Bachelor
Field of knowledge "Automation and instrument making"
in specialty «AUTOMATION AND COMPUTER INTEGRATED TECHNOLOGIES»
Educational Program «Automation and Computer Integrated Technologies»

Form of Training:	Licensed number of persons:
– Full-time	50
– Part-time	50
Duration of Training	4 years
Credits	240 ECTS
Language of Teaching	Ukrainian
Qualification	Junior Engineer Automation and Computer Technologies

The concept of training

Educational activities while ensuring fulfillment of state orders and other agreements with legal entities and individuals for training specialists with higher education is carried out in accordance with state standards of higher education. Courses in the Institute of Energetics, automation and energy saving based on a systems approach between the objective and principles of learning to educate students broadmindedness non-standard thinking, overhead and ability to solve social and economic problems in their relationship and to meet the needs of modern production and con 'situation on the labor market.

An integral part of the educational activity is an educational process that involves the education of future professionals in the best traditions of national and world culture taking into account the human priorities, Recovery and development of the national economy, culture, science, spiritual unity of the nation and the people of Ukraine.

Practical training

Practical training is carried out in educational and research facilities of the university: Separated subdivision of NULES of Ukraine "Velykosnytinske Education and Research Farm named after O. Muzychenka", Separated subdivision of NULES of Ukraine "Agronomic Research Station", Separated subdivision of NULES of Ukraine "Education and Research Farm "Vorzel", Separated subdivision of NULES of Ukraine "Boyarka Forestry Research Station", LTD "Kyiv Poultry", PC "Kombinat "Teplychniy", State Enterprise "Puscha Vodytsia", regional electricity networks.

Proposed Topics for Bachelor theses

1. Development of a system for automatic temperature control in a pasteurization unit.

2. Development of a system for automatic temperature control in a pigsty, a mother shed.

3. Development of a system for automatic regulation of the microclimate in the greenhouse.

Academic rights of graduates

A bachelor in the specialty "Automation and computer-integrated technologies" has the right to continue training to obtain OS "Master" in the specialty "Automation and computer-integrated technologies" or other specialties of specific categories.

Employment of Graduates

The activity is subject to generalized automation systems and computer-integrated technologies. Professionals trained to work in the following sectors: – automated production control engineer, manager – source – computer systems tuning technicians.

Bachelor`s Program and Curriculum in Specialty "Automation and Computer Integrated Technologies"
Educational Program «Automation and Computer Integrated Technologies»

Code n/a	Components of the educational and professional program (education disciplines, course projects (paper), practice, qualification work)	Amount of credits ECTS	The final control
1	2	3	4
1. GENERAL TRAINING CYCLE			
Compulsory components of EPP			
OK1.	Ecology	4,0	exem
OK2.	High Maths	17,0	exem
OK3.	Numerical Methods	5,0	exem
OK4.	Physics	9,0	exem
OK5.	Chemistry	4,0	exem
Compulsory components of EPP by the decision of the Academic Council of the University			
ОКУ 1	History of Ukrainian statehood	4,0	exem
ОКУ 2	Ukrainian Language (for professional purposes)	4,0	exem
ОКУ 3	Philosophy	4,0	exem
ОКУ 4	Foreign Language	8,0	exem
ОКУ 5	Physical Education	4,0	exem
2. SPECIAL (PROFESSIONAL) TRAINING CYCLE			
Compulsory components of EPP			
CC 6.	Technology of production, storage and processing of agricultural products	4,0	exam
CC 7.	Computer Graphics	4,0	exam
CC 8.	Computer Technologies and Programming	9,0	exam
CC 9.	Electrical Engineering and Electromechanics	9,0	exam
CC 10.	Electronics and Microprocessor Technics	8,0	exam
CC 11.	Automation Systems Design	8,0	exam
CC 12.	Theory of automatic Control	9,0	exam
CC 13.	Technical Means of Automation	7,0	exam
CC 14.	Metrology, Measurement Technology and Instruments	7,0	exam
CC 15.	Identification and Modeling of Biotechnical Objects	7,0	exam
CC 16.	Automation of Technological Processes and Productions	5,0	exam
CC 17.	Microprocessor Devices Control	4,0	exam
CC 18.	Computer Integrated Technologies	8,0	exam
CC 19.	Information and Measuring Systems	4,0	exam
CC 20.	Optimization of Control Systems Modelling	4,0	exam
CC 21	Educational Practice	10,0	exam
CC 22.	Industrial Practice	5,0	exam
CC 23.	Diploma Project	5,0	Defense of qualification work
The total amount of Compulsory components		**180**	
Optional components			
Optional components by specialty			
OB 1.1.	Data transmission systems and networks	4,0	exam
OB 1.2.	Technical means of information transmission.	4,0	exam
OB 2.1	Engineering graphics	4,0	test
OB 2.2.	Information security of automation systems	4,0	test
OB 3.1.	Cloud technologies and global databases	4,0	test
OB 3.2.	Theoretical and applied mechanics	4,0	test
OB 4.1.	Heat engineering and hydraulics	4,0	test
OB 4.2.	Electrical and structural materials	4,0	test
OB 5.1.	Labor and life safety	4,0	test

OB 5.2	Real Time Systems Programming	4,0	test
OB 6.1	Electrical technologies in agricultural production	4,0	exam
OB 6.2.	Maintenance of computer, network equipment and server systems	4,0	exam
OB 7.1.	Legal culture of the individual	4,0	test
OB 7.2.	Automated electric drive	4,0	test
OB 8.1	Information theory	4,0	exam
OB 8.2.	Energy and resource saving technologies	4,0	exam
OB 9.1.	Political Science and Sociology	4,0	test
OB 9.2.	Economics and organization of energy service of enterprises	4,0	test
OB 10.1.	WEB technologies in automation systems	4,0	exam
OB 10.2.	Robotic industrial complexes	4,0	exam
OB 11.1.	Basics of systems analysis	4,0	test
OB 11.2	CAD Basics	4,0	test
OB 12.1	Basics of technical operation of automation systems	4,0	exam
OB 12.2.	Fundamentals of Scientific Research	4,0	exam
OB 13.1.	Economics of automated production in the agro-industrial complex	4,0	test
OB 13.2.	Optimal control systems	4,0	test
Optional subjects by Student's Choice			
ВКУ 1	*Selective discipline 1*	4,0	test
ВКУ 2	*Selective discipline 2*	4,0	test
The total amount of Optional components		**60**	
THE TOTAL AMOUNT OF EPP		**240**	

Annotations of Components in the curriculum

1. GENERAL TRAINING CYCLE

Compulsory components

Ecology. Legal and organizational issues of environmental protection. Global problems of ecology: problems of population, depletion of energy resources, physical meaning of "greenhouse effect", physical meaning of ozone hole formation. The concept of toxicity of substances. Hydrosphere protection. Atmospheric protection. Lithosphere protection. Environmental monitoring systems. Energy and its impact on the environment.

High Maths. Elements of linear, vector algebra and analytic geometry. Differential calculus of a function of one and several variables. Complex numbers. Laplace transform, series on orthogonal system, correspondence between operations on originals and images. Integral calculus of a function of one and several variables. Differential equations, systems of differential equations. The series are numerical and functional. Harmonic analysis.

Numerical Methods. Linear systems of algebraic equations. Elementary system transformations. Algorithm of Gaussian method and its application. Harmonic analysis. Methods of experimental data processing.

Physics. Physical foundations of classical mechanics. Fundamentals of Molecular Physics and Thermodynamics. Electricity and magnetism. Physics of vibrations and waves. Optics. Elements of the physics of the atom and quantum mechanics. Elements of solid state physics. Elements of the special theory of relativity. Elements of physics of the atomic nucleus and nuclear power.

Chemistry. The structure of atoms, molecules, substances, their state of aggregation. Chemical reactions. Solutions of electrolytes and non-electrolytes. Corrosion and protection of materials and alloys. The concept of Ph. Electrochemical processes.

Compulsory components of EPP by the decision of the Academic Council of the University

History of Ukrainian statehood. Study of the objective laws of development of the Ukrainian state. Adoption of the Constitution of Ukraine Analysis of the general problems of Ukraine's transition to a social market economy and integration into the world community.

Ukrainian Language (for professional purposes). Scientific terminology, terms and their use, specific to the specialty of an automation engineer and computer-integrated technologies, as well as the reproduction of previously acquired knowledge.

Philosophy. The system of philosophical knowledge in the main sections of philosophy, developing a type of consciousness, which is based on constructive and critical approaches to the ideals of humanism.

Foreign language. Comprehensive teaching of speech activity (reading, listening, speaking). Mastering communication and translation skills.

Physical education. The purpose of teaching the discipline is to form the physical culture of a young specialist and the ability to implement it in social and professional training and family. The task of studying the discipline is to improve the health of students and the development of physical abilities that correspond to the professional activities of the future specialist.

2. SPECIAL (PROFESSIONAL) TRAINING CYCLE

Compulsory components

Computer Graphics. The use of computer tools when performing tasks, including the creation of graphic objects of various types. Modeling by geometric and computer methods of instrumentation products. Construction and execution of their technical drawings and diagrams in accordance with existing standards. Use of information and design systems in their professional activities.

Computer Technologies and Programming. Algorithmic languages and programming methods. Spheres of use of algorithmic languages. Fundamentals of programming in high and low level languages. Application of programming methods in engineering.

Electrical Engineering and Electromechanics. Electric and magnetic fields. Electrical circuits. Methods for calculating direct current electrical circuits. Multipole. Non-linear circuits. Methods for calculating circuits with periodic currents and voltages. Transient processes in linear circuits and methods for their calculation. Methods for calculating nonlinear circuits. Transient processes in nonlinear circuits.

Electronics and Microprocessor Technology. Passive elements of electronics. Semiconductor diodes, transistors, thyristors. Photoelectric, optoelectronic and indicator devices. Electronic amplifiers. Digital and pulse devices. Means of food. Microprocessor devices. Micro-computer structure, processor architecture, microprocessor command system, microcontroller hardware, interrupt system, object matching devices.

Design of Automation Systems. Automation schemes, methods of choosing complex technical means of automation at the stage of design and analysis of automation systems are considered.

Theory of Automatic Control. Automation systems, classification. System elements. Static and dynamic characteristics. Dynamic links. Characteristics of the elements of systems and control objects. Linear systems. Schemes, transfer functions. Conditions and criteria for sustainability. Quality of regulation. Synthesis. Statistical analysis. Non-linear systems. Research by methods of fitting, phase portrait, harmonious linearization. Statistical linearization. Stability.

Technical Means of Automation. State instrumentation system. Sensors. Amplifiers. Logic gates. Executive elements. Automatic regulators. Classification. Features of selection and calculation. Structure, design features. Control.

Metrology, Measurement Technology and Instruments. Legislative and normative acts in the field of metrology. General problems of the theory of measurements and errors. Theory and practice of ensuring guaranteed accuracy of measurements and measuring systems. Analogue measuring devices. Measuring. Recording devices. Digital devices. Measurements of electrical and magnetic quantities.

Identification and modeling of biotechnical objects. The classification of technological processes and production as objects of automatic control is considered. Particular attention is given to a detailed analysis of biotechnical objects; methods for constructing mathematical models of static and dynamic objects of agricultural technological processes and production are studied.

Automation of Technological Processes and Productions. Classification and structure of modern automated standard technological processes; basic characteristics of automation of typical technological processes; setting automation tasks for typical technological processes; automation of specific typical technological processes. Classification and structure of modern ACS; types of ACS support; ACS of specific objects and production processes in animal husbandry, plant growing and fodder production; functional automation diagrams; formulation of ACS tasks.

Information and Measuring Systems. Modern information and measurement systems that are part of complex software and hardware complexes and consist of technical means for obtaining experimental information, a technical object and a computer system. Computer systems in such complexes perform the functions of managing processing, displaying and storing information, exchanging data with computer networks, building information and expert systems, modeling and researching computer models, planning, forecasting, diagnosing, designing, designing, teaching and solving many other problems.

Optimization of Control Systems Modelling. Formulation of optimal and adaptive control problems, reasonably choose the optimization method, the AOSAK synthesis method, develop algorithms for the functioning of AOSAK, as well as know the main tasks of AOK TPPs, nuclear power plants and industrial enterprises, be able to design the software for the AOK subsystems in the APCS.

Computer Integrated Technologies. Creation and operation of computer-integrated control systems that ensure the solution of problems of coordinating the functioning of subsystems, the use of intelligent subsystems for decision support based on databases and knowledge and their management systems. Computer-integrated technologies are closely related to automatic control systems and process automation in various industries and production.

Microprocessor Devices Control. Passive elements of electronics. Semiconductor diodes, transistors, thyristors. Photoelectric, optoelectronic and indicator devices. Electronic amplifiers. Digital and pulse devices. Means of food. Microprocessor devices.

Optional components of EPP

Legal culture of the individual. Regularities of the development of state and law, certain branches of Ukrainian legislation. Characteristics of constitutional, labor, environmental, land, civil, administrative, criminal and family law.

Labor and life safety. Legislative and regulatory framework of Ukraine on labor protection. State management of labor protection and organization of labor protection in production. Explosion hazard of production, explosion protection. Fire safety. Electrical safety. Occupational hygiene and industrial sanitation. State supervision and public control over labor protection. Providing first aid to victims of accidents.

Information theory. Entropy as the degree of uncertainty in the state of a system. Entropy and information. Methods for measuring the amount of information. Methods for encoding information during transmission. The relationship between the amount of information and the length of the code that provides a given reliability at a given level of interference. Calculations of communication and control channel capacity.

Engineering graphics. Projection drawing. Views, sections and sections. Sketches and working drawings. Elements of structural connections. Assembly drawing. Detailing. Drawing using AutoCAD. The scope of use of computer graphics. Basics of working with computer graphics software. AutoCAD automated drawing system. Setting problems in computer graphics.

Fundamentals of scientific research. Methodological basis for organizing scientific research. Specifics of research activities. General methodology of scientific research. Principles of working with scientific information. General requirements for writing and formatting scientific papers.

Theoretical and applied mechanics. Mechanics. Theory of devices and machines. Mechanics of materials and structures. Machine details.

Economics of automated production in the agro-industrial complex. Economic efficiency of investments in the energy sector. Economic mechanism. Planning of labor and wages in the energy sector Profit, profitability, financial activities in electricity. Energy planning. Restoration of basic income expenditure.

Electrical technologies in agricultural production. Basics of converting electrical energy into heat. Calculation of electric heating installations. Direct, indirect, electric arc, induction, dielectric, thermoelectric heating.

Fundamentals of technical operation of automation systems. Regulatory framework and problems of equipment operation. Energy equipment in the agro-industrial complex, optimization and reliability. Maintenance and repair of equipment. Organization of commissioning works, acceptance tests and operation of rural energy facilities.

Heat engineering and hydraulics. Thermal and color parameters of the state. Thermodynamic processes. The first and second laws of thermodynamics. Wet air. Cycles of heat engines and refrigeration machines. Heat transfer theory. Thermal conductivity, convection. Thermal radiation. Heat exchangers. Sources of thermal energy. Boiler installations. Heat generators, Heat treatment of products. Renewable energy sources: solar energy, wind energy, biogas, energy-saving technologies.

Data transmission systems and networks. The scope of use of PCs and computer technologies, bases for working with software, database management systems. Working on a computer network.

Fundamentals of system analysis Creation of mathematical models of the subject area of information systems, in particular, automation systems for design work, and belongs to the cycle of disciplines of professional and practical training.

Political science and sociology. The acquisition of knowledge about the mechanisms of functioning of society, its institutions and social groups, the development of the ability to analyze and predict the development of social processes are the most

important conditions for the formation of an active life and civic position of future specialists.

WEB technologies in automation systems. Formation of a system of theoretical knowledge about the technological components of the WWW service, their place among other computer technologies and a set of skills for creating automation systems. Basics of automation systems based on web technologies. Advantages of using Web technologies. Expanding the capabilities of automation systems using web technologies. Web-enabled SCADA/HMI software.

CAD Basics. Classification of CAD systems by purpose and functionality. CAD information structure. Subsystems included in CAD. CAD software. Models and algorithms for calculating the physical properties of media used in CAD. Structure and functionality of computer-aided design systems for measuring temperature and pressure levels.

Operated industrial production complexes. General concepts about industrial work (WP) and robotic technological complexes (RTC). Structure of PR and RTK. Classification of PR and RTK, their composition Use of PR in production and industry. PR as part of the RTK. Varieties of RTK. Robot control systems (RCS). Classification of control systems of robots. Types of work management systems. Unified PR management systems. RTK control systems. Information system of robots and RTK. Auxiliary elements of RTK. Devices for object recognition. Design of robots and RTK.

Cloud technologies and global databases. The principles and software that implement the concept of cloud computing are analyzed. The main objectives of the course are illustrated using public and private cloud platforms. Modern practical solutions and technologies in the field of design, implementation and maintenance of distributed information systems; familiarization with technologies for creating information resources based on Intranet technologies; research into ways of organizing distributed information and hardware resources of such systems. Cloud computing for monitoring technological processes with their subsequent analysis, applications for various business processes.

Information security of automation systems. Algorithms for creating modern security programs and coding algorithms. Modern methods, technologies, software and hardware protection tools. Database and confidential information management systems. Conceptual models for the development, distribution, processing, use and storage of confidential documents. Strategies for selecting attack detection systems. Working with security devices in local and global computer networks in order to use their capabilities to improve security performance.

Maintenance of computer, network equipment and server systems. Hardware and software for organizing local networks. Fundamentals of building, programming and using local computer networks. Principles of building computer networks. Designing software for exchanging information between computers on a local network. Working on a computer network.

Programming for present-day systems. Definition of the present tense system. Control based on sequential programming. Interrupt-based control. Sequential programming and real time programming. Real-time programming methods. Algorithms for real-time problems. Operating systems of the present time. Architecture of current operating systems.

Automated electric drive. Modern methods and means of control in electromechanical automation systems of technological objects. Structural, functional and methodological principles of construction and operation of automated electromechanical systems. Mechanical and electromechanical characteristics of constant and alternating current electric motors. Adjusting the coordinates of the electric drive and the electric drive control system.

Optimal management systems. Fundamentals of constructing computer models of control systems. Calculation of good automatic control systems and implementation of

this knowledge in practical calculations of automatic control systems. Computer modeling methods for the synthesis of management systems. Optimization and optimal control problems.

Energy and resource saving technologies. Conservation of resources and their economical use in the production, transformation and consumption of various types of energy and modern energy-saving technologies in market conditions. Ways to save energy resources and energy. Current state and prospects for the use of renewable energy sources. Environmental problems and methods of environmental protection in the process of extraction, transportation and use of different types of energy resources.

Electrical and structural materials. The overall goal of the discipline teaching program is to provide students with the opportunity to master the theoretical foundations of the formation of the structure and properties of the most common metallic and non-metallic materials, study the areas of their application, and also acquire practical skills in the targeted management of the structure and properties of materials

Technical means of information transmission. General information about telecommunication systems. Generalized system of digital communication system. Messages, signals, interference and their mathematical models. Mathematical models of telecommunication channels. Fundamentals of information theory. Methods and methods for encoding messages. Transmission of messages in digital systems. Noise immunity of modern telecommunication systems. Principles of multichannel communication and their implementation in analog and digital systems. Efficiency of the telecommunication system. Elements of SEZ design.

Economics and organization of energy services of companies. Economic efficiency of investments in the energy sector. Economic mechanism. Planning of labor and wages in the energy sector Profit, profitability, monetary activity in the energy sector. Energy planning. Restoration of basic income expenditure. General issues of assessing the energy efficiency of the functioning of energy systems of the agro-industrial complex, including those using renewable and secondary energy sources, are considered. Methods for determining the efficiency of power systems are outlined. The features and problems of financial and economic analysis of agricultural objects are analyzed.