

GENERAL TRAINING CYCLE

Compulsory components

Safety in Electrical Installations. Safety measures in normal and emergency modes of electrical installations. Safety during installation, repair and maintenance of electrical installations. Lightning protection of agricultural objects.

Electromagnetic Compatibility. Power quality. Quality of energy and its determination. Ensuring of sustainable functioning of normal power supply for any violations of modes. Transients in stations synchronous generator and electrical systems networks. Electromechanical transients in electrical systems for small and large disturbances.

Information Technology. Information and controlling complexes and systems. Concept of automated electricity metering systems in terms of energy market in Ukraine. The structures and features of the construction and information control systems and systems for electricity metering.

Agrarian policy. The discipline introduces the principles of formation of policy in agrarian sphere, gives the possibility to gain proficiency in methodical and methodological principles of the development and realization of the complex of actions concerning support and provision of the development of agriculture in the system of inter-branch links in national economy as well as estimate from the theoretic position practical actions of state structures concerning regulation of the agricultural production of the country. Both national and foreign experience is studied. In case of mastering the material students get the possibility to form their own view on professional base about processes and phenomena happening in agrarian sector of the state economy.

Business foreign language. The general aim of the program of teaching of foreign language for the professional purpose is formation students' professional linguistic competencies that will contribute to their efficient operating in cultural variety of training and professional environment. The methods of search of new information in another language sources, linguistic methods of analytical study of another language sources are learned. Students study published original literature in another language and increase their lexical and grammatical skills. Methods and linguistic peculiarities of annotation and synopsis of another language sources, the principles of translation of professional oriented another language sources are studied.

Methodology and organization of research with the principles of intellectual property. The aim of the discipline is formation of the system of knowledge in methodology, theory of method and research process, methodical support of scientific and research activity at the stages of preparation of a Master paper, formation of the ability to organize research of a specific issue using the whole complex of the traditional methods of research including general and special methods. The main task of the theoretical part of the course is introduction to students the current concepts of research creation, the principles of methodology of scientific perception and methods of research. The main task of the practical part is the development of self-education ability, mastering skills of formation and application of perceived methodological position of research. In case of mastering the course students have to improve their skills of search, assortment and processing of scientific information, accurate formulation of a problem, aim, task, object, subject, methods of research. Introduction to students the principles of intellectual property and direction of them to gain knowledge and skills concerning registration of rights of ownership, their protection, commercialization, estimation and management are envisaged.

Optional Block by specialty

Optional Block 1 "Energy Efficient Control Systems of Biotechnological Objects"

Methods of Modern Process and Production Control in Energetics. Characteristics of technological processes as control facilities and their disturbances. Principles of automated process control systems. Automation of technological processes in energetics. Principles of the control system design. Information channels and their characteristics. Identification of control objects. Control algorithms. Technical means of automation. Reliability and economic efficiency of automation.

Automated Systems in Energetics. Principles of the control systems design. Information channels and their characteristics. Identification of control objects. Control algorithms. Technical means of automation. Reliability and economic efficiency of automation.

Typical Technological Processes in Energetics and Methods of Modeling. Automation object; classification, structure and main characteristics of typical technological facilities, technologies and processes AIC branches. Physics and chemical basis of hydrodynamic, thermal, mass transfer, mechanical, chemical and technological processes. Calculation of the heat and mass transfer processes in agriculture technology processing and storage of agricultural products. Fundamentals of modeling and designing technological devices.

Hardware and hardware of control systems in power engineering. Principles of construction of ASUTP. Information channels and their characteristics. Identification of management objects. Management algorithms. Technical means of ACUTP. Reliability and cost-effectiveness of ACMS. Microprocessor and microcomputer architecture, microprocessor programming in assembler language, microprocessor hardware. Development and adjustment of microprocessor systems in agricultural production. Discrete signals, their encoding. DAC and ADC. Time and frequency domain analysis. Manageability and observability. Synthesis of digital systems. Limitations in microprocessor control systems.

Biotechnological Automation Objects, Methods of Its Research and Modeling. Automation object; classification, structure and main characteristics of typical technological facilities, technologies and processes AIC branches. Physico-chemical basis of hydrodynamic, thermal, mass transfer, mechanical, chemical and technological processes. Calculation of the heat and mass transfer processes in agriculture technology processing and storage of agricultural products. Fundamentals of modeling and designing technological devices.

Information Technology of Control Systems. Computer technology for visualization modes and parameters of technological facilities and production processes. Applications for processing and transmitting of information. Technical means of information technology.

Computer Integrated Control Systems in Agriculture. The architecture of the microprocessor and microcomputer, microprocessor programming in assembly language, microprocessor-based hardware systems. Development and debugging microprocessor systems in agricultural production. Discrete signals, their coding. DAC and ADC. The analysis in the time and frequency domains. Manageability. The synthesis of digital systems. Restrictions in microprocessor control systems.

Modern Methods of Design Automation Systems of Biotechnological Objects. Characteristics of technological processes as control facilities and their disturbances. Principles of automated process control systems. Automation of technological processes in energetics. Principles of the control system design. Information channels and their characteristics. Identification of control objects. Control algorithms. Technical means of automation. Reliability and economic efficiency of automation.

Optional Block 2 "Electrical stations, networks and systems"

Automatics and Telemechanics of Energy Supply Systems. Information management systems power supply. Means remotely control power supply systems. Telecontrol systems, telemeasuring and signaling. Channels of communication systems in automation and remote control. Dispatch of command and control equipment. Means of automation in the control systems of power supply. Techno-economic performance and automation telemechanization.

Electrical Networks and Systems. The electric part of substations and reserve power. Protection of rural electrical surge. Increasing economic efficiency and reliability of power supply systems of agriculture. Automation and control systems.

Electrical Plants and Systems of Energy Supply. The electric part of

substations and reserve power. Protecting rural of electrical surge. Improving the efficiency and reliability of power supply systems of agriculture. Automation and control systems

Design of Power Supply Systems in Agriculture. Setting the specification, calculations, graphics creation and delivery of documents using CAD company Autodesk Ins. And subsystems CAD MathCad, AUTOCAD, and the best computer-integrated technologies. The mathematical description of the functioning ACS. Typical dynamic link ACS. Identification of facilities management models/

Intelligent systems of electroenergy. Information and controlling complexes and systems. Concepts of automated electricity metering systems in terms of energy market in Ukraine. The structures and features of the existing building and information management systems and systems for metering.

Mathematical Tasks in Optimization Problems of Power Supply. Basic definitions and concepts. Model, modeling, object, subject of study. Requirements for the model with position specific goals and objectives of the study. Conditional distribution models for analytical, experimental and experimental, analytical. Main phases: setting objectives and research, construction of a mathematical model, algorithm development and application limitations of variable factors, verification of compliance and analysis of the obtained results.

Transients in Power Supply Systems. Ensuring sustainable of normal functioning of supply for any violation. Transients in synchronous generators of electric stations and networks systems. Electromechanical transients in electrical systems for small and large disturbances.

Modes Control of Electrical Networks. The concept of modes. Modern principles, methods and tools for monitoring and control power consumption. Of Electrical substations and reserve power. Protection of rural electrical surge. Improving economic efficiency and reliability of power supply systems of agriculture. Automation and control systems Telemechanization supply.

Optional Block 3 "Energy Supply"

Energy Saving in Heating Technologies. Sources of heat and electricity. Losses in the transmission of energy. Losses in transformers. Losses in transmission lines. Technical measures to reduce energy losses. Arrangements reduce energy losses

Accounting and Control of Energy Resources Distribution and Costs. Devices of accounting of active and reactive power. Regulators of reactive power. Multiplemetering. Devices for control of heat consumption. Counters of water and gas.

Thermal Power Plants and Systems. Sources of heat. Burning fossil fuels. Boiler systems. Heat. Heating system. Thermal network. Gas agriculture. Alternative heating sources of agricultural production.

Heating Technologies of Production and Processing of Agricultural Product. Sources of heat. Burning fossil fuels. Boiler systems. Heat. Heating systems. Thermal networks. Gas supply of agriculture. Alternative heating sources of agricultural production.

Integrated Use of Alternative and Renewable Energy Sources. Using of alternative and renewable sources of energy is an effective method of energy saving of energy resources. The principles of these energy sources, which include heat pumps, solar panels, biogas and wind installations, geothermal installations are presented. The methods of calculation and means of the integrated use of various sources of energy for different objects.

Modeling of Heat and Hydrodynamic Processes. Bases mathematical modeling of mass and energy transfer in thermal power plants and systems. The modeling is based on the development of physical models transfer, use transport equations and boundary conditions describing these processes. For the solution of transport equations using numerical methods, including software packages that allow

you to get all the local thermal characteristics of the process. Simulation is an effective means for optimizing power equipment

Nanotechnology of Intensification of Heat and Mass Transfer Processes.

Nanotechnologies are an effective tool for intensification of heat and mass transfer in power plants and systems. The analysis of the main approaches that are allowed to apply nanotechnology in agriculture. The basic principles of discrete input pulse energy installations in the agricultural and food production. Using this approach makes it possible to significantly improve the efficiency of thermal power equipment.

Optimization of Energy Supply and Energy Saving Systems. The basic methods for optimization the power supply systems. Optimization methods based on the determination of thermal and hydraulic losses in power systems, such as heating and water systems, boilers, power plants and other facilities. Special attention is given to the use in energy systems and renewable energy use economic analysis.

Optional Block 4 "Scientific and Technical Principles of Electromechanical Energy Conversion"

Reliability of Technical Systems, Technogenic Risks. The main categories and standards in reliability. Categories reliability of electricity supply. The quality of electricity. Man-made risks in the energy sector. Environmental aspects electrification of agriculture.

Accounting and Regulation of Energy Resources Costs. Devices of accounting of active and reactive power. Regulators of reactive power. Multiple-metering. Devices for control of heat consumption. Counters of water and gas.

Technical Service of Energy Equipment. Maintenance of transformer substations and power lines. Servicing of electrical consumers. Diagnosis of electrical equipment.

Physical Research Software. Computer technologies for visualization of modes and parameters of technological objects and production processes. Application packages for processing and transmitting information. Technical means of information technologies. Global Internet.

Mathematical Modeling of Electromagnetic Devices and Electromechanical Energy Converters. Analytical methods of mathematical modeling of objects agricultural production. Methods of mathematical models. Construction of mathematical models electrotechnological equipment analytical method and the results of the experiment. Analysis models and their optimization.

Reliability of Electromagnetic Devices and Electromechanical Energy Converters. Basic concepts, performance and position of integrated program reliability, calculation methods and improve the reliability of the results of tests and operation of electromagnetic and electromechanical devices, power converters, reliability analysis, a system providing spare parts, determining the reliability of technical systems for an operator.

Special Sections of Theoretical Electrical Engineering. The method of conformal mapping and its application to calculate the static electromagnetic fields in electromechanical devices and converters. Basic theory and technology of modeling. The method of integral equations calculate static fields.

Asynchronous machines of high energy efficiency. Study of the basics of the electromagnetism theory and general principles of electromechanical energy conversion, their practical use for the design and operation of electric machines.

Optional Block 5 "Electrotechnical systems of power consumption"

Renewable Sources of Electric Energy Generation. Renewable sources of energy. The types of small plants. Features of small power plants and their role in the power supply of AIC. Comparative characteristics of small sources of electricity. The construction of small power plants.

Design of Power Consumption Systems. Setting the specification, calculations, graphics creation and delivery of documents using CAD company

Autodesk Ins. And subsystems CAD Mathcad, Autocad, and the best computer-integrated technologies. The mathematical description of the functioning ACS. Typical dynamic link ACS. Identification of facilities management models.

Relay Protection and Automation of Distribution Power Networks. Theory and practice of automatic control modes of power supply systems using modern methods and means of automation and relay protection.

Telemechanics and ACS of Power Supply Systems. Theory of telemechanical signal transmission by channels of communication. Methods of improving noise immunity of signals. Principles of telecontrol, signaling, remote metering. Features of modern telemechanics, automatic supervisory control of power networks and power supply of industrial enterprises.

Mathematical and Simulation Modeling of Processes in Electrical Networks and Systems. Parameters of energy networks. Simulation parameters and network analysis. Requirements for performance of networks and ways to support them. Criteria for optimizing network settings. How to optimize the network settings. Analysis modes of energy networks. Criteria for optimization of networks. Optimizing components of the cost of electricity.

Estimation of Electrical Systems Modes. Modes of electrical systems and their modeling. Analysis modes. Information control systems of power supply. Telecontrol systems, telemeasuring and signaling. Dispatch of command and control equipment. Means of automation control systems power supply. Techno-economic performance and automation telemechanization.

Electromechanical Transients in Electrical Systems. Ensuring sustainable of normal functioning of supply for any violation. Transients in synchronous generators of electric stations and networks systems. Electromechanical transients in electrical systems for small and large disturbances.

Algorithmization of Electric Power Problems. Fundamentals of linear and nonlinear mathematical programming. Mathematical models. Transport problem. Fundamentals of dynamic programming. Optimization models.

Optional Block 6 "Electrotechnics and electrotechnology"

Agricultural Technology Electrotechnology. Basics of converting electrical energy into thermal energy. Calculation of electric heating installations. Direct, indirect, arc, induction, dielectric, thermoelectric heating. Fundamentals of using optical radiation in agricultural production. Lighting and irradiation installations appointment. Electric heating installations appointment. Possibilities of using new electrotechnical techniques in agricultural production.

Modeling of Adjustable Electric Drives, Aggregates and Production Lines. Classification of models of induction motor (IM). Mathematical model of IM, powered by ideal voltage source. Consideration of the asymmetry of the electromagnetic system IM. The mathematical model of the IM, which is powered by the ideal source of alternating current. Conversion coordinates. Matrix Simulink-models of an asynchronous motor in an arbitrary orthogonal coordinate system. Models of IM in a two-phase stationary coordinate system of a stator. Mathematical models of an asynchronous motor in an orthogonal coordinate system, oriented on the vector of the flow of a rotor.

Fundamentals of energy efficiency of consumer grids. The energy problem, its roots and approaches to solving it. General characteristics of the fuel and energy complex of Ukraine. Ensuring the energy security of the state. Energy Saving Potential in Ukraine. Energy Saving Legislation. Characteristic problems in the field of energy supply. Introduction of the latest technologies as a method of energy saving. Application of automatic energy management systems as a method of energy saving. Introduction of alternative energy sources as a method of energy saving. Energy-saving technologies in industry. Energy saving in agrarian and industrial complex.

Fundamentals of bioenergy technologies. Renewable resources for energy-generating bioenergy. Obtaining biomass of multi-enzyme systems for the conversion of chemical and light energy into renewable energy. Technologies for producing solid fuel

from biomass (from green biomass, peat, coal and waste). Thermal methods, equipment and technologies for the production of energy from solid biomass and waste. Biofuels and prospects for their use. Biologics for intensification of bioenergy processes. Safety when

operating this category of technology. Fuel Standards. Peculiarities of use of gas and liquid biofuels in power plants and their impact on them.

Electromagnetic Processing of Agricultural Products. Investigation of electromagnetic processes and work of electrotechnical equipment in agriculture. Electric power sources and installations for electromagnetic processing of agricultural materials, the basis of the strong magnetic fields use theory in the processing of seeds, taking into account its properties. Ozonization. Electro-pulse technology and technology.

Electrotechnology Research Methods. Research of electro-technological processes and work of the electrotechnological equipment in agriculture. Electric power sources and installations for electrophysical processing of agricultural materials. Fundamentals of strong electric fields use theory in the seeds processing taking into account its properties. Ozonization. Electricity treatment. Electro-impulse technics and technology, ultrasonic and magnetic materials processing.

Energy Efficiency of Closed Biosystems. Research of electrotechnical processes and work of the electrotechnical equipment in agriculture. Electric power sources and installations for electrophysical processing of agricultural materials. Determination of energy efficiency of electrotechnical equipment in agriculture.

Physical and Technological Properties of Agricultural Products and Materials. Physical and technological bases of hydrodynamic, thermal, mass-exchange, mechanical, chemical-technological processes. Calculation of parameters of thermal and mass-exchange processes. Technology of processing and storage of agricultural products. Fundamentals of modeling and designing of technological devices. Analytical methods of modeling of technological processes. Methods of identification of technological processes. Examples of simulation of typical technological processes. Check the adequacy of mathematical models for technological processes.

Optional Block 7 "Lighting engineering and light sources"

Laser Technics. Physical bases of quantum electronics. Physical bases of lasers. Active laser environments. Excitation systems in different types of lasers. Optical resonators. Properties of laser radiation. Optical amplifiers. Acquaintance with the physical foundations of quantum radiophysics and nonlinear optics and the most important characteristics of the corresponding devices.

Design, Installation and Operation of Lighting Installations. Organization and methodology of design work. The stage of working design. Requirements for electrical part of lighting installations. Electricity supply of lighting installations. Power supply circuits. Calculation of the lighting network. Compensation of reactive power. Protection of lighting networks. Types of postings and areas of their use. Grounding and Grounding in Lighting Networks. Installation of wiring and lighting fixtures. Operation and maintenance of lighting installations.

Lighting Installations and Systems. Normative and lighting calculations of lighting installations (LI). Principles, criteria and methods of valuation. Threshold characteristics of the visual process and methods of their study. The calculation of the spectral composition of radiation during the normalization of lighting installations. Choosing a normalized photometric characteristic. Standardization of quantitative and qualitative characteristics of lighting. Methods of calculating the quantitative indicators of the LI. Methods of calculation of qualitative indices of LI. Methods of calculation of power LI. Lighting software design and calculations of LI.

Physical Bases of Light Sources and Energy Saving in Lighting Installations. Physical processes in thermal, semiconductor (LED), gas-discharge light sources. Physical principles of light generation. Thermal radiation. Laws of thermal radiation. Zone theory of solids. Basic provisions of quantum mechanics. Luminescence

and gas discharge Problems and prospects for increasing the efficiency of electricity use in lighting installations. Technological process of irradiation. The general principles of its energy assessment. Power analysis of power supply to the source of radiation, generation of flow in the source, flow formation of the reflector.

Electrotechnical Devices of Lighting Systems. The basics of electrotechnical devices of light engineering systems. Analysis of ballasts and their influence on the work of digital light sources. Types of ballast resistances. Dependence of electrical parameters of discharge lamps and ballasts on the supply voltage. Classification of circuits for the inclusion of discharge lamps and requirements for start-up equipment. Application of electrical engineering devices of lighting systems. Impulse illumination of fluorescent lamps. Without starlight illumination of fluorescent lamps. Types of ballast resistances. Illumination of two-electrode gas-discharge lamps of high pressure. Illuminating circuit diagrams are four electrodes gas discharge lamps of high pressure.

Modern Research Trends in Light Engineering. Trends in development and directions of scientific research in the main sections of electrical engineering. World trends of electric power industry. Decentralization of electricity generation. Cogeneration. Generation of electricity from renewable energy sources. Intelligent control, system and local automation, monitoring of loads in the electric power industry. Micro networks and smart grids. Stability of electric power systems. Environmental issues and safety. Hybrid lighting. The problem of electromagnetic compatibility of light sources, current correction. Optoelectronics.

Methodology of Optoelectronic Systems Construction. Receivers of radiation. Key features and options. Scanners. Solar panels. Optocouplers. Fundamentals of Integral Optics. Indicators. Screens. Projection systems. LEDs. Light propagation in light wave. Dispersion of fiber optics. Fiber optic cables. Transmitting and receiving modules. Switching elements.

Photonics and Application of Coherent Radiation Sources. Physical bases of interaction of quantum systems with electromagnetic field. The subject and basic concepts of photonics, quantum electronics and laser technology. Features, practical use, classification of sources of coherent radiation and prospects for the development of optical systems. Physical bases of interaction of quantum systems with electromagnetic field. Homogeneous and heterogeneous expansion of spectral lines. Physical mechanisms of expansion. Principles of functioning of sources of optical radiation (lasers) and methods of registration, their application. Principles of laser operation. Basic types of amplifiers and lasers. Receivers of optical radiation. Materials for photonics. Crystal environments.