CATALOG OF ELECTIVE DISCIPLINES

6B07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

6B071 - Engineering and engineering trades
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

B063 - Electrical Engineering and Automation
(Code and classification of the educational program group)

6B07104 - Automation and control
(Code and name of the educational program)

bachelor
(Level of preparation)

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By the Academic Committee of the OP
The head of the AK Nurymkhan Gulnur
EP Manager Zolotov A.D.

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Faculty of Engineering and Technology
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Chairman of the Academic Council Oralkanova I.A.

Control methods intelligent systems

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies principles, methods of construction systems of control a technical object on the basis of the method of artificial intelligence theory and modern software-technical means. Creative and practical bases in the field of design and creation intelligent systems, basic learning algorithms and hardware-software tools and methods of implementation of artificial neuronet and fuzzy logic are considered. Specificity of design and development of intelligent systems for control of technical systems and technological processes.

Purpose of studying of the discipline
the principles and methods of constructing control systems for a technical object based on the methods of the theory of artificial intelligence and modern software and hardware are studied

Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline
Upon completion of the development of the discipline Perform work on the design of information, electromechanical, electrohydraulic, electronic and microprocessor modules of mechatronic and robotic systems.
And gets the competence: Owns the methods of developing robotic control systems.

Prerequisites
Development of user interfaces.

Postrequisites
Design of systems based on programmable logic integrated circuits

Robotic systems and complexes with the basics of artificial intelligence.

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
Discipline is aimed at getting acquainted with the principles of building robotic systems and complexes. Components of robotic complexes and systems, basic and auxiliary equipment, methodology and theory of creation of intelligent systems and robotic complexes are considered. The designs of manipulators and actuators of industrial robots, creation of intelligent systems and expert systems are studied.Specificity of development and application of robotic complexes and systems in the fields of their application.

Purpose of studying of the discipline
The purpose of studying the discipline is to get acquainted with the principles of building robotic systems and complexes, the main technological and auxiliary equipment, the foundations of the theory and methodology of creating intelligent systems and robotic complexes, as well as their areas of application.

Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline
Upon completion of the development of the discipline Perform work on the design of information, electromechanical, electrohydraulic, electronic and microprocessor modules of mechatronic and robotic systems.
And gets the competence: Owns the methods of developing robotic control systems.

Prerequisites
Interfaces of robotic systems

Postrequisites
Information devices and systems in mechatronics

Electronic devices of robotic systems

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes general issues of building typical automation objects, classification of objects, selection of automation algorithms, selection of elements of technical automation tools and their configuration and operation. The analysis of both local automation systems and complex systems is presented: with distributed parameters, digital, automated control systems. Automation schemes of periodic and discrete processes, methods for describing discrete and logical control tasks, transients of digital control systems are studied.

Purpose of studying of the discipline

Mastering knowledge in the field of electronics, acquiring skills in the development of electronic devices of mechatronic and robotic systems.

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

Upon completion of the development of the discipline Perform work on the design of information, electromechanical, electrohydraulic, electronic and microprocessor modules of mechatronic and robotic systems.
And gets the competence: Owns the methods of developing robotic control systems.

Prerequisites

Development of user interfaces.

Postrequisites

Information devices of robotic systems

Computer graphics and bases of ADS

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to the study of graphic editors CorelDRAW, AutoCAD, COMPAS, mastering the basic rules for drawing drawings, working drawings of parts. Ways to transform the drawing. The main commands for modifying drawings in the system AutoCAD, COMPAS. Modeling of surface lines, solid- state modeling in three- dimensional space. Viewing objects in three- dimensional space. Working with a custom coordinate system. Creating new custom coordinate systems, basic commands. Commands for displaying objects in three-dimensional space.

Purpose of studying of the discipline

Study of engineering and computer graphics.

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

present the basic rules for designing drawings.
apply the acquired knowledge of AutoCAD, COMPAS.
designs three-dimensional models for solving professional tasks.
Upon completion of the development of the discipline
Evaluate the prospects and trends in the development of management information technologies.
And gets the competence:Owns methods of development of robotic control systems.

Prerequisites

School course

Postrequisites

Design of automation and remote control systems

Fundamentals of engineering and computer graphics

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to the basic rules of drawing up drawings, studying design documentation, images, inscriptions, designations. Images and designations of elements of parts, threads. Working drawings of parts, sketches of machine parts, images of assembly units. Assembly drawing of products. Ways to transform the drawing. The concept, types of computer graphics. Basic concepts of three-dimensional graphics. Representation of graphic data: formats, methods of color description, color palette, color management systems. AutoCAD graphic editors, COMPASS.

Purpose of studying of the discipline

Study of engineering and computer graphics.

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

Knowing: To know the rules ofrmlenii drawings, disaggregated as possible sistemavto-design AutoCAD (COMPASS).
Abilities: to use the standards and rules of construction and read dash- ments and schemes; methods of graphic representation of

spatial images
Skills: The ability to apply the conditional-WIDE graphics; program-mated the basic elements of a three-dimensional graphics; design and use of graphical tools
Competencies Competence oblas-minute theory of graphical tools in the IP; Grafoanaliticheskу methods in building algorithms of IP; computer graphics.

Prerequisites
School course

Postrequisites
Design of automation and remote control systems

Systems of design automation

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline
The discipline is devoted to automatic design systems in AutoCAD, COMPAS graphic editors. Basic concepts of three- dimensional graphics. Geometric modeling, graphic objects, primitives and their attributes. Image control commands on the monitor screen. Data entry. Setting coordinates. Parameters of the object binding mode. Methods of selecting objects, basic commands. Sequential viewing of objects. The main commands for modifying drawings in the AutoCAD system, COMPAS.

Purpose of studying of the discipline
Study of engineering and computer graphics.

Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline
To present the rules of drawing design, the capabilities of computer-aided design systems AutoCAD (COMPAS).
Use standards and rules for the construction and reading of drawings and diagrams; methods of graphical representation of spatial images
Apply the basic elements of three-dimensional graphics; design and use graphic tools.
Upon completion of the development of the discipline
Evaluate the prospects and trends in the development of management information technologies.
And gets the competence:Owns methods of development of robotic control systems.

Prerequisites
School course

Postrequisites
Design of automated systems

Automation of heattechnical processes and installation.

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline
The discipline is devoted to heat supply systems, generation, transportation and consumption of thermal energy. Students study the basic concepts of the theory of automatic regulation, reliability and operation of heating equipment, heat supply systems. The topics of the course include fuel and energy resources, labor costs for the production and transportation of thermal energy, technological objects of industrial energy, methods for determining dynamic and statistical errors, automation equipment, functional composition of automated process control systems, algorithmic support of automated process control systems.

Purpose of studying of the discipline
To study the ways of organizing and developing technological processes associated with the production, transportation and consumption of heat energy

Learning Outcomes
ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline
Upon completion of the development of the discipline
Evaluate the features of automated information management systems as control objects, the main tasks and principles of technical system management, the relationship, and methods for developing control algorithms.
And gets the competence:Studies the basic principles and methods of building management systems

Prerequisites
Technical means of automation and control

Postrequisites
Linear systems of automatic control

Methods of optimization of technological process management

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline
The discipline is devoted to optimal control problems, optimality criteria. Students study methods of optimal control theory, necessary and sufficient conditions for the minimum of smooth functions of one and several variables, basic numerical methods of unconditional minimization. Course topics include convex programming problem, Lagrange function, linear programming problem. Simplex is a method for solving a linear programming problem. Optimization on graphs. The Pontryagin maximum principle. The simplest problem of the calculus of variations. The Euler equation.

Purpose of studying of the discipline
Preparation of specialists are holding methods of optimization theory and able to carry out the settlement and research on the optimal design and operation of control systems. Optimal control system. Optimal control problems, optimality criteria. Methods of optimal control theory.

Learning Outcomes
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline
Upon completion of the development of the discipline
Evaluate the features of automated information management systems as control objects, the main tasks and principles of technical system management, the relationship, and methods for developing control algorithms.
And gets the competence:Studies the basic principles and methods of building management systems

Prerequisites
Mathematics

Postrequisites
Linear systems of automatic control

Optimal control system

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline
The discipline studies optimal control systems, optimal mechatronic systems, and the block diagram of an optimal system. The Bellman functional equation. The course topics include dynamic systems and modeling, controlled systems and the Pontryagin maximum principle, Lagrange function, linear programming problems, convex programming problems. Students study numerical methods of unconditional minimization: the method of half division, the method of the golden section, the scanning method, methods of unconditional one-dimensional minimization.

Purpose of studying of the discipline
Preparation of specialists are holding methods of optimization theory and able to carry out the settlement and research on the optimal design and operation of control systems. Optimal control system. Optimal control problems, optimality criteria. Methods of optimal control theory.

Learning Outcomes
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline
Upon completion of the development of the discipline
Evaluate the features of automated information management systems as control objects, the main tasks and principles of technical system management, the relationship, and methods for developing control algorithms.
And gets the competence:Studies the basic principles and methods of building management systems

Prerequisites
Mathematics

Postrequisites
Nonlinear systems of automatic control

CAD microelectronic circuits

Discipline cycle	Basic disciplines
Course	2
Credits count	3
Knowledge control form	Examination

Short description of discipline
The discipline considers the issues of construction and design of electronic means based on modern information technologies. The main issues of the essence of the process of computer- aided design of various processes are outlined. Basic information on the structure and operation of industrial CAD systems P-CAD, Micro-CAP and EasyEDA is given. The methods of creating new libraries of electronic components, modeling microelectronic circuits, creating printed circuit boards in various CAD systems are investigated.

Purpose of studying of the discipline
Familiarization of students with the principles of construction and structure of CAD, technical means and operating systems of CAD,

information and application software CAD, automation of functional, design and technological design of CAD.

Learning Outcomes

ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.

Learning outcomes by discipline

Upon completion of the development of the discipline to Choose the means of automation of technological processes and production, program and debug control system based on microcontrollers.
And gets the competence: Owns various types of design and operation of microelectronic devices.

Prerequisites

Computer graphics and bases of ADS

Postrequisites

Installation, commissioning and operation of tools and automation systems

CAD of microelectronic devices

Discipline cycle	Basic disciplines
Course	2
Credits count	3
Knowledge control form	Examination

Short description of discipline

Within the framework of the discipline, students study the basics of circuit modeling of microelectronic devices, a basic set of elements of circuit models, models of semiconductor devices, modern CAD circuit modeling. The composition and principles of CAD construction of microelectronic devices, the stages of creation, CAD software and the possibility of connecting additional libraries with elements of electronic device design are considered. The description and possibilities of modern software products for the design of electronic devices are given.

Purpose of studying of the discipline

Training of specialists with a broad outlook in the field of computer-aided design of power plants and who are able to professionally create circuit diagrams and printed circuit boards in the design and development of automatic and automated control systems for industrial facilities with modern design tools. The study of the discipline is aimed at mastering the principles of building and using information technologies for the design of electronic systems, as well as obtaining practical skills in working in an integrated CAD environment.

Learning Outcomes

ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.

Learning outcomes by discipline

Upon completion of mastering the discipline, the student:
Selects means of automation of technological processes and production, programs and debugs control systems based on microcontrollers.
And he gets the competence: Owns various types of construction and operating principle of microelectronic devices.

Prerequisites

Computer graphics and bases of ADS

Postrequisites

Installation, commissioning and operation of tools and automation systems

Technology of installation in microelectronics

Discipline cycle	Basic disciplines
Course	2
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline introduces students to the modern principles and methods of thin-film microelectronics, examines the principles of action of active and passive thin-film elements used in microelectro- and nanoelectronics, promotes the development of skills for applying the knowledge gained in practice. Modern software tools for the layout and tracing of printed circuit boards, tools for designing semiconductor chips in various technological bases are considered. The ways of development and improvement of microelectronic devices are described.

Purpose of studying of the discipline

Acquaintance with modern principles and methods of thin-film microelectronics, study of the principles of action of active and passive thin-film elements used in thin-film microelectronics and development of skills in applying the knowledge gained in practice.

Learning Outcomes

ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.
ON 7 Able to studies the basic principles and devices for processing and transmission of information

Learning outcomes by discipline

Upon completion of the development of the discipline to Choose the means of automation of technological processes and production, program and debug control system based on microcontrollers.
And gets the competence: Owns various types of design and operation of microelectronic devices.
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Prerequisites

Computer graphics and bases of ADS

Postrequisites

Installation, commissioning and operation of tools and automation systems

Nanoscale electronic devices and novel simulation techniques

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies such new modeling methods as molecular wire, silicone nanocarriers, quantum dots: single-electron transistors. The nanowire device, sensors based on wireless communication, nanobioelectronics, magnetic and molecular technologies are being studied. Application of computer-aided design systems for modeling at the molecular level. Nanodevices based on metal, silicon carbon. Modeling of devices at the molecular level.

Purpose of studying of the discipline
Explore the methodology and methods of modeling devices at the molecular level

Learning Outcomes
ON 4 Develops algorithms and software for microcontrollers in control systems.

Learning outcomes by discipline
Upon completion of the development of the discipline
Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems.

Prerequisites
Microelectronics

Postrequisites
Technology of installation in microelectronics

Verification of the property of microelectronic components and devices by impedance spectroscopy

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the field of impedance theory and methods of its measurement.
Familiarization with the factors and properties in AC circuits, the correlation between current and voltage, the characteristic of PV devices and their determination methods, the basis of nanocrystalline solar cells and their impedance. Analysis of nano- layer on semiconductor devices.
Specificity of determining factors, properties and fundamentals of impedance measurement.

Purpose of studying of the discipline
Study the ways and methods of obtaining impedance spectroscopy to check the properties of microelectronic components and devices

Learning Outcomes
ON 4 Develops algorithms and software for microcontrollers in control systems.

Learning outcomes by discipline
Upon completion of the discipline, the training
Owns the development of control algorithms and their software and hardware management systems
And gets the competence: to develop the algorithm and software of microcontrollers in control systems

Prerequisites
Microelectronics

Postrequisites
Programmable logic controllers

Software for microcontrollers and industrial controllers

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying the basic software foundations of industrial controllers and microcontrollers, their programming in the conditions of production and operation.
General questions on programming methods, programming environments, syntax of IEC-61131/3 standard are discussed. Industrial controllers from Owen, Siemens, Delta Electronics, National Instruments and Microcontrollers are being explored for automated production control systems.
Specification of the application of flexible reconfigurable technical means in automation systems.

Purpose of studying of the discipline
Mastering the basic and applied software of microcontrollers and industrial controllers, special programming languages, tools and programming methods

Learning Outcomes
ON 4 Develops algorithms and software for microcontrollers in control systems.

Learning outcomes by discipline
Upon completion of the discipline, the training
Owns the development of control algorithms and their software and hardware management systems
And gets the competence: to develop the algorithm and software of microcontrollers in control systems

Prerequisites
Microelectronics
Postrequisites
Industrial Controls

Fundamentals of Information Processes

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes the main stages of information circulation: perception, preparation, transmission and storage, processing and use of information. Studies information systems and information transmission systems. Basic concepts and definitions, types of information, such as semantic, syntactic and pragmatic information. Examples of information processes and the movement of information from the source to the recipient with all signal transformations are presented.
Purpose of studying of the discipline
The study of the students the necessary theoretical foundations of information theory, methods and means of collection, transmission and processing of information; familiarize students with the basic processes proiskhodya¬schimi when converting messages to and transfer of signal channels and communication lines; development of students of general issues of building systems for the collection, transmission and processing of information; development of practical skills of theoretical and experimental studies of model systems for the collection, transmission and processing of information
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
Upon completion of the development of the discipline
Master the main methods, methods and means of obtaining, storing, processing information, works with a computer as a means of information management, evaluates information in global computer networks.
And gets the competence:Studies the basic principles and devices for processing and transmitting information.
Prerequisites
Mathematics
Postrequisites
Dispatch control system

Basics of collecting and information transfer

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes the following concepts: material carrier, signal, signal parameter, message as a carrier of information, information threats. Continuous signal, continuous message are studied. Discrete signal, discrete message. The general issues of the accumulative system and methods of dissemination and processing of information are considered. Upon studying the discipline, students acquire practical skills in theoretical and experimental application of systems for complex collection, transmission and processing of information.
Purpose of studying of the discipline
Approaches to the definition of information." The basic properties of information. Media. The rule of interpretation of the message.
A carrier material. Signal, the signal parameter. Message as a carrier of information threats. Legal protection of software and databases. Copyright. Methods of protection. Information society. Informatization of the society. Information security society and the individual Continuous signal, continuous message. Discrete signal to discrete message: sign the alphabet.
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
Upon completion of the development of the discipline
Master the main methods, methods and means of obtaining, storing, processing information, works with a computer as a means of information management, evaluates information in global computer networks.
And gets the competence:Studies the basic principles and devices for processing and transmitting information
Prerequisites
Technical means of automation and control Mathematics
Postrequisites
Local Area Networks

Applied Information Theory

Discipline cycle	Basic disciplines
Course	2

Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies the basic theoretical methods and concepts of information processing and accumulation based on information theory; familiarity with the main processes at the stage of information encoding, as well as the conversion of messages into signals; knowledge of methods of digital information processing, signal coding in the presence and absence of interference and reverse coding, as well as information transmission through communication channels and networks.

Purpose of studying of the discipline
"Ақпараттың қолданбалы теориясы" пәні келесі ұғымдарға бағытталған:
- Студенттердің ақпараттық теория негізінде ақпаратты өңдеу мен жинақтаудың негізгі теориялық әдістері мен түсініктерін зерттеу;
- Студенттерді ақпаратты кодтау, сондай-ақ хаттарды сигналдарға түрлендіру кезеңіндегі негізгі процестермен таныстыру;
- Ақпаратты цифрлық өңдеу, кодтау және кері кодтау, сондай-ақ ақпаратты арналар мен байланыс желілері бойынша беру әдістерін меңгеру;
- Жинақтау жүйесінің жалпы мәселелерін және ақпаратты тарату мен өңдеу әдістерін меңгеру;
- Ақпаратты кешенді жинау және беру және өңдеу жүйелерін теориялық және эксперименттік қолданудың практикалық дағдыларын игеру

Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline
Upon completion of the development of the discipline
Master the main methods, methods and means of obtaining, storing, processing information, works with a computer as a means of information management, evaluates information in global computer networks.
And gets the competence:Studies the basic principles and devices for processing and transmitting information.

Prerequisites
Technical means of automation and control Mathematics

Postrequisites
Wireless control systems

Interfaces of robotic systems

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the field of development of interfaces of robotic systems.
Features of standard interface, stack, protocols, compatibility and principle of interfaces organization, modes of interfaces and ways of information exchange between devices. The levels of signals and the speed of information exchange, electrical organization of interfaces and consistency of harmonisation are considered.
Specification of development and organization of interfaces of robotic systems.

Purpose of studying of the discipline
is the deepening of students` knowledge in the field of installation, configuration and operation of various types of communication interfaces used in modern control systems; study of the physical, logical and informational component of wired and wireless general industrial and specialized interfaces.

Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information

Learning outcomes by discipline
Upon completion of learning to Use the principles, methods and ways of interconnecting hardware and software to create systems of automation and control, to solve some problem with existing knowledge, abilities and skills of handling technical and software PC, and process application programs
And gets the competence: Owns various types of design and operation of microelectronic devices

Prerequisites
Optimal control system

Postrequisites
Design of automated systems

Development of user interfaces.

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The study of the discipline will deepen knowledge of students in field of development, configuration and operation of user interfaces.
The properties and rules of interface creation, characteristics of human operator, psychophysiological characteristics of operators are considered. The principle of «feedback» and simplicity of interface, naturalness and consistency of interface is studied. Questions about comparison of work and characteristics of known industrial interfaces.
Specificity of physical, logical and information component of user interfaces.

Purpose of studying of the discipline
Improved knowledge of learners in the design, configuration and use of user interfaces; study of the physical, logical and informational components of user interfaces
Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information
Learning outcomes by discipline
Upon completion of learning to Use the principles, methods and ways of interconnecting hardware and software to create systems of automation and control, to solve some problem with existing knowledge, abilities and skills of handling technical and software PC, and process application programs
And gets the competence: Owns various types of design and operation of microelectronic devices
Prerequisites
Optimal control system
Postrequisites
Design of automated systems

Data transmission systems and automation and control interfaces

Discipline cycle	Profiling discipline
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The study of the discipline will deepen the knowledge of students in the field of installation, adjustment and operation of various types of communication interfaces used in modern control systems. The physical, logical and information components of wired and wireless industrial and specialized interfaces are considered. The principles of organization and functioning of interfaces in modern control systems are considered. Specific design and development of reception-transmission interfaces in control systems.
Purpose of studying of the discipline
Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information
Learning outcomes by discipline
Prerequisites
Methods of optimization of technological process management
Postrequisites
Design of automation and remote control systems

PIC Microcontrollers

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
Discipline considers main issues and principles of architecture and the composition of microcontrollers. The main terminology of microcontrollers, network complex of microcontrollers, types of interfaces for data transmission are considered. The methods and methods of programming microcontrollers, fields of their application, control circuits of objects of technological process are studied. The specificity of discipline is the determination of methods and environments of programming, variants layout of systems of automatic control on the basis of microcontrollers.
Purpose of studying of the discipline
Study the architecture and composition of typical series of industrial controllers; to acquire practical skills in the use of industrial controllers in the implementation of standard means of technological control and management.
Learning Outcomes
ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.
ON 3 Able to explore and design functional structures, separate types of support for different types of technical control objects, develop models of automated information processing and control systems, to apply various methods of nonparametric identification to construct adequate mathematical models; the ability to describe and apply parametric methods for the identification of models of control objects; methods of identification of nonlinear systems.
Learning outcomes by discipline
When completing the development of the discipline, Use specialized software for solving problems of managing technological objects.
And gets the competence: Owns various types of design and operation of microelectronic devices.
Prerequisites
Software for microcontrollers and industrial controllers
Postrequisites
Design of automated systems

Programmable logic controllers

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline deals with the main issues and principles of work, installation and adjustment of programmable logic controllers.

Programming environments and programming languages of IEC-61131/3, PLC composition and architecture are considered. Graphical and textual programming languages, types and structure of industrial networks used in automation systems are studied. The specifics of the discipline familiarization with the basics of installation and adjustment of PLC operation in automatic control systems.

Purpose of studying of the discipline

Study the architecture and composition of typical series of industrial controllers; to acquire practical skills in the use of industrial controllers in the implementation of standard means of technological control and management.

Learning Outcomes

ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.
ON 3 Able to explore and design functional structures, separate types of support for different types of technical control objects, develop models of automated information processing and control systems, to apply various methods of nonparametric identification to construct adequate mathematical models; the ability to describe and apply parametric methods for the identification of models of control objects; methods of identification of nonlinear systems.

Learning outcomes by discipline

When completing the development of the discipline, Use specialized software for solving problems of managing technological objects.
And gets the competence: Owns various types of design and operation of microelectronic devices.

Prerequisites

Application software of control systems

Postrequisites

Design, installation, commissioning and maintenance of automation systems

Industrial Controls

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline includes the basic questions and concepts of the composition of the standard series of industrial controllers and their architecture. The main concepts and classification, methods of programming and software environments, Owen Logic, CoDeSyS are considered. The concepts and composition of industrial networks Profibus, Modbus, CAN, and their applications are studied. Specificity of the discipline familiarization with the main types of industrial controllers and programming methods.

Purpose of studying of the discipline

Study the architecture and composition of typical series of industrial controllers; to acquire practical skills in the use of industrial controllers in the implementation of standard means of technological control and management.

Learning Outcomes

ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.
ON 3 Able to explore and design functional structures, separate types of support for different types of technical control objects, develop models of automated information processing and control systems, to apply various methods of nonparametric identification to construct adequate mathematical models; the ability to describe and apply parametric methods for the identification of models of control objects; methods of identification of nonlinear systems.

Learning outcomes by discipline

To form in a specialist a solid foundation of knowledge, high mathematical culture and practical skills sufficient for successful production activities and allowing him to independently master new necessary knowledge and achievements in the field of setting and programming logic controllers.

Prerequisites

Software for microcontrollers and industrial controllers

Postrequisites

Design of automation and remote control systems

Dispatch control system

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline includes the study of software complexes of industrial controllers, the study of the principles of constructing the functioning of a microprocessor as an element of a dispatching system, the formation of knowledge of the principles of digital control systems, to show the possibilities of using dispatching systems in automation systems, mastering the skills of designing automated dispatching systems. Studies issues related to languages and means of development of dispatching systems, modern SCADA and MES systems.

Purpose of studying of the discipline

Learning Outcomes

ON 4 Develops algorithms and software for microcontrollers in control systems.

Learning outcomes by discipline

Upon completion of the discipline, the student:
Owns the development of control algorithms and their software and hardware management systems.
And gets the competence: Develops algorithms and software for microcontrollers in control systems.

Prerequisites

Fundamentals of Information Processes

Postrequisites

Software and hardware complexes management

Application software of control systems

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline will allow to get acquainted with basics of work with application software tools for programming of ACS TP systems. Typical structures of ACS based on SCADA systems, main functions of programming languages FBD, IL, ST are considered. Main libraries of PLC programming languages, methods of organization communication between individual elements ACS TP are studied. Specificity the discipline of acquiring programming skills PLC as part of structure ACS TP on the basis SCADA systems.

Purpose of studying of the discipline

to study the typical classes of application software of control systems;
приобрести acquire practical skills of PLC programming according to IEC 61131 standard;
изучить to study the ways of interaction of modern industrial automation equipment, which is part of a complex hierarchical automated process control system;
have an idea of the trends in the development of modern industrial software and related control systems, as well as ways of programming them.

Learning Outcomes

ON 4 Develops algorithms and software for microcontrollers in control systems.

Learning outcomes by discipline

Upon completion of the discipline, the student:
Owns the development of control algorithms and their software and hardware management systems.
And gets the competence: Develops algorithms and software for microcontrollers in control systems.

Prerequisites

Data transmission systems and automation and control interfaces

Postrequisites

Information and Control Systems. (course work)

PCS Software.

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies a set of software tools that solve specific functional tasks and ensure the functioning of all automated process control systems: servers, controllers, workstations and engineering stations, operator panels, programmers. Both specialized software, such programs as CodeSys, Step 7, FBD, and programs written for microcontrollers in high-level languages are studied. The discipline also studies working and engineering stations, programmers, servers.

Purpose of studying of the discipline

to study the typical classes of application software of control systems;
acquire practical skills of PLC programming according to IEC 61131 standard;
to study the ways of interaction of modern industrial automation equipment, which is part of a complex hierarchical automated process control system;
have an idea of the trends in the development of modern industrial software and related control systems, as well as ways of programming them.

Learning Outcomes

ON 4 Develops algorithms and software for microcontrollers in control systems.
ON 5 Able to analyze control systems with the aim of mathematical model designing, to build and explore mathematical models of control objects, to solve problems related to the control system and using modern math methods

Learning outcomes by discipline

Upon completion of the discipline, the student:
Owns the development of control algorithms and their software and hardware management systems.
And gets the competence: Develops algorithms and software for microcontrollers in control systems.

Prerequisites

Basics of collecting and information transfer

Postrequisites

System modeling software

Fundamentals of programming mobile systems

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline includes the basic questions and principles of programming mobile systems based on the Android operating system for automatic control systems.
Familiarization with the main types of applications on the Android operating system, and the main components of libraries, their security, architecture, their application in automatic control systems.
The specifics of working with mobile systems and applications based on the Android operating system in automatic control systems.

Purpose of studying of the discipline
To study the ways and methods of programming mobile systems for their use in automation systems
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
At the end of mastering the discipline, He knows the main approaches to building software for the Android platform, the main technologies for developing applications for mobile and embedded systems And receives competence: acquisition of basic principles and devices for processing and transmitting
Prerequisites
Information and communication technology
Postrequisites
Application of mobile systems for remote control

Programming of mobile applications for Java

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the development of mobile applications in Java for automatic control systems.
Acquaintance with the basic concepts of Java and its differences with C++, the basics of development of Java applications, work with the main libraries and interfaces for data exchange, ways to develop a graphical interface.
Specifics of working with mobile systems and applications based on the Java operating system in automatic control systems.
Purpose of studying of the discipline
mastering the discipline "Programming of mobile applications on Java" is: mastering modern concepts and ways of writing programs in the C# language necessary in professional practice
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
At the end of mastering the discipline, He knows the main approaches to building software for the Android platform, the main technologies for developing applications for mobile and embedded systems, And receives competence: acquisition of basic principles and devices for processing and transmitting
Prerequisites
Information and communication technology
Postrequisites
Remote control of the Arduino platform

Mobile device programming

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the field of mobile devices for operation in automatic control systems.
Enterprise with the main variety of mobile devices, application development tools, hardware and software capabilities of mobile devices, with the main libraries of mobile devices.
Specification of working with the main types of mobile devices and software shells for programming of mobile devices in automatic control systems.
Purpose of studying of the discipline
Get acquainted with the features and methods of programming mobile devices
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
When completing the development of the discipline, the student is able to develop components of hardware and software complexes, network applications and databases, using modern tools and programming technologies .And receives the competence to acquire the basic principles and devices for processing and transmitting information.
Prerequisites
Information and communication technology
Postrequisites
Cloud technologies in automation

Methods of scientific research

Discipline cycle	Profiling discipline
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline gives an idea of scientific activity, the main types of scientific research, inventive activity, methods of solving inventive tasks, scientific organizations, financing, planning, conducting research and presenting their results; training and certification of scientific personnel.Considers issues such as types of scientific organizations and their interaction, financing and organization of scientific research, planning of research works. Introduces the concept of invention, teaches the creation of claims.

Purpose of studying of the discipline

Learning Outcomes

ON 5 Able to analyze control systems with the aim of mathematical model designing, to build and explore mathematical models of control objects, to solve problems related to the control system and using modern math methods

Learning outcomes by discipline

Prerequisites

Introduction to the profession

Postrequisites

Final examination

Methods and means of scientific research

Discipline cycle	Profiling discipline
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

The course describes in detail the methodological support of research activities. The role of the functional structure of research activity is shown. Empirical and theoretical thinking in scientific cognition is analyzed. The confirmations and refutations of theoretical schemes are formulated and substantiated. The functional features of experimental modeling are generalized. An explanation of the growth of scientific knowledge is given. The importance of functional and procedural characteristics of hypotheses and their scientific novelty is shown.

Purpose of studying of the discipline

Learning Outcomes

ON 5 Able to analyze control systems with the aim of mathematical model designing, to build and explore mathematical models of control objects, to solve problems related to the control system and using modern math methods

Learning outcomes by discipline

Prerequisites

Metrology and measurement

Postrequisites

Final examination

Processing of experimental data

Discipline cycle	Profiling discipline
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at teaching students methods of experimental research and processing of results in the field of automation and control. Considers the application of statistical methods of variance, regression, correlation analysis of experimental data processing, solving problems using least squares methods, by modeling automation objects and research by experimental planning methods. Universal application software packages are used to solve experimental data processing problems

Purpose of studying of the discipline

Learning Outcomes

ON 5 Able to analyze control systems with the aim of mathematical model designing, to build and explore mathematical models of control objects, to solve problems related to the control system and using modern math methods

Learning outcomes by discipline

Prerequisites

Metrology and measurement

Postrequisites

Final examination

Diagnostics and reliability of control systems

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to the concepts of diagnostic quality and reliability of control systems. Basic concepts, definitions and criteria of reliability. Quantitative characteristics of reliability. Reliability indicators of automation equipment. The basic probability laws of distributions used in reliability theory. The course topics include methods for determining reliability indicators, methods for calculating the reliability of unserved equipment of automatic control systems, calculating the reliability of devices of automatic control systems for various types of failures.

Purpose of studying of the discipline

The purpose of studying this discipline is to master the methods of theoretical and practical assessment of the reliability of control systems, the study of organizational and technical issues of ensuring the reliability of hardware and software.

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline

When completing the course, Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems

Prerequisites

Modeling and identification of objects of management

Postrequisites

Automation of typical technological processes.

Diagnostics and reliability of components and systems automation

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to indicators of reliability of automation equipment. The basic probability laws of distributions used in reliability theory. Methods for determining reliability indicators. Methods for calculating the reliability of unserved equipment of automatic control systems. The main stages of calculating the reliability of automatic control system devices for various types of failures Reliability of automatic control systems. Basic concepts and definition of reservation. Structural redundancy without restoration. Structural redundancy with restoration. Optimal redundancy. Calculation of reliability with information redundancy.

Purpose of studying of the discipline

Целью изучения данной дисциплины является освоения методов теоретической и практической оценки надежности систем управления, изучение организационных и технических вопросов обеспечения надежности аппаратного и программного обеспечения.

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline

When completing the course, Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems

Prerequisites

Modeling and identification of objects of management

Postrequisites

Automation of industrial plants and facilities

The reliability of control systems.

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline is devoted to the basic concepts, definitions and stages of calculating the reliability of elements and systems. The main stages of calculating the reliability of automatic control system devices for various types of failures. The course topics include reliability of automatic control systems, basic concepts and definition of redundancy, structural redundancy without restoration, structural redundancy with restoration, optimal redundancy, reliability calculation with information redundancy.

Purpose of studying of the discipline

The purpose of studying this discipline is to master the methods of theoretical and practical assessment of the reliability of control systems, the study of organizational and technical issues of ensuring the reliability of hardware and software.

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline

When completing the course, Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems

Prerequisites

Modeling and identification of objects of management

Postrequisites

Automation of typical technological and logical processes

Information and Control Systems. (course work)

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline introduces students to various types of automated information and control systems in automation, their purpose, structure, requirements for them and basic characteristics. The discipline describes communication channels and data transmission protocols on them, standards in the field of information encoding. The issues of building networks on radio channels and using satellite communications are studied, the architecture and capabilities of digital integrated service networks are considered.

Purpose of studying of the discipline

The purpose of this course is to study the ways of interaction of modern industrial automation equipment, which is part of a complex hierarchical automated process control system, the study of standard classes of applied software for information and control systems.

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 8 Able to apply optimal control methods in practice while solving automation problems of control systems, to apply mathematical methods to analyze the general properties of non- linear systems, perform computational work on the study of nonlinear systems; analyzing and synthesizing a non-linear control system to build mathematical models.

Learning outcomes by discipline

When completing the course, Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems

Prerequisites

Application software of control systems

Postrequisites

Design of automation and remote control systems

Software and hardware complexes management

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

Within the framework of the discipline, SCADA systems used to control technological processes are studied. The discipline provides the basic concepts of SCADA systems, methods of their selection based on the principle of application, discusses the hardware of SCADA systems and operating control systems in real time, as well as an overview of data transmission protocols in industrial networks. The work of various SCADA systems is being investigated: the trace Mode SCADA system, the Plcwin SCADA system, Genesis for Windows.

Purpose of studying of the discipline

Learning Outcomes

ON 4 Develops algorithms and software for microcontrollers in control systems.
ON 5 Able to analyze control systems with the aim of mathematical model designing, to build and explore mathematical models of control objects, to solve problems related to the control system and using modern math methods

Learning outcomes by discipline

When completing the course, Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems

Prerequisites

Dispatch control system

Postrequisites

Design of automated systems

System modeling software

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies methods and means of modeling dynamic processes using various specialized programs. The description, scope and characteristics of the application programs used for modeling technological processes are given. The types of models of various objects, their mathematical description and methods of construction are investigated. The problems of automating the construction of models in three-dimensional space and modeling time-varying nonlinear technological processes are considered.

Purpose of studying of the discipline
Introduction to basic models of control objects, methods of structural and parametric identification, interpretation of modelled results, study of general algorithms and methods of experimental data processing.
Learning Outcomes
ON 6 Able to studies the basic principles and methods of construction of control systems.
Learning outcomes by discipline
When completing the course, Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.
And gets the competence: Studies the basic principles and methods of building management systems
Prerequisites
PCS Software.
Postrequisites
Design, installation, commissioning and maintenance of automation systems

Information devices and systems in mechatronics

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies the basic issues and principles in the field of sensors and information mechatronic devices. The basic terminology of information systems and robotics devices, typical devices and information systems in mechatronics are considered. Technical vision systems, metrological support of information systems, methods of digital signal processing from primary converters are studied. The specifics of the development of information systems and devices based on the Arduino platform, Raspberry Pi.
Purpose of studying of the discipline
The purpose of teaching the discipline" information devices and systems in Mechatronics " is to acquire basic knowledge in the field of sensors and information mechatronics devices, the formation of skills in practical work and implementation of innovative activities using mechatronic and robotic systems and control systems of mechatronic and robotic modules and systems.
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.
Learning outcomes by discipline
Upon completion of the development of the discipline
Evaluate the prospects and trends in the development of management information technologies.
And gets the competence:Owns methods of development of robotic control systems.
Prerequisites
Robotic systems and complexes with the basics of artificial intelligence.
Postrequisites
Final examination

Information devices of robotic systems

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes the main issues and principles in the field of types and methods of obtaining information in robotic systems from information devices. The main elements of information systems, sensors and their characteristics, an information model of the measurement process are considered. The methods of working with sensors, their sensitive elements, the main types of measuring circuits, location information systems are studied. The specifics of the transmission and processing of information received from information devices and systems in robotics.
Purpose of studying of the discipline
To study the main types and methods of obtaining information in robotic systems from information devices
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.
Learning outcomes by discipline
Upon completion of the development of the discipline
Evaluate the prospects and trends in the development of management information technologies.
And gets the competence:Owns methods of development of robotic control systems.
Prerequisites
Robotic systems and complexes with the basics of artificial intelligence.
Postrequisites
Executive systems of industrial robots

Design of systems based on programmable logic integrated circuits

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline will allow you to study the tasks solved by the microcontroller in automated process control systems. The basic terminology of microcontrollers, local PLCs, the composition and structure of microprocessor systems are considered. The composition and structure of standard interfaces and basic microprocessor controllers, software and ways of implementing industrial networks are studied. The specifics of the design and development of a process control system based on microcontrollers.

Purpose of studying of the discipline
To study the problems solved by the microcontroller in computer-aided process control, examine the architecture and composition of typical series of industrial kon¬trollerov; acquire practical skills in the use of industrial controllers in the implementation of the standard means of process control and management.

Learning Outcomes
ON 3 Able to explore and design functional structures, separate types of support for different types of technical control objects, develop models of automated information processing and control systems, to apply various methods of nonparametric identification to construct adequate mathematical models; the ability to describe and apply parametric methods for the identification of models of control objects; methods of identification of nonlinear systems.
ON 4 Develops algorithms and software for microcontrollers in control systems.

Learning outcomes by discipline
Upon completion of the development of the discipline
Evaluate the prospects and trends in the development of management information technologies.
And gets the competence:Owns methods of development of robotic control systems.

Prerequisites
Control methods intelligent systems

Postrequisites
System of electric drive control

Cloud technologies in automation

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the application of cloud technologies in automation systems.
Introduction to the basics of cloud technologies, information transfer and processing from sensors, application of Ethernet protocols and interfaces for communication of controllers and programmable relays with OwenCloud technology.
The specifics of working with cloud technologies in automation systems for storage and transmission of information through protocols and interfaces.

Purpose of studying of the discipline
Explore the main ways and methods of applying cloud technologies in automation

Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information

Learning outcomes by discipline
Upon completion of the discipline, he is able to identify automated processes that are more efficient to transfer to the cloud and assess the possible risks of using cloud technologies.And receives competence: acquisition of basic principles and devices for processing and transmitting

Prerequisites
Mobile device programming

Postrequisites
Internet of Things technologies

Application of mobile systems for remote control

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the application of mobile systems for remote control in automatic control systems.
Introduction to the main protocols and interfaces of wired and wireless data transmission, standards of OPC-servers, OPC UA, Multi-Partner MasterOPC, and SCADA-systems, Server TeslaScada.
Specification of working with basic protocols and interfaces for remote management of mobile systems in automatic control systems.

Purpose of studying of the discipline
Explore protocols and interfaces for wireless and wired data transmission of mobile systems

Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information

Learning outcomes by discipline

When completing the discipline, the student is able to develop structural schemes and algorithms for the functioning of programmable mobile systems, taking into account the purpose and features of the system, the amount of information processed and the operating conditions of the system, select and design information transmission channels to ensure the relationship and interaction between parts of the programmable mobile system, the external environment and the user.
And receives competence: acquisition of basic principles and devices for processing and transmitting information

Prerequisites

Fundamentals of programming mobile systems

Postrequisites

The hardware of the Internet of Things

Remote control of the Arduino platform

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline includes basic questions and principles in the application of the Arduino platform for remote control.
Introduction to the basic protocols and interfaces of data transfer between devices in automation systems based on Bluetooth, Wi-fi, communication with the Android operating system and mobile applications.
The specifics of working with protocols and interfaces of remote operation of the Arduino platform in systems of automatic control and development of the Internet of things.

Purpose of studying of the discipline

Learn interfaces and protocols for remote control of the Arduino platform

Learning Outcomes

ON 7 Able to studies the basic principles and devices for processing and transmission of information

Learning outcomes by discipline

Develop basic principles and devices for processing and transmitting information

Prerequisites

Programming of mobile applications for Java

Postrequisites

Internet of Things software platforms

Installation, commissioning and operation of tools and automation systems

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline deals with the basics of the organization of installation work, installation stages, installation schedules of automation systems, materials. tools and devices used during installation. Examples of devices for measuring electrical resistance, methods of direct and indirect measurement, various methods of checking, testing, monitoring and checking insulation, checking circuits of electrical circuits, ringing of electrical circuits and finding faults in circuits are given

Purpose of studying of the discipline

The purpose of this course is to study the methods of installation, adjustment and operation of automation tools of modern industrial equipment, which is part of a complex hierarchical automated process control system, to study standard methods of installation and adjustment of equipment of information and control systems

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

When completing the development of the discipline, Build automation tools for technological processes and production
And gets the competence: Studies the basic principles and devices for processing and transmitting information

Prerequisites

Information and Control Systems. (course work)

Postrequisites

Final examination

Technologies and Applications of Superconductive Materials

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at studying such issues as the basics of superconductivity, the basic properties of superconducting materials, a brief history of superconductivity, the study of their properties such as critical parameters, classification and magnetization. Examines such issues as what is superconductivity, the use of superconductors in electronics, in nano-dimensional systems, gives an overview of superconducting materials with operating temperatures above 23 K.

Purpose of studying of the discipline
Study the ways of manifestation of superconductivity and the use of superconducting materials in automation devices
Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information
Learning outcomes by discipline
When completing the development of the discipline, Build automation tools for technological processes and production
And gets the competence: Studies the basic principles and devices for processing and transmitting information
Prerequisites
Microelectronics
Postrequisites
Final examination

Packaging technologies in microelectronics

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying general and special knowledge on micromodules of assembly technologies at the level of microcircuits and printed circuit boards, the corresponding materials, technological parameters, equipment. Such issues as assembly technology in microelectronics, assembly levels are being studied. The technology of assembling micromodules by surface mounting. Installation of semiconductor crystals. Installation of microelectromechanical systems. Specialized installation. Such issues as wired and wireless installation methods are considered.
Purpose of studying of the discipline
To study the methods, methods of installation and assembly technology in microelectronics
Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information
Learning outcomes by discipline
When completing the development of the discipline, Build automation tools for technological processes and production
And gets the competence: Studies the basic principles and devices for processing and transmitting information
Prerequisites
Microelectronics
Postrequisites
Final examination

Automated electric drive

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies the basic issues and principles of mathematical description, and the principles of building control systems for electric drives.
The methods of electric drive control, speed and torque control systems of DC and asynchronous electric drives are considered. The systems of regulation and control of electric drives of technological processes and complexes, methods of software implementation of control of electric drives are studied. The specifics of studying the basics of building and hardware - software control of electric drives.
Purpose of studying of the discipline
To study the methods of mathematical description and principles of building control systems for electric drives
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.
Learning outcomes by discipline
Upon completion of the development of the discipline Conduct research and analysis of mathematical models of robotic and mechatronic systems using the methods of automatic control theory, computer technology and modern software.
And gets the competence: he Knows the methods of developing robotic control systems.
Prerequisites
Software and hardware complexes management
Postrequisites
Final examination

Executive systems of industrial robots

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

Studying the discipline will allow you to gain knowledge in the field of various types of industrial robot drives, structures and composition of drive control systems. The basic terminology of industrial robots, control methods and characteristics of the main types of actuators, manipulator kinematics are considered. Methods of calculation and selection of actuators of industrial robots are studied. The specifics of choosing and configuring the control of industrial robots and their actuators.

Purpose of studying of the discipline

The purpose of studying the discipline "Executive systems of industrial robots" is to gain students knowledge in the field of various types of drives of industrial robots and the structure and composition of drive control systems.

Learning Outcomes

ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

Upon completion of the development of the discipline Conduct research and analysis of mathematical models of robotic and mechatronic systems using the methods of automatic control theory, computer technology and modern software.
And gets the competence: he Knows the methods of developing robotic control systems.

Prerequisites

Information devices and systems in mechatronics

Postrequisites

Final examination

System of electric drive control

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

Studying the discipline will allow you to gain knowledge about the principles of construction and methods of implementation of electric drive control systems. The methods of implementation and design of control and regulation systems for DC and asynchronous electric drives are considered. The basics of asynchronous electric drive speed control and electric drive control systems in general at technological complexes are studied. The specifics of the methodology of design and development of electric drive control systems.

Purpose of studying of the discipline

The aim of this discipline is a form-ing the students` knowledge of the Principles of construction and methods of imple-tion control systems electric drives, providing the required changes in the laws, mye coordinate the drive, as well as acquiring of skills-designing, calculation and research of systems
Contents: Logical- mechanical control of electrical drives. The mathematical description of the Prince- nN construction of control systems. Closed systems control the speed and torque of the electric DC- tion system regulates the speed of electron- troprivoda asynchronous electric drive control system of technological systems Software implementation management elektroprivo-rows Control Systems Electrical drives in tracking mode and positioning systems we adaptive control electric drives

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

Upon completion of the development of the discipline Conduct research and analysis of mathematical models of robotic and mechatronic systems using the methods of automatic control theory, computer technology and modern software.
And gets the competence: he Knows the methods of developing robotic control systems.

Prerequisites

Software and hardware complexes management

Postrequisites

Final examination

Organization and planning of production

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline «Organization and production planning» gives different ideas about the basics of organization, industrial production planning, methods of evaluating its effective activities. As well as the analysis and forecast of production risks and losses of the enterprise, including ways to eliminate them as soon as possible. Students will gain knowledge and skills in the field of implementation, organization and planning of industrial production of the enterprise.

Purpose of studying of the discipline

The purpose of studying the discipline "Organization and planning of production" is to study the theoretical and methodological foundations of the organization and planning of production and production infrastructure at enterprises.

Learning Outcomes

ON 1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Learning outcomes by discipline

1) Demonstrates the ability to work effectively both individually and as a team member;
2) Organizes the work of small labor collectives of performers of production tasks;

3) Draws up technical documentation on the planning and organization of production, as well as on the established reporting according to approved forms.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Cost management

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

The purpose of the course "Cost Management" is the formation of students` competencies in cost management, the ability to conduct analytical work in the field of cost management. This discipline is aimed at forming students with a set of necessary theoretical knowledge to understand the essence of costs and the basics of their management, as well as practical skills necessary for the purposes of strategic cost management.

Purpose of studying of the discipline

To reveal the problems in the field of organization, planning and management of production in a market economy in order to reduce costs.

Learning Outcomes

ON 1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Learning outcomes by discipline

1) Demonstrates the ability to work effectively both individually and as a team member;
2) Draws up technical documentation (work schedules, instructions, plans, estimates, applications for materials, equipment, etc.), as well as established reporting on approved forms;
3) Organizes the work of small groups of performers.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Economics of enterprise

Discipline cycle	Basic disciplines
Course	4
Credits count	3
Knowledge control form	Examination

Short description of discipline

At the present stage of economic reforms, significant changes are taking place in the economy, especially at the microeconomic level: the nature and methods of economic activity of enterprises are changing. This course studies in detail the resources of the enterprise, the efficiency of their use, profitability and the main technical and economic indicators of the functioning of the enterprise. In addition, methods of stimulating labor resources, in order to optimize the production capacity and capital of the enterprise.

Purpose of studying of the discipline

The purpose of studying the discipline "Enterprise Economics" is to develop students` economic thinking based on the study of the economic mechanism of the enterprise in market conditions, providing deep theoretical knowledge and practical experience in the field of economics and organization of the enterprise and the use of technological equipment.

Learning Outcomes

ON 1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Learning outcomes by discipline

1) Demonstrates the ability to work effectively both individually and as a team member;
2) Assesses the feasibility study of design solutions;
3) Organizes activities related to the management of the actions of individual employees.

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Wireless control systems

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

Evolution and prospects for the development of wireless communication systems (BPS). Standards for wireless systems and networks: IEEE.802.11, WiMAX, LTE. The main technologies of mobile systems of the third generation. Management of radio resources and quality in BTS systems. Basics of construction and functioning of the radio interface of UMTS and LTE networks. The analysis of information security and methods of information protection in the systems of BPS standards IEEE.802.11. Interfaces of wireless communication

systems with public networks

Purpose of studying of the discipline

is to study a set of questions on the basic technologies, protocols and principles of the functioning of wireless communication systems.

Learning Outcomes

ON 7 Able to studies the basic principles and devices for processing and transmission of information
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

When completing the development of the discipline, Apply in practice the justification for the choice of regulated, controlled, signaled parameters and assesses the technical means of automation and control.
And gets the competence: Develops algorithms and software for microcontrollers in control systems

Prerequisites

Applied Information Theory

Postrequisites

Final examination

Computer networks

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline considers the architecture of computing systems. Components, allocation of computer resources. Protocols, cables and adapters. Network software. Peer-to-peer networks. Network expansion and management. Compatibility analysis. Characteristics of networks. Organization of networks. Network operating systems, standards, means of interaction of processes in networks. Integration of local networks into regional and global networks. Practical construction and administration of networks based on D-LINK and CISCO switches.

Purpose of studying of the discipline

Learning Outcomes

ON 7 Able to studies the basic principles and devices for processing and transmission of information
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

When completing the development of the discipline, Apply in practice the justification for the choice of regulated, controlled, signaled parameters and assesses the technical means of automation and control.
And gets the competence: Develops algorithms and software for microcontrollers in control systems

Prerequisites

Basics of collecting and information transfer

Postrequisites

Final examination

Local Area Networks

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline

The discipline examines the architecture of computer systems and their components. Allocation of computer resources. Email. File servers. Protocols, cables and adapters. Workstations. Network software. Peer-to-peer local area networks. Network expansion and management. Compatibility analysis. Data processing, a reference model of open systems interaction. Classification of networks by data distribution methods. Characteristics of networks. Organization and functioning of networks. Network tools, basic service protocols.

Purpose of studying of the discipline

The study of modern computer and telecommunication technologies, computer systems, networks, their structures, functions, protocols, implementations.

Learning Outcomes

ON 7 Able to studies the basic principles and devices for processing and transmission of information
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

When completing the development of the discipline, Apply in practice the justification for the choice of regulated, controlled, signaled parameters and assesses the technical means of automation and control.
And gets the competence: Develops algorithms and software for microcontrollers in control systems

Prerequisites

Basics of collecting and information transfer

Postrequisites
Final examination

The hardware of the Internet of Things

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes main issues and principles in the field of hardware development of the IoT. Familiarization with the components in construction of the hardware part of the IoT, the use of a variety of microcontrollers, protocols and interfaces in development of the IoT, ways of getting information from sensors of automation system.Specifics of work with selection of components, development of hardware and familiarity with standard protocols and interfaces in development of the IoT.
Purpose of studying of the discipline
Explore ways to design IoT hardware
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
At the completion of learning the student will learn the basic concepts, technologies, standards, protocols, and platform hardware and software platform for the Internet of things, will be able to formulate and solve problems associated with the selection and development of software and hardware platforms for embedded information and communication devices and systemsand also to evaluate the efficiency of alternative components and devices in specific situations.And receives competence: acquisition of basic principles and devices for processing and transmitting information
Prerequisites
Application of mobile systems for remote control
Postrequisites
Final examination

Internet of Things software platforms

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes basic questions and principles in the field of application of platforms for the implementation of program part of the Internet of things.
Familiarization with MQTT data transfer protocols, microcontrollers and software platforms PC ThingWorx, IBM Bluemix, Rightech IoT Cloud, Microsoft Azure, Artik Cloud. Tizen OS, organization of data exchange with cloud technologies.
Specifics of working with standard protocols, interfaces and software platforms for implementing the program part of the Internet of things
Purpose of studying of the discipline
To study basic ways and principles of designing software platforms Internet of things
Learning Outcomes
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.
Learning outcomes by discipline
At the completion of learning the student will learn the basic concepts, technologies, standards, protocols, and platform hardware and software platform for the Internet of things, will be able to formulate and solve problems associated with the selection and development of software and hardware platforms for embedded information and communication devices and systems and also to evaluate the efficiency of alternative components and devices in specific situations . And receives competence: acquisition of basic principles and devices for processing and transmitting information.
Prerequisites
Remote control of the Arduino platform
Postrequisites
Final examination

Internet of Things technologies

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline includes the main questions and principles in the field of application and the definition of the main methods and methods of developing the Internet of things and their application in systems of automatic control.

Introduction to basic principles, standards, architecture of the Internet of things, application of data transmission protocols in wireless sensor networks.
Specificity of working with the basic principles and methods of developing the Internet of things for automatic control systems.

Purpose of studying of the discipline

Study the basic principles, standards, architecture of the Internet of Things

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

At the completion of learning the student will learn the basic concepts, technologies, standards, protocols, and platform hardware and software platform for the Internet of things, will be able to formulate and solve problems associated with the selection and development of software and hardware platforms for embedded information and communication devices and systems and also to evaluate the efficiency of alternative components and devices in specific situations.And receives competence: acquisition of basic principles and devices for processing and transmitting information.

Prerequisites

Cloud technologies in automation

Postrequisites

Final examination

Design of automated systems

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline deals with the problems of designing automatic systems, characteristics, composition and content of project documentation. The requirements for the technical and operational design of an automatic system, the formulation of the design problem, the choice of standard automation equipment, the features of the choice of information and control computing complexes, the definition of control points, signaling and control are indicated. The rules of circuit construction and their hardware implementation are explained. principles of designing control systems based on microcontrollers.

Purpose of studying of the discipline

The mastery of the theoretical background of system design automation and remote control and the implementation of the settlement and research on the design and operation of control systems based on the tools of modern computer technology

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

Knowledge: know the theoretical foundations, basic principles and mathematical methods of system design.
Skills: able to design automation systems and robot.
Skills: Development has different structural and functional schemes of management systems, basic algorithms. Provides work for standard industrial regulators.

Prerequisites

Software and hardware complexes management

Postrequisites

Final examination

Design of automation and remote control systems

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline examines the issues of design quality criteria, the general characteristics of the project documentation, the composition and content of the graphic and text parts of the project, the composition of the technical and working design of the automated process control system. Examples of the formulation of the design problem, the choice of standard technical means of automated control systems, the features of the choice of information and control computing complexes, control points, signaling and control are given.

Purpose of studying of the discipline

The mastery of theoretical-cal machine design automation and remote control and execution of settlement and research work on the draft-ing and operation of control systems based on means-ency- variable computing

Learning Outcomes

ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

Upon completion of the development of the discipline Conduct research and analysis of mathematical models of robotic and

mechatronic systems using the methods of automatic control theory, computer technology and modern software.
And gets the competence: he Knows the methods of developing robotic control systems.

Prerequisites

Information and Control Systems. (course work)

Postrequisites

Final examination

Design, installation, commissioning and maintenance of automation systems

Discipline cycle	Profiling discipline
Course	4
Credits count	5
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline deals with the issues of design and design procedures, the stages of the terms of reference, the structure of the automation project, the main requirements for automation system projects, the content and composition of the terms of reference with the initial data for design, the basics of the organization of installation work, installation stages, schedules of commissioning of automation systems, materials. tools and devices used during installation. The rules for setting up automation tools, verification tests, repair and maintenance of automation tools are put forward.

Purpose of studying of the discipline

study of methods of installation, adjustment and operation of automation equipment for modern industrial equipment, which is part of a complex hierarchical automated control system for technological processes, study of standard methods of installation and adjustment of information and control systems equipment.

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 9 Able to apply the acquired knowledge to the selection and implementation of design and develop intelligent systems for controlling technical systems and technological processes, train artificial neural networks, apply software and hardware methods for implementing artificial neural networks and fuzzy control algorithms, to apply received knowledge to the solution of issues of selection and implementation of corporate systems and information technologies for solving management problems.

Learning outcomes by discipline

Upon completion of the development of the discipline Conduct research and analysis of mathematical models of robotic and mechatronic systems using the methods of automatic control theory, computer technology and modern software.
And gets the competence: he Knows the methods of developing robotic control systems.

Prerequisites

Programmable logic controllers

Postrequisites

Final examination

Automation of industrial plants and facilities

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline includes the main issues of automation of industrial facilities and productions, complex control systems are considered, a systematic approach to managing complex systems, optimal control algorithms, mathematical models of control objects, technological and technical systems are presented, calculation and modeling of single-circuit, combined and cascade ASR using the MATLAB program of the SIMULINK package are studied. SCADA systems, industrial automated control system support networks and industrial facility management systems are considered.

Purpose of studying of the discipline

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.

Learning outcomes by discipline

When completing the development of the discipline, Apply in practice the justification for the choice of regulated, controlled, signaled parameters and assesses the technical means of automation and control.
And gets the competence: Develops algorithms and software for microcontrollers in control systems.

Prerequisites

Diagnostics and reliability of components and systems automation

Postrequisites

Final examination

Automation of typical technological and logical processes

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline includes the main issues of automation of technological equipment. The equipment is presented as a control object, dynamic and static properties of objects are studied. Methods and methods of determining and calculating regulators of local control systems are studied. The classification of objects, the choice of automation algorithms, the selection of elements of automation

equipment, their settings and operation are also studied. Issues of receiving transmitting and processing technological and control information.

Purpose of studying of the discipline

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.

Learning outcomes by discipline

When completing the development of the discipline, Apply in practice the justification for the choice of regulated, controlled, signaled parameters and assesses the technical means of automation and control.
And gets the competence: Develops algorithms and software for microcontrollers in control systems.

Prerequisites

The reliability of control systems.

Postrequisites

Final examination

Automation of typical technological processes.

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline includes general issues of building typical automation objects, classification of objects, selection of automation algorithms, selection of elements of technical automation tools and their configuration and operation. The analysis of both local automation systems and complex systems is presented: with distributed parameters, digital, automated control systems. Automation schemes of periodic and discrete processes, methods for describing discrete and logical control tasks, transients of digital control systems are studied.

Purpose of studying of the discipline

The purpose of studying the discipline is to prepare a bachelor for an independent solution of theoretical and applied problems of automation of technological processes in various industries.

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of control systems.

Learning outcomes by discipline

When completing the development of the discipline, Apply in practice the justification for the choice of regulated, controlled, signaled parameters and assesses the technical means of automation and control.
And gets the competence: Develops algorithms and software for microcontrollers in control systems.

Prerequisites

Diagnostics and reliability of control systems

Postrequisites

Final examination

Prediploma practice

Discipline cycle	Profiling discipline
Course	4
Credits count	15
Knowledge control form	Total mark on practice

Short description of discipline

During the period of pre-diploma practice, students, along with the collection of materials on the degree design, should be involved in solving the current production problems.
The main range of issues studied by students: familiarization with the basic principles and methods of managing technological processes that exist in the enterprise.

Purpose of studying of the discipline

The purpose of the undergraduate practice is to complete the writing of the thesis (project)

Learning Outcomes

ON 3 Able to explore and design functional structures, separate types of support for different types of technical control objects, develop models of automated information processing and control systems, to apply various methods of nonparametric identification to construct adequate mathematical models; the ability to describe and apply parametric methods for the identification of models of control objects; methods of identification of nonlinear systems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

Acquire practical skills in the development and design of functional tasks, functional subsystems in accordance with the theme of the diploma project.

Prerequisites

Production practice 3

Postrequisites

Final examination

Production practice 3

Discipline cycle	Profiling discipline
Course	4
Credits count	15

Knowledge control form | Total mark on practice

Short description of discipline

Industrial practice 3 is one of the important stages for consolidating the competencies formed as a result of the knowledge acquired by students in the IT specialty at the university. The practice is aimed at consolidating general cultural, professional and specialized professional competencies, as well as at supplementing the knowledge acquired by students in all disciplines, and ensuring the possibility of their use in order to solve problems arising in enterprises, institutions, and industries.

Purpose of studying of the discipline

deepening students` knowledge through practical study of automation and informatization of production facilities and systems; consolidation of theoretical and practical knowledge gained by students in the study of basic and specialized disciplines; study of job responsibilities of technical employees of enterprises; economic issues of organization and planning of production; issues of ensuring the safety of life in the enterprise.

Learning Outcomes

ON 3 Able to explore and design functional structures, separate types of support for different types of technical control objects, develop models of automated information processing and control systems, to apply various methods of nonparametric identification to construct adequate mathematical models; the ability to describe and apply parametric methods for the identification of models of control objects; methods of identification of nonlinear systems.
ON 10 Owns methods of development of robotic control systems.

Learning outcomes by discipline

1) approval of general cultural, professional and specialized professional competencies;
2) demonstrate the knowledge gained in all disciplines studied at the university ;
3) Apply the knowledge gained at the University in order to solve problems encountered at enterprises, institutions, production facilities, etc.

Prerequisites

Industrial practice 2

Postrequisites

Prediploma practice