

GENERAL TRAINING CYCLE

Compulsory components

Physics. Physical foundations of classical mechanics. Foundations of molecular physics and thermodynamics. Electricity and Magnetism. Physics of oscillations and waves. Optics. Basics of Atomic physics and Quantum mechanics. Principles of solid state physics. Theory of relativity. Basics of nuclear physics and nuclear energy.

High Maths. Elements of linear, vector algebra and analytical geometry. Differential calculus of function of one and several variables. Complex numbers. Transformation Laplas, numbers on orthogonal system, conformity between operations above originals and images. Integral calculus of function of one and several variables. Differential equations, differential equations systems. Numerical and functional numbers. The harmonious analysis.

Theoretical mechanics. Theoretical mechanics. Theory of mechanisms and machines. Mechanics of materials and structures. Machine parts.

Chemistry. Structure of atoms, molecules, substances, their modular condition. Chemical reactions. Solutions of electrolytes and non-electrolytes. Corrosion and protection of materials and alloys. Concept PH. Electrochemical processes.

Compulsory components by decision of the Academic Council of the University

Annotations of components: History of Ukrainian Statehood, Ethnocultural, Philosophy, Ukrainian language for professional purposes, Foreign language.

SPECIAL (PROFESSIONAL) TRAINING CYCLE

Compulsory components

Foundations of Automation. Automation systems and elements. Means of automation. Linear systems of automatic control. Nonlinear and optimal automatic control.

Fundamentals of electrical engineering and electromechanics. The course "Electrical Engineering and Electromechanics" is a discipline for the fundamental training of engineers in electrical specialties. This science studies electrical and magnetic phenomena, the transformation of electrical energy into mechanical, the production of electrical energy and methods and means of its use. The purpose of the discipline is to familiarize students with the basics of modern electrical engineering, with the methods of calculating electrical circuits, with the principles of work of electromechanical converters, including with the principles of operation of electric machines of direct and alternating current, information micromachines. The tasks of the discipline are to: teach students to calculate electric and magnetic circuits in the steady and transient modes, to determine the characteristics of electric machines and to calculate effective and safe modes of their use. As a result of studying the discipline, the student must know the basics of the analysis of electric circuits of direct and alternating currents; the principles of the theory of quadrupole and its use; basic principles of the analysis of transients in electric circuits; the principles of electromechanical energy conversion; designs and principles of operation of electric machines (including micromachines). Student should be able to solve typical problems of analysis of electric circuits; to calculate transients in electric circuits; apply knowledge of the laws of electrical engineering and electromechanics for the efficient and safe

operation of electromechanical transducers.

Thermal power plants. Structure of construction of thermal power plants. The main elements of thermal power plants and their interconnection. Thermodynamic and technological bases of thermal power plants. Study of the principles of functioning of steam and gas boilers, electric generators for the generation of electric energy. The main constructions of heat and power equipment and ways to improve the efficiency of the TPS are considered.

Control and measuring devices and apparatus. The legislative and normative acts in metrology. General problems of measurement and errors. The theory and practice of measurement precision and measurement systems. Analogue measuring apparatuses. Measuring mechanisms. Registering devices. Digital devices. Measuring of electrical and magnetic magnitude.

Heat-technological processes in the processing of agricultural products. The purpose of discipline is to form students' knowledge of the main processes of heat and mass transfer during the processing and storage of agricultural products, namely cooling processes, phase transformations and other processes. The principles of the devices for the processing of agricultural products are considered: dryers, shredders, refrigeration units, etc. The methods of thermal and hydraulic calculation of devices for processing and storage of agricultural products are considered. Acquaintance with modern methods and approaches in storage of agricultural products.

As a result of studying the discipline the student must know: the basics of the functioning of devices and industrial objects in the processing and storage of agricultural products, methods of their calculation and bases of operation.

Engineering and Computer Graphics. Projection drawing. Looks, cuts and sections. Thumbnails and work drawings. Elements of structural joints. Assembly drawing. Detailing Drawing using the AutoCAD system. Areas of use of computer graphics. Basics of PC software computer graphics. AutoCAD automated drawing system. Setting up tasks for computer graphics. Fundamentals of graphical representation of information, graphic primitives and tools for editing CAD systems; the basis of solid-state modeling of parts.

Computer Technologies and Programming. Computer architecture. Operating systems and software computing technologies. Systems and Technology Management database. Computer networks. Working in local area computer networks and the Internet. Basic programming and algorithmic languages. High-level programming languages. Mathematical package MathCAD. Programming in the mathematical package MathCAD. Computer graphics and image editors.

Energy-saving technologies and use of energy resources. The purpose of discipline is mastering the basic principles and methods of energy saving, introduction of modern energy-saving technologies, modern approaches and challenges in the development, design and operation of energy-saving installations and systems. The discipline allows students to study renewable energy sources, calculate them and get acquainted with the establishment of automatic control of modern energy supply systems based on renewable energy sources.

Software of Engineering Calculations. Electronics and Microprocessor Technics. Passive electronics. Semiconductor diodes, transistors, thyristors. Photovoltaic, optoelectronic and indicating devices. Electronic Amplifiers. Digital and pulse devices. Power supplies. Microprocessor devices. Microcomputer structure, microprocessor architecture, microprocessor command system, hardware microcontrollers, interrupt system, device matching with the object.

Economy and Energy Services Organization. Economic efficiency of investment in the energy sector. The economic mechanism. Scheduling and wages in the energy sector. Revenue, profitability, financial activities in electricity. Energy planning. Recovery costs of fixed income.

The general questions of estimation of energy efficiency of functioning of energy systems of agroindustrial complex, including those using renewable and secondary energy sources, are considered. The methods of determining the efficiency of power systems are described. The peculiarities and problems of financial and economic analysis of objects of agrarian and industrial complex are analyzed.

Water supply and drainage. The basic principles of water supply and drainage for settlements are considered. Principles of water treatment and transportation of drinking water to consumers are studied. The designs and functioning of the Rozhnovsky towers and the methods of treatment of drinking water in them are considered. The bases of sewage and water treatment of sewage are studied.

Thermal networks. The purpose of discipline is to study the basic principles of building thermal networks for the efficient transport of heat energy. The processes of transportation of heat carriers in thermal networks are considered. Thermal and hydraulic calculation of heating networks is carried out, types of insulation materials for pipelines and methods of their protection against destruction are considered. The ways of improvement of heat networks for minimizing heat losses during the transportation of thermal energy

Fundamentals of Electricity Supply in Agroindustrial complex. The discipline includes: general information on the production, transmission, distribution and consumption of electric energy; power supply tasks; reliability of power supply of enterprises and settlements; quality of electric energy in electric networks; electrical loads of networks; efficiency of electric networks; elements of electric networks; calculation of

electric networks; voltage regulation in electric networks; calculation of air lines for mechanical strength; transients in electrical networks; reserve and non-traditional sources of electric energy; means of protection of systems of power supply from emergency modes of work; relay protection and automation of power supply systems.

Fundamentals of Electric Drive. Mechanical and Electrical Specifications DCmotors and AC. Transients in electric drives. Adjust the coordinate drive. Power drive. Choice of electric vehicles and electric control and protection. Scheme electric. General procedure for selecting drive.

Hydro-gas dynamics. The discipline involves the preparation of students for the independent solution of theoretical and applied problems of hydrodynamics, knowledge of the laws of hydraulics, principles of operation and design of hydraulic systems, the operation of hydraulic devices and machines used in rural, municipal and industrial spheres. Basic principles of construction and functioning of pumping and ventilation equipment, their calculation and bases of operation. Design, calculation and management of hot and cold water supply networks, choice of water pump equipment, cost accounting and water supply regulation. Basic application packages for modeling complex water supply systems, their features and purpose.

Fundamentals of Heat Mass Transfer processes. The discipline studies the basic processes of heat transfer and mass transfer in technological processes and energy devices and apparatuses. Different mechanisms of heat transfer are considered, namely, thermal conductivity, convective heat transfer, radiation transport, heat exchange during boiling and condensation. The basic equations and methods of calculation of heat and mass transfer processes are presented. The main heat energy devices used in the agroindustrial complex are considered.

Heat power installations and systems. The purpose of discipline is to form students' knowledge of the bases of functioning and principles of construction of thermal power plants and systems used in the agro-industrial complex. Tasks that are considered in the studied discipline: familiarization with the basic concepts,

terminology and definitions used in thermal power plants; study of the principles of operation of thermal power plants, boiler-houses and cogeneration units, assimilation of methods for calculating thermal power plants, studying their constructions and bases of exploitation. Familiarization with modern methods and installations for the development of thermal and electric energy at agricultural facilities.

As a result of studying the discipline, the student must know: the basics of the operation of heat and power plants and systems, energy management systems, methods of their calculation and bases of operation

Compulsory components by decision of the Academic Council of the University

Safety and Life. Legislative and normative base of Ukraine on labor protection.

State management of labor protection and organization of labor protection at work. Explosion of production, explosion protection. Fire Security. Electrical safety. Labor Hygiene and Industrial Sanitation. State supervision and public control over labor protection. Providing First Aid to Victims of Accidents.

Introduction to speciality. The purpose of discipline is to study the main directions of training of heat energy specialists, the features of the future profession, the content and objectives of practical activities in the energy sector. The main disciplines studied during the preparation of bachelors are given and information on the necessary types of training of heat energy specialists is provided. Particular attention is paid to the current trends in the development of heat and power engineering, which affect energy saving and alternative energy sources. The discipline substantiates the formation of the primary knowledge of the main heat power engineering and ideas about the future work, the publication of the basic concept and terminology apparatus of heat power engineering and understanding of the ways of development of society.

Optional components EPP

Optional components by specialty (block 1)

Heat Engineering. The purpose of discipline is to form students knowledge of thermodynamic principles, methods and obtaining practical skills in the functioning and research of technological processes in heat and power systems and energy objects of agro-industrial production. When studying the discipline the student: acquaints with the state, the basic concepts and definitions of heat engineering, material flows and thermal energy; the main position of the operation of heat and power systems; analysis of typical (existing) technical solutions.

As a result of the study of the discipline, the student must know: the general principles of production, distribution and measurement of the cost of electric and thermal energy and material flows (gas, water, petroleum products, fuel resources); methods of formation and principles of saving of expenses of energy and material resources; the procedure for selecting technical means of automated control and accounting; construction and principles of the functioning of power systems and installations, management of distribution and consumption of energy and material resources;

The student should be able to: to identify the needs and normalize the energy and material resources, and select the technical means for the operation of power plants and systems and the consumption of energy and material resources.

Generation and transportation of electricity at power station. Electric power systems, their structure and operative management. The main types of power plants. TPP and HPP. Main electrical equipment of stations and substations.

Electric networks. Loss of voltage and power. Operating modes of electrical networks. Short circuits in electric power systems and short-circuit currents. Switching devices. Measuring transformers. Sources of operational current. Main circuits of connections of electric power stations and substations.

Gas supply. Discipline gives an opportunity to gain knowledge: in the field of gas supply to the agro-industrial complex, gas supply systems; gasification of rural settlements with natural gas; gasification of rural settlements by liquefied gas; the composition of gaseous fuel, its main characteristics of the basics of combustion of gaseous fuels. In addition, issues concerning gas supply of biogas plants, technologies and equipment for its receipt are considered.

As a result of studying the discipline, energy engineers should be prepared to solve the problems of development and reconstruction of the material and technical base of agricultural production and social development of the village in the field of gas supply to the agro-industrial complex.

Diagnosis and maintenance of power equipment. Normative and legislative basis of the energy service. System of maintenance and repair of electrical equipment. Diagnosing and maintenance of synchronous generators. Determination of the technical state and operation of electric power transmission devices: air and cable lines of power transmission, transformers, switchgears. Switching devices with voltage up to 1000 V. Exploitation and diagnostics of the electric drive. Organization and conducting of acceptance testing of electrical equipment.

Renewable sources of electric energy. The discipline is an important subject discipline, the main purpose of which is the students' awareness of the role of power systems using renewable sources of electrical power generation; assimilation of the complex of questions concerning the substantiation of the type and methods of selecting

renewable power sources, their design features, electrical parameters; study of schemes and features of work of power plants. Lecture material includes: Scientific-organizational principles and directions for the implementation of power stations with renewable energy sources. Classification and basic technical and economic indicators. Investigation of the efficiency of the transformation of the intensity of the light flux into electricity by a photoelectric converter. Study of power supply circuits with photoelectric converters. Selection and substantiation of the parameters of the wind power and solar power station. Substantiation and calculation of hydroelectric power.

Accumulation of thermal and electric energy. The discipline in which accumulated knowledge of students obtained in the courses of physics, electrical engineering, surface physics, solid state physics, semiconductor electronics, micro and nanoelectronics and heat engineering. During the study of the discipline students learn about the basic physical phenomena, which are the basis of the work of different types of energy batteries, master the approaches to measure their working parameters, the skills of using modern software environments to analyze the results of measurements.

Electrical Technologies in Agriculture. Electrical and magnetic fields. Electrical circuits. Calculation of direct current electrical circuits. Multi-poles network. Nonlinear circuits. Calculation of circuits at alternative currents and voltage. Transients in linear circuits and their calculation. Calculations of nonlinear circuits. Transients in nonlinear circuits.

Modeling of heat transfer processes and hydrodynamics. In the discipline are considered the basic principles of mathematical modeling of heat and mass transfer processes occurring in heat and power equipment, agricultural and industrial objects. The basic equations describing the processes of heat and mass transfer and methods of their solution are considered. The bases of numerical

calculation of integro-differential equations and their computer calculations are presented. The information on the main packages of applied programs for the calculation of thermal physical processes and the practical skills of working with such packages are given.

Fundamentals of Scientific Research. Methodological foundations of scientific research organization. The specificity of research activities. Total research methodology. Principles of scientific information. General requirements for the design and writing scientific works.

Energy audit of objects of electric and heat consumption. Basic provisions of energy audit. Technologies and equipment used in conducting energy audits. Methodology and procedure for conducting energy audits of heat and power consumption objects. Making a report on energy audit. Development and substantiation of energy saving measures at the enterprise.

Basics of Business, Management and Marketing. HR management system in the organization. Analysis and quality of staff turnover. Plan of personnel. Methods of recruitment and selection, assessment of motivation and professional development.

Heat supply, heating and ventilation systems. The purpose of the discipline is to study heat supply, heating and ventilation systems for residential, public and industrial buildings. Systems of supply of heat to buildings, their distribution and methods of control of thermal conditions of premises, design of heating devices are studied. In addition, the basic principles of construction of ventilation and air conditioning systems for buildings and objects of various purposes are considered. The methods of calculation of heating and ventilation of buildings are given. Modern methods of energy saving for heating and ventilation of buildings are presented.

Accounting and regulation of energy costs. Accounting for active and reactive electricity. Multi-tariff electricity accounting. Devices for recording and controlling the flow of heat-carrier. Automated systems for monitoring and accounting of energy costs.

Alternative sources of thermal energy. Discipline involves studying the possibilities of using non-traditional and renewable sources of thermal energy in power supply systems of industrial enterprises; systems of transformation of solar radiation into thermal energy; possibilities of using biomass and solid household wastes for the production of electric and thermal energy. The discipline creates students' knowledge in the field of renewable energy sources, the principles of constructing converters of various types of energy from renewable sources to heat energy, mastering the skills of calculating the main parameters of renewable energy converters, familiarizing with the modern world achievements in the development and implementation of renewable energy sources.

Fundamentals of maintenance and service of power equipment. Preparing students to work independently, making qualified decisions for the efficient operation of thermal power units and systems.

Formation of theoretical knowledge of the rules of operation of boiler plants, autonomous sources of thermal energy, thermal networks and gas economy; normative documents of technical operation of heat and power equipment, systems of heat and gas supply.

Providing students with practical skills to ensure the trouble-free operation of heat and power equipment and networks of heat and gas supply; taking appropriate measures in case of malfunctions in equipment operation, as well as in emergencies; solving issues of organization of repair works of boiler equipment and systems of heat and gas supply taking into account the requirements of ecology and rational nature management.

Design of systems of electric and heat supply of objects of agrarian and

industrial complex. The main objective of the discipline is to develop knowledge and skills of specialists in the design of energy objects and systems, development of project documentation for network objects of electric and thermal power engineering and electric power stations, studying and calculation of parameters of schemes of electric and heat supply of consumers, studying of calculation methods for designing power objects, study of the state normative base necessary for execution and approval of the project documentation.