10. Management, control of the work of the ACS system object.</p>
Prerequisites	Physics, special ialnye mathematics, theoretical and applied mechanics, theoretical bases of electrical engineering
Discipline module makers	<p>1. Total energy</p> <p>2. Basics of electricity</p> <p>3. Automated electric drive</p> <p>4. Industrial Electronics</p> <p>5. Fundamentals of metrology</p>
Module type (mandatory, optional)	Mandatory
Labor Intensity (credits /academic hours)	8 credits/ 240 hours
Duration of the module	2-3 course

Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical, lab exercises
Teaching methods	Tests, oral questioning, defense of laboratory work and calculation tasks
Forms control	Pass fail exam, exam
Required Resources	<p>Technical literature:</p> <ol style="list-style-type: none"> 1. Bystritsky GF Fundamentals of energy. - M.: INFRA-M, 2007. 2. Sibikin Yu.D., Sibikin M.Yu. Energy saving technology. - M.: INFRA-M, 2006. 3. Kudrin B.I. Power supply of industrial enterprises. Textbook for universities. - M.: Internet Engineering, 2005. 4. Kabyshev A.V., Obukhov S.G. Calculation and design of power supply systems: Reference materials for electrical equipment: 5. Study guide / Tomsk Polytechnic University. - Tomsk, 2005. - 168 p. 6. Katsman M.M. Electric drive. Textbook for technicals.-M.: "Academy", 2005. 7. Moskalenko V.V. Electric drive. Textbook.- M.: IC "Academy", 2005. 8. Kalabekov B.A. "Digital devices and microprocessor systems" textbook M.: Radio and Communications, 2000. 9. Kuchumov A.I. "Electronics and circuitry." Tutorial M.: Helios ARV, 2002. 10. Tartovskiy DF, Yastrebov A.S. Metrology, standardization and technical means of measurement. ., - M.: Higher. shk., 2001. 11. Utegulova A.P. Electronic textbooks in the modern educational process on the subject "Fundamentals of Metrology and Measuring Instruments", 2017. <p>Presentations, service computer programs MathCAD, MathLab to perform a billing task. Learning laboratories</p>
Language of instruction	Russian, Kazakh, English

Post-requisites

Electric machines, applied mechanics, theoretical foundations of HES

Specification of Professional module 3
“Works performance on technical maintenance, repair and modernization of power equipment, power HES structures”

Scope of competence	Perform technical maintenance, repair and modernization of power plants based on HES
Title and code of the module	Performance of works on technical operation, repair and modernization of power equipment, power structures of HES
Purpose of the module	After completion of the module the student will be able to work on technical maintenance, repair and modernization of power plants based on HES
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To organize work on the operation of electrical equipment of power plants and substations 2. To carry out work on the technical operation of energy equipment and energy installations GIE 3. To carry out the repair of energy equipment and power installations GIE 4. To modernize energy equipment and power plants 5. To master the features of operation and maintenance of wind turbines 6. To select and operate hydropower plants. 7. To know features of GRID - technologies in the field of renewable energy 8. To master the design and operational features of solar systems and heat pumps
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Organization of work on the operation of electrical equipment of power plants and substations 2. Implementation of work on the technical operation of energy equipment and HES power plants

	<ul style="list-style-type: none"> 3. Repair of power equipment and energy installations of HES 4. Modernization of energy equipment and power plants 5. Possession of features of operation and maintenance of wind turbines 6. Implementation of the selection and operation of hydropower plants 7. Owing the features of GRID - technologies in the field of renewable energy 8. Mastering the design and operational features of solar systems and heat pumps
Prerequisites	Physics, mathematics, engineering graphics, electrical machines
Discipline module makers	<ul style="list-style-type: none"> 1. Electrical stations and substations 2. operation of power supply systems 3. Wind energy 4. Hydropower 5. Hybrid technology to use RES
Module type (mandatory, optional)	Optional
Labor Intensity (credits RK/academic hours)	11 credits /330 hours
Duration of the module	2-3 course
Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical lab exercises
Teaching methods	tests, oral questioning, defense of laboratory work and calculation tasks
Forms control	Pass fail exam, exam
Required Resources	<p>Technical literature:</p> <ul style="list-style-type: none"> 1. Rozhkova, LD, Karneeva, L.K., Chirkova, 2.T.V. Electrical equipment of power stations and substations. Textbook. 9th Edition. -Academy, 2004

	<p>3. Uchebnik V. Ya. Khorolsky, M. A. Taranov, V. N. Shemyakin. Operation of power supply systems. Study Guide.-M. Higher Education, 2017.</p> <p>4. The tutorial "Fundamentals of wind energy" by Velkin V.I., D.A. Purkin, A.N. Shestak, S.E. Shcheklein 2006</p> <p>5. Alexander A.Yu., Silaev B.I. Hydropower Installations Study Guide - M.: Due to MEI, 2004.</p> <p>6. Hydropower engineering: Textbook for universities / A.Yu.Aleksandrovsky, M.I. Kneller et al.: Ed. Obrezkov. 2nd ed., Pererab. And add. - M.: Energoatom izdat, 1990.</p> <p>7. Energy equipment for the use of renewable energy, under ed. Vissarionov VI, - M.: 2004.</p> <p>Presentations, service computer programs MathCAD, MathLab to perform a billing task.</p>
Language of instruction	Russian, Kazakh
Post-requisites	Electric power systems and networks, relay protection and automation of electric power systems, high voltage technique

Specification of Professional module 4
“Technical Diagnostics of hybrid energy consumers’ electrical plants”

Scope of competences	Perform technical diagnostics of electrical consumers hybrid energy
Name and code of the module	Performance of technical diagnostics of electrical installations of hybrid energy consumers
Purpose of the module	After completion of the module the student will be able to perform technical diagnostics of electrical consumers hybrid energy
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To predict the technical condition of power plants 2. To diagnose and apply power software
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Possession of key concepts and definitions of the diagnostic equipment 2. Determination of the kind of technical condition of power plants 3. Search the location of failure or malfunctions power plants 4. Prediction of technical condition of power plants 5. Installation parameters and characteristics of diagnosis 6 Ensuring the fitness of the electrical installation to the technical Diagnostics 7. Technical requirements for the diagnosis 8. Processing of the results of technical diagnostics
Prerequisites	Electrical stations and substations
Discipline module makers	<ol style="list-style-type: none"> 1. Monitoring and diagnostics of power equipment 2. Theoretical basis of HES 3. Energetic facilities of HES
Module type (mandatory, optional)	Optional
Labor Intensity (credits RoK/academic hours)	7 credits/210 hours
Duration of the module	2-3

Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical lab exercises
Teaching methods	Tests, oral work, laboratory work defense, calculation tasks
Forms control	Pass fail exam, exam
Required Resources	<p>Technical literature:</p> <ol style="list-style-type: none"> 1. The Republic of Kazakhstan. Law of July 4, 2009 No. 165-IV. On supporting the use of renewable energy sources [electronic resource] // http://online.prg.kz/Document/?link_id=1001090139 2. Kambarov M.N. Renewable energy resources of Kazakhstan, aspects of involvement in the energy balance // Energy and fuel resources of Kazakhstan. - 2002. - №9. - p. 67-78. 3. Germanovich V., Turilin A. Alternative energy sources and energy saving. Practical designs for the use of wind energy, sun, water, earth, biomass. - SPb.: Science and Technology, 2014. - 320 p. Source: twirpx.com # RES @ zelenayaenergetica. licensed software and Internet resources
Language of instruction	Russian, Kazakh
Post-requisites	General energy, electricity, economics of the industry.

Specification of Professional module 5
“Monitoring of hybrid power plants operation”

Scope of competences	To conduct monitoring of hybrid power plants
Title and code of the module	Carrying out monitoring of hybrid power plants
Purpose of the module	After completion of the module the student will be able to conduct monitoring of hybrid power plants
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To know the composition and content of monitoring system installations HE 2. To monitor the work of Wind Power Plant 3. To conduct monitoring of installations using the Sun’s energy to heat energy
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Knowledge of the structure and the purpose of a monitoring system installations of HES 2. Understanding features of monitoring of wind turbines 3. Understanding of the monitoring features of the Sun for energy installations heat generation 4. Understanding the features of monitoring installations using solar energy to generate heat 4 Application of monitoring features of photovoltaic plants 5. Possession of atmospheric monitoring features 6. Determination of the composition of equipment for organizing data collection with wind turbines 7. Determination of technical characteristics of equipment 8. Connection of equipment to wind turbines 9. Analysis of the main equipment of wind turbines

	<p>10. Determination of equipment for organizing data collection from a solar collector.</p> <p>12 Definition technical characteristics of the equipment of a solar collector</p> <p>13. Knowledge of equipment diagram used for connection to solar collector</p> <p>14. Determination of equipment composition for organization of data collection with a solar concentrator</p> <p>15. Definition of the technical characteristics of the equipment of solar concentrator</p>
Prerequisites	Electrical stations and substations
Discipline module makers	<p>1. Electric power plants HES</p> <p>2. Monitoring and diagnosis of power equipment</p> <p>3. Theoretical basis of HES</p>
Module type (mandatory, optional)	Optional
Labor Intensity (credits RK/academic hours)	12 credits / 360 hours
Duration of the module	2-3
Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical, lab exercises
Teaching methods	Tests, oral questioning, defense of laboratory work and calculation tasks
Forms control	Pass fail exam, exam
Required Resources	<p>Technical literature:</p> <p>1. Rusov V.A. "Diagnostics of defects of rotating equipment by vibration signals" 2012;</p> <p>Licensed software and Internet resources</p>

Language of instruction	Russian, Kazakh
Post-requisites	Physics, General energy, electricity, economics of the industry.

Specification of Professional module 6
“Assessment of the technical capacity of hybrid power plants”

Scope of competence	Assessment of the technical potential of hybrid power plants
Title and code of the module	Assessing the technical capacity of hybrid power plants
Purpose of the module	After studying this module training will be able to conduct evaluation of technical capacity hybrid power plants
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To assess the technical capacity of hybrid systems RES 2. To possess a theoretical basis of hybrid energy
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Identification of the main categories of potential GIE 2. Calculation of the main categories of the energy potential of solar energy 3. Calculation of the main categories of the energy potential of wind energy 4. Calculation of the main categories of the energy potential of hydropower 5. Calculation of the potential of hybrid systems of renewable energy and assessment of the technical potential of hybrid systems of renewable energy 6. Application of various types of non-conventional energy systems, taking into account regional features 7. Application of the main sources and potentials of small and traditional energy 8. Implementation of approximate methods of calculation and selection of the main categories of potential of small and traditional energy 9. Orientation in the main types, types and technological features of small and traditional energy

	10. Knowledge of basic concepts, definitions and basic types of hybrid power plants
Prerequisites	1. Electrical equipment of stations and substations 2. Electric machines
Discipline module makers	Theoretical bases of hybrid energy
Module type (mandatory, optional)	Optional
Labor Intensity (credits RK/academic hours)	9 credits / 270 hours
Duration of the module	3-4 course
Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical lab exercises
Teaching methods	Tests, written and oral questioning, defense of laboratory work and calculation tasks
Forms control	Pass fail exam, exam
Required Resources	1. A. P. Kashkarov Wind generators, solar panels and other useful constructions / A. P. Kashkarov. - M.: DMK Press, 2011. - 144 p. 2. YU.D. Sibikin. Nonconventional renewable energy sources / Sibikin Yu.D., Sibikin M.Yu. - M.: RadioSoft, 2008.- 338 p. 3. Udalov S.N. Renewable energy sources. - Novosibirsk: Novosibirsk State Technical University (NSTU), 2009. - 444 p. 4. http://window.edu.ru/resource/549/75549 Cities, R.V. Nonconventional and renewable energy sources: study guide / R.V. 5. Towns, V.E. Gubin, A.S. Matveyev; Tomsk Polytechnic University. - Tomsk: TPU publishing house, 2009. - 294 p.

	<p>6.http://window.edu.ru/resource/944/58944 Khakhaleva L.V. Non-traditional and renewable energy sources: A guide for practical exercises. - Ulyanovsk: UISTU, 2008. - 32 p.</p> <p>7.http://window.edu.ru/resource/190/45190 Khakhaleva L.V. Unconventional and renewable energy sources: A manual for laboratory practice. - Ulyanovsk: UISTU, 2007. - 21 p.</p> <p>presentations, service computer programs MathCAD, MathLab to perform a billing task</p>
Language of instruction	Russian, Kazakh
Post-requisites	Economy, life safety

Specification of Professional module 7

“Works performance on planning of optimal technological regimes for power plants, power stations and energy complexes based on HES”

Scope of competence	Perform work on the planning of optimal technological regimes for power plants, power plants and energy complexes based on HE
Title and code of the module	Execution of works on planning optimal technological regimes, power plants, power stations and power complexes based on HE
Purpose of the module	After studying this module, the trainer will be able to perform work on the planning of optimal technological regimes of power plants, power plants and energy complexes based on HES
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To characterize the modes of operation of power plants 2. To optimize the operation modes of installations based on HIE in electric power systems 3. To plan the operation modes of electric power systems in the conditions of the electricity and capacity market. 4. To apply special operating modes of installations based on GIE 5. To master the principles of transmission and distribution of electricity 6. To analyze the results of calculations of operating modes of electric power systems and networks 7. To master the basic principles of protection devices and automation of electric power facilities 8. To apply types of relay protection and automation devices at power facilities

	<p>9. To possess methods for assessing the electrical strength of insulation, reliability of lightning protection</p> <p>10. To determine the diagnostic parameters of high-voltage equipment.</p>
Summary of content (sections, topics)	<ul style="list-style-type: none"> -Modes of operation of power installations GIE -Optimization of operating modes of installations based on HIE in electric power systems - Planning of operating modes of electric power systems in the conditions of the market of the electric power and power -Special operating modes of installations based on GIE - Principles of transmission and distribution of electricity -Analysis of the results of calculations of operating modes of electric power systems and networks; -Methods for assessing the electrical strength of insulation, reliability of lightning protection; -Diagnostic parameters of high-voltage equipment; -Undergraduate practice at energy facilities.
Prerequisites	<ol style="list-style-type: none"> 1. Electrical stations and substations 2. Electric machines
Discipline module makers	<ol style="list-style-type: none"> 1. Modes of the use of power plants HES 2. Electric systems and networks 3. Relay protection and automation of electric power systems 4. High voltage technology
Module type (mandatory, optional)	optional
Labor Intensity (credits RK/academic hours)	13 credits / 390 hours

The duration of the module	3-4 course
Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical lab exercises
Teaching methods	Tests, oral work, laboratory work defense survey and calculation tasks
Forms control	Pass fail exam, exam
Required Resources	<p>Technical literature:</p> <ol style="list-style-type: none"> 1. Renewable energy [Electronic resource]. - M.: Fizmatlit, 2010. - 256s., 978-5-9221-1244-4, (http:// biblioclub). 2. M.W. Shkaruba. High Voltage Technique: Study Guide / M.V. Shkaruba. Omsk: Omsk State Technical University Publishing House, 2012. - 80 p. 3. M.V. Shkaruba. Insulation and surge in electrical systems: Lecture notes / M.V. Shkaruba;. - Omsk: Omsk State Technical University Publishing House, 2006. - 64 p. (4. Internet resources: Scientific electronic library elibrary.ru, Integrum. 5. Manual on operation of microprocessor-based relay protection units MICOM. <p>Presentations, service computer programs MathCAD, MathLab to perform a billing task</p>
Language of instruction	Russian, Kazakh
Post-requisites	-

Specification of Professional module 8
“Elaboration of the projects elements on power plants, power stations and energy complexes based on HES”

Scope of competence	To develop elements of projects of power plants, power plants and energy complexes on the basis of HE
Title and code of the module	Development of project items, power plants, power stations and power complexes based on HE
Purpose of the module	After studying this module the participant will be able to develop elements of power plants projects, power plants and power complexes based on HES
Level of professional qualification	Applied Bachelor of hybrid energy
Learning outcomes by module	<ol style="list-style-type: none"> 1. To perform work on the design and operation of new power plants and substations 2. To present the main information retrieval system on the Internet. 3. To know the principles of development of energy-saving technologies. 4. To analyze economic problems in the development of innovative forms of energy 5. To apply methods of financial and economic rationale for investment in a market economy 6. To fulfill the requirements of pre-diploma practice at power facilities
Summary of content (sections, topics)	<ol style="list-style-type: none"> 1. Implementation of the design and operation of the electrical part of power plants and substations 2. Investigation of physical processes occurring in electrical equipment during its operation 3. Fulfillment of the requirements imposed by computer search systems on the source data

4. Informing about the sites of the main manufacturers of electrical equipment for power supply systems
5. Perform Internet search for the necessary information at a specific stage of project work.
6. Search for technical information on modern electrical equipment produced by various manufacturers
7. Possession of general information on the formation and use of energy resources, energy-saving technologies and equipment
8. Application of forms and methods for conducting energy audits of various facilities
9. Possession of the principles of operation of heat and power equipment
10. Possession of information about the current state of HES resources and their use
11. Knowing terminology in the field of economics of HES
12. Analysis from the point of view of the economy of information on new technologies in the field of HES
13. Application of information on the technical parameters of equipment in the design of installations HES
14. Execution of technical and economic calculation of investment projects in the field of HES
15. Justification of specific technical and economic decisions in the design of installations using HES
16. Consolidation of previously acquired knowledge in the professional disciplines of undergraduate training
17. Collection of factual material on the topic of final qualifying work, familiarization with the functional responsibilities of officials on the profile of hybrid energy

Prerequisites	1. Electrical stations and substations 2. Electric machines
Discipline module makers	1. Design and operation HE 2. Internet technologies in designing electricity 3. Energy-saving technologies in electricity and automation 4. Economics of alternative and renewable energy sources 5. Undergraduate practice
Module type (mandatory, optional)	mandatory
Labor Intensity (credits RK/academic hours)	14 credits /420 hours
Duration of the module	3-4 course
Form of teaching	Full-time
Education technology	Modular
Form of organization of educational process	Lectures, practical, lab exercises
Teaching methods	Tests, defense of laboratory work and calculation tasks
Forms control	Exam, test
Required Resources	Technical literature: 1. Sibikin Yu.D., Sibikin M.Yu. Unconventional and renewable energy sources: study guide. - M.: KNORUS, 2010. - 232 p. 2. Gibilisko S. Alternative energy without secrets. Per. from English A.V. Solovieva.- M.: EKSMO, 2010 3. licensed software and Internet resources: www.sci.aha.ru www.biodat.ru www.energsovet.ru www.expert.ru . 4. Energy equipment for the use of alternative and renewable energy sources. Ed. IN AND. Vissarionov. M., 2004

	presentations, service computer programs MathCAD, MathLab to perform a billing task
Language of instruction	Russian, Kazakh, English
Post-requisites	The module is the base for the study of the course of special disciplines and the implementation of final qualifying work

PLAN OF EDUCATIONAL PROCESS

Code and profile of education: 0900000 – Energy. Electricity
Specialty: 0916000 – Hybrid Energy
Qualification: 0916034- Applied Bachelor of Hybrid Energy

Form of education: Full-time
 Standard term of training: 2 years 10 months on the basis of general secondary education

Index	Modules and types of training activities	Number of credits	Form control		The amount of training time (watches)							Distribution courses
			Exam	Differential set-off	Total hours	From them:						
						On the types of training			On the forms of organization training			
						Theoretical training	Laboratory and practical works, course projects and	Practical training *	Audit, contact	SRO		
PSAS	FEWS											
B M	Basic modules	30	3	8	900	630	270		720	180	60	1-6

BM 1	Application of professional vocabulary, the preparation of business papers in the field of professional activity	6	+	+	180	120	60	-	120	60	15	1-6
BM 2	Understanding the history, role and place of Kazakhstan in the world community	4	+	+	120	120	-	-	120	-		1-6
BM 3	Development and improvement of physical qualities	6	+	+	180	-	180	-	180	-		1-6
BM 4	Application of the basics of philosophical knowledge, social sciences for socialization and adaptation in society and the workforce	6	+	+	180	180	-	-	120	60	15	1-6
BM 5	Application of basic knowledge of economics and knowledge of labor laws and regulations to protect their rights in their professional activities	4	+	+	120	120	-	-	90	30	15	1-6
BM 6	Performance, design, reading of design and technological documentation using application programs	4	+	+	120	90	30	-	90	30	15	1-6
PM	Professional modules on working qualifications	36	+	+	1080	600	240	240	600	480	120	1-6
PM 1	Maintenance of station equipment with traditional new and renewable energy sources.	10	+	+	300	180	60	60	180	120	30	1-6
PM 2	Power supply, control and monitoring of the operating energy equipment and hybrid energy power plants	8	+	+	240	120	60	60	120	120	30	1-6

PM 3	Performance of works on technical operation, repair and modernization of energy equipment, energy structures of HES	11	+	+	330	210	60	60	210	120	30	1-6
PM 4	Technical diagnostics of electrical installations of consumers of hybrid energy	7	+	+	210	90	60	60	90	120	30	1-6
PM	Professional Modules of Midlevel Specialist Qualifications	21	+	+	630	300	240	90	300	330	180	1-6
PM 5	Monitoring the operation of hybrid power plants	12	+	+	360	150	150	60	150	210	90	3-6
PM 6	Evaluation of the technical potential of hybrid power plants	9	+	+	270	150	90	30	150	120	90	3-6
PM	Professional modules of applied bachelor qualifications	27	+	+	810	240	390	180	240	570	390	
PM 7	Planning the optimal technological conditions for power plants, power plants and energy complexes based on HIE	13	+	+	390	120	180	90	120	270	180	3-6
PM 8	Development of project elements for power plants, power plants and energy complexes based on HIE	14	+	+	420	120	210	90	120	300	210	3-6
	Subtotal:	114			3420	1770	1140	510	1860	1560	750	
PP	Professional practice (academic, industrial, undergraduate)	42			1260			1260	180	1080	300	1-6
DD	Diploma project *	9			270		270		60	210	30	6

PA	Intermediate certification	10		300	300			300			1-6
FC	Final certification	2		60	60			60			6
	Total compulsory education:	180		5400	2130	1410	1770	2460	2850	1080	
		(144 +36)		(4320 +1080)							
C	Consultation	10		300	300				300		1-6
O	Optional classes	11		330	330				330		1-6
	Total:	201		6030	2760	1410	1770	2460	3480	1080	
		(165 +36)		(4950 +1080)							

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.