NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

6B07 - Engineering, Manufacturing and Civil engineering
(Code and classifcation of the feld of education)

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

0710
(Code in the International Standard Classifcation of Education)

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

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

Bachelor
(Level of preparation)

Semey

Educational program

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)

Semey 2023

PREFACE

Developed

The educational program 6B07104 - Automation and control in the direction of preparation 6B071 - Engineering and engineering trades on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymkhan Gulnur	Dean of the Faculty of Engineering and Technology, PhD	
Educational program manager	Zolotov Alexander	Associate Professor the Department of Automation, Information Technology and Urban Planning	
Member of the AC	Kozhakhmetova Dinara	Head of the Department of Automation, Information Technology and Urban Planning, PhD	
Member of the AC	Ospanov Erbol	Associate Professor the Department of Automation, Information Technology and Urban Planning	
Member of the AC	Maxim Kolbin	Chief Engineer of Spetsmontazhproekt LLP	
Member of the AC	Kidirbayev Ayan	Director of RTC - installation LLP	
Member of the AC	Abylay Orynbasarov	EP 6B07104-automation and control, Student of the AU-001 group	
Member of the AC	Aset Masalimov	EP 6B07104-automation and control, Student of the AU-001 group	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Zhumagazhinov Askar	Teplokommunenergo LLP	

Reviewed

At the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4/6 «10» April 2023
Chairman of the Commission on Quality Assurance Abdilova G.B.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

Approved

at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

Content

1.Introduction

1.1.General data

Training according to the educational program 6B07104 "Automation and control" is carried out at the Department of "Automation, Information Technologies and Urban planning" of the Faculty of Engineering and Technology of the "Shakarim Semey University". The developers are both teachers of the department who have extensive professional experience both in the scientific and pedagogical sphere and in production, as well as stakeholders interested in obtaining specialists of this profile. Having mastered this educational program, graduates acquire the skills and abilities of theoretical and experimental research in complex engineering activities in the field of automation and control; apply progressive methods of operation of automation and control systems equipment, apply modern methods for the development of energy-saving and environmentally friendly automation and control systems that ensure the safety of human life and their protection from possible consequences of accidents, catastrophes and natural disasters, gain knowledge and skills focused on the creation of robots and robotic systems with elements of artificial intelligence. The novelty of this program is its content uniqueness, which consists in the ability to combine the design and programming in one course of both control systems built on a modern element base, and the study of mechatronics- an applied science engaged in the development and operation of intelligent automated technical systems for their implementation in various spheres of human activity. Graduates of this educational program will master the latest design tools and methods, such as methods of artificial intelligence, digital information processing, modeling of complex dynamic systems, and many others.
The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

1.2.Completion criteria

The main criterion for the completion of the educational process in the preparation of bachelors is the acquisition of at least 205 credits of theoretical training, as well as at least 27 credits of practice, not 8 credits for the preparation of diplomas. Total 240 credits.

1.3.Typical study duration: Duration of training: 4 years

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	The development of students theoretical knowledge and practical skills that allow graduates to understand and apply fundamental and advanced knowledge to monitor and control technological processes and production and to formulate and solve engineering problems
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B07 - Engineering, Manufacturing and Civil engineering
Code and classification of the direction of training	6B071 - Engineering and engineering trades
Code in the International Standard Classification of Education	0710
Code and classification of the educational program group	B063 - Electrical Engineering and Automation
Code and name of the educational program	6B07104 - Automation and control
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Engineering and Technology in the educational program-Automation and Control
Name of the profession / list of positions of a specialist	- positions of managers - the master of the site, the head of the shop (site), the producer of works, the master of the shop, the shift supervisor, the head (head of the workshop); - positions of specialists - design engineer, laboratory engineer, production management engineer, equipment commissioning and operation engineer, software engineer. - positions of senior, scientific and technical employees, common for research, design, technological, design organizations: technician, laboratory assistant, design engineer
OQF qualification level (industry qualification framework)	6
Area of professional activity	Graduates are prepared to work in the field of automation, informatization and management in technical systems, technological systems, systems related to the use of information processing tools and methods for management in all areas of production
Object of professional activity	Automated control systems for technological processes of various industries, automated information and control systems for various purposes, automated systems for receiving, processing and transmitting data for various purposes, automated systems for designing systems, objects, devices, automated systems for technological preparation of production of various industries, automated systems for complex testing of parts, products, assemblies, devices in various industries.
Types of professional activity	- service and operational; - production and technological; - organizational and managerial; - design and engineering.
Graduate Model	Graduate Model OP

	6B07104 "Automation and control" According to the results of the training, the student receives: 1.Professional competencies: - To develop control algorithms and their software and hardware for control systems; - To apply in practice the justification for the choice of regulated, controlled, signaled parameters and to assess the technical means of automation and control; - Explain the principles of organization and architecture of automatic and automated control and management systems for objects and processes in various sectors of the national economy; - To evaluate the methods of analysis of computational and information processes related to the functioning of automation and control systems software; - Develop algorithmic and software tools and systems for automation and process control; - Apply the physical and mathematical apparatus to solve computational and analytical problems arising in the course of professional activity; - To choose methods, develop decision-making algorithms and modify hardware and software of nodes and devices of mobile communication systems, - to use the basic laws of natural science disciplines in professional activity, to apply methods of mathematical analysis and modeling, theoretical and experimental research; - use specialized software to solve the tasks of managing technological objects; - to choose tools when designing control automation systems, to program and debug systems based on microcontrollers; - to use optimal standards of measurement accuracy and control reliability, to choose technical means of automation, control, diagnostics, testing and process management; - To use in practice the principles, methods and methods of integrating hardware and software when creating automation and control systems; - To evaluate the issues of the use of electrical equipment in the means and methods of measuring electrical quantities. - To use the fundamental principles of building control systems, classification of systems according to the main algorithmic features and corresponding algorithmic schemes, to determine the advantages and disadvantages of closed and open systems, the role of feedback in control systems; - 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; - to use the basic laws of natural science disciplines in professional activity, to apply methods of

	mathematical analysis and modeling, theoretical and experimental research; - to use technological and functional standards, modern models and methods for assessing quality and reliability in the design, construction and debugging of automatic control and control systems, to determine the tasks of optimal control of technological processes using a computer; - Apply methods for calculating control systems based on linear and nonlinear continuous and discrete models under deterministic and random influences. - to assemble automation tools for technological processes and productions; - Possess the basic methods, methods and means of obtaining, storing, processing information, work with a computer as a means of information management; - to carry out a study of the stability, accuracy and quality of control processes, to develop control algorithms and their hardware and software; -to conduct research and analysis of mathematical models of robotic and mechatronic systems using methods of automatic control theory, computer technology and modern software. 2 Personal qualities of the graduate - has a culture of thinking, is capable of generalization, analysis, perception of information, setting goals and choosing ways to achieve it; - can logically correctly, argumentatively and clearly build oral and written speech; - is able to find organizational and managerial solutions in non-standard situations and is ready to take responsibility for them; - is able to use regulatory legal documents in its activities; - strives for self-development, improvement of their qualifications and skills; - is able to critically evaluate its advantages and disadvantages, outline ways and choose means of developing advantages and eliminating disadvantages; - is aware of the social significance of his future profession, has a high motivation to perform professional activities; - uses the basic laws of natural science disciplines in professional activity, applies methods of mathematical analysis and modeling, theoretical and experimental research; - speaks one of the foreign languages at a level not lower than spoken; - is able to use, generalize and analyze information, set goals and find ways to achieve them in the conditions of formation and development of the information society; he is able to logically correctly, argumentatively and clearly build oral and written speech, possess the skills of conducting discussions and polemics.

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27175 (3010810)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline «Foreign language» assumes the formation of students` intercultural and communicative competencies at B1 level. The discipline is aimed at mastering the knowledge, skills and abilities that allow using a foreign language in interpersonal communication and professional activity. All types of speech activity are taught, such as reading, writing, listening and production of texts of level complexity with a certain degree of grammatical and lexical correctness.

Purpose of studying of the discipline

Formation of intercultural and communicative competence of students in the process of foreign language education at a sufficient level (A2, pan-European competence) and the level of basic sufficiency (B1, pan-European competence). Depending on the level of training, the student at the time of completion of the course reaches the B1 level of the pan-European competence if the language level of the student at the start is higher than the A2 level of the pan-European competence.

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.

Prerequisites

School course

Postrequisites

Foreign language

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27172 (3010808)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at deepening the acquired knowledge of students in the framework of the school curriculum, as well as the use of language and speech means based on a full understanding of vocabulary and grammatical system of knowledge; the formation of socio-humanitarian worldview of students within the framework of the national idea of spiritual revival; free expression of mobile thought as a means of speech communication and in the process of communication; awareness of the national culture of the people, the ability to distinguish features of national cognition.

Purpose of studying of the discipline

Forms through phraseological units the recognition of national culture, its meaning as a linguistic unit related to spiritual culture; skills of identifying facts of national and cultural significance in the formation of Kazakh phraseology.

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.

Prerequisites

School course

Postrequisites

Kazakh language

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines

Discipline component	University component
SubjectID	27176 (3012261)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The integrated discipline includes the main issues and principles in the field of fundamentals of law and anti- corruption culture, economics, entrepreneurship and leadership, ecology and life safety. Features of the use of regulatory legal acts, the ability to use the business, ethical, social, economic, entrepreneurial and environmental standards of society. Specifics of environmental-legal, economic, entrepreneurial relations, leadership qualities and principles of combating corruption.

Purpose of studying of the discipline

It consists in studying the basic patterns of the functioning of living organisms, the biosphere as a whole and the mechanisms of their sustainable development under the conditions of anthropogenic impact and emergency situations; in understanding the concept of corruption, the legitimacy of the fight against it, the content of the state penal policy; in the formation of students` basic fundamental stable knowledge on the basics of economic theory, in instilling the skills and abilities of economic thinking; in introducing students to the theory and practice of entrepreneurship, to the basics of creating their own business; in the formation of theoretical knowledge and practical skills for the development and improvement of leadership qualities.

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.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27174 (3010809)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; for teaching students practical mastery of the Russian language in various areas of communication and various situations, mastering the specifics of functional semantic types and genres of functional styles of speech, enriching the vocabulary with special vocabulary, forming and improving the skills of monologue and dialogic speech.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

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.

Prerequisites

School course

Postrequisites

Russian language

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	32967 (3010814)

Course	1
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, preparing students for participation in mass sports competitions; forms motivational and value attitudes towards physical culture and the need for systematic physical exercises and sports; gives basic knowledge about the use of physical culture and sports in the development of vital physical qualities.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
School course

Postrequisites
Physical Culture

Mathematics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27648 (3010892)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The purpose of this course is to provide students with fundamental training in mathematics. The course is aimed at forming a sufficiently high culture of mathematical thinking among students and developing the ability to creatively approach problem solving. In addition to studying the fundamental foundations of higher mathematics (elements of analytical geometry, linear algebra, mathematical analysis, differential equations), the course assumes consideration of various applications of mathematics to solving production problems from the field of professional specialization.

Purpose of studying of the discipline
creation of the basis for the development of logical thinking and mathematical culture. Formation of basic knowledge and acquisition of basic skills of using mathematical apparatus for solving theoretical and applied problems, as well as the necessary level of mathematical training for mastering other applied disciplines studied within a specific profile; skills of working with special mathematical literature

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.

Prerequisites
School course

Postrequisites
Methods of optimization of technological process management

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27653 (3010811)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
The discipline is aimed at expanding language literacy, free communication with the environment and mental and ideological skills of the student, understanding the role of language in the process of mastering world- class knowledge through the formation of a future specialist`s worldview based on national consciousness and cultural code, improving the knowledge of the state language by future specialists, increasing the scope of use of the Kazakh language by specialists.

Purpose of studying of the discipline
Ensuring high- quality mastery of the Kazakh language as a means of social, intercultural, professional communication through the formation of communicative competencies at all levels of language use.

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.

Prerequisites
Kazakh language

Postrequisites
World of Abai

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27655 (3010813)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline
Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

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.

Prerequisites
Foreign language

Postrequisites
Information and communication technology

History of Kazakhstan

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27656 (3010898)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Qualification examination

Short description of discipline
The main stages of the history of Kazakhstan are studied with: nomadic statehood, Turkic civilization, the era of colonialism, the Soviet period, independence. The driving forces, trends, patterns of historical development are analyzed; problems: ethnogenesis of the Kazakh people, the formation of statehood, national liberation movements, demographic development. The skills of analyzing historical events and facts, working with historical literature are being formed.

Purpose of studying of the discipline
The purpose of the discipline is to provide objective knowledge about the main stages of the development of the history of Kazakhstan from ancient times to the present.
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.
Prerequisites
School course
Postrequisites
Final examination

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	32959 (3012260)
Course	1
Term	2
Credits count	8
Lections	30hours
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	55hours
Independent work of the student	110hours
Total	240hours
Knowledge control form	Examination

Short description of discipline
The module of socio-political knowledge involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; generality of the methodology of learning, result-oriented; unified system representation of the typology of learning outcomes as formed abilities.
Purpose of studying of the discipline
Formation of social and humanitarian worldview of students in the context of solving the problems of modernization of public consciousness, defined by the state program "Looking into the Future: Modernization of Public Consciousness".
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.
Prerequisites
School course
Postrequisites
Basic and profile disciplines of the EP

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27654 (3010812)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; to teach the scientific style of speech as a language of specialty, the creation of secondary texts, the formation of skills for the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication, instilling the skills of speech etiquette, business rhetoric.
Purpose of studying of the discipline
The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.
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.

Prerequisites

Russian language

Postrequisites

World of Abai

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	32968 (3010815)
Course	1
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, the ability to exercise control and self-control in the process of classes, gaining knowledge on health promotion, hardening and increasing the body`s resistance to the effects of adverse factors of labor activity, mastering methods of selection of physical exercises and sports.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites

Physical Culture

Postrequisites

Physical Culture

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	32969 (3010816)
Course	2
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; increasing the level of physical fitness and developing physical qualities; mastering the technique of sports; education of discipline, collectivism, comradely mutual assistance; education of mental stability, development and improvement of basic motor qualities - endurance, strength, speed, dexterity, flexibility.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites

Physical Culture

Postrequisites

Physical Culture

World of Abai

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27671 (3010891)
Course	2
Term	1

Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying historical facts, the philosophical and artistic foundations of the works of Abay Kunanbaev, Shakarim Kudaiberdiev, which form worldview and aesthetic values, the student`s ability to express his opinion, practical skills and perception of such human qualities as morality, honesty, artistic character. The genius of the writers of Kazakh literature and the role of M. Auezov in the study and popularization of Abai`s heritage, the significance of his works for history, literature and science are determined.

Purpose of studying of the discipline
Formation of the meaning of philosophical and ideological being, understanding of the problems raised in the works of Abai Kunanbayuly, Shakarim Kudaiberdiuly, Mukhtar Auezov and application of the acquired knowledge in the practice of everyday life.

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.

Prerequisites
Kazakh language

Postrequisites
Final examination

Information and communication technology

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27672 (3012259)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at mastering the conceptual foundations of the architecture of computer systems, operating systems and networks by students; formation of the ability to critically understand the role and signifcance of modern information and communication technologies in the era of digital globalization, new "digital" thinking, knowledge about the concepts of developing network and web applications, skills in using modern information and communication technologies in various felds of professional activity, scientifc and practical work, for self-educational and other purposes.

Purpose of studying of the discipline
Formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies

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.

Prerequisites
Foreign language

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	32970 (3010817)
Course	2
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; acquisition of versatile abilities and skills for the development of physical abilities, socio-cultural experience and socio-cultural values of physical culture and sports; development of communication skills, thinking, self-development, the formation of experience in the implementation of sports and recreational and training programs.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites

Physical Culture

Postrequisites

Final examination

Philosophy

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	27763 (3010807)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at developing students` openness of consciousness, understanding their own national code and self-consciousness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, a holistic view of philosophy as a special form of understanding the world, mastering key worldview concepts, as well as the development and strengthening of the values of tolerance, intercultural dialogue and a culture of peace.

Purpose of studying of the discipline

Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities.

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.

Prerequisites

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites

Basic and profile disciplines of the EP

Organization and planning of production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27852 (3010894)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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.
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Cost management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27851 (3010895)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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.
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Economics of enterprise

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27853 (3010893)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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.
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Module 2. Microelectronic devices

CAD microelectronic circuits

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	32150 (3010888)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

Principles of construction, purpose of creation, composition and basic principles of construction of CAD systems for microelectronic devices. Stages of CAD creation. CAD software. Computer- aided design system Micro- Cap and P- CAD. Connecting libraries with elements of design of electronic devices. Hierarchy of models

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.

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
Discipline component	Electives
SubjectID	27666 (3010889)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

Principles of construction, purpose of creation, composition and basic principles of construction of CAD systems for microelectronic devices. Stages of CAD creation. CAD software. Computer- aided design system Micro- Cap and P- CAD. Connecting libraries with elements of design of electronic devices. Hierarchy of models.

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.

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
Discipline component	Electives
SubjectID	27658 (3010824)

Course	2
Term	1
Credits count	3
Lections	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
Modern electronic modules are characterized by a wide use of surface mounted elements: "chip" resistors and capacitors, miniature enclosures of integrated circuits (IC), plastic and ceramic crystal carriers, etc., which allows to abandon boards with metallized holes, simplify installation elements and increase the reliability of electronic units. The technology of surface mounting (SMT) has significant constructive and technological advantages: increasing the density of the layout of elements in 4-6 times; reduction of mass-dimensional indicators in 3-5 times; Increase of speed and noise immunity due to absence of component outputs.
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
Prerequisites
Computer graphics and bases of ADS
Postrequisites
Installation, commissioning and operation of tools and automation systems

Interfaces of robotic systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27735 (3010886)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
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
Prerequisites
Optimal control system
Postrequisites
Design of automated systems

Development of user interfaces.

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27727 (3010885)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours

Total	150hours
Knowledge control form	Examination

Short description of discipline
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
Prerequisites
Optimal control system
Postrequisites
Design of automated systems

Data transmission systems and automation and control interfaces

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27741 (3010897)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Purpose of studying of the discipline
Learning Outcomes
ON 7 Able to studies the basic principles and devices for processing and transmission of information
Prerequisites
Methods of optimization of technological process management
Postrequisites
Design of automation and remote control systems

PIC Microcontrollers

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27771 (3010823)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Microcontrollers, basic concepts, definitions and classifications. Local PLC. Network complex controllers. CSF small scale. Full-CSF. The composition and structure of microprocessor systems. Programmable parallel, serial interfaces, structure interface types. Composition and structure of the basic model of microprocessor controllers. Software microprocessor controllers. Tehnicheskiesredstva implementation of industrial networks Profibus, CAN, DeviceNet, CANopen, Interbus, AS-Interface, ControlNet, Foundation Fieldbus and typical fields of application. Real time operating system, the structure of a resident of a special PC SOFTWARE-cheniya programming languages. The mathematical description of a typical loop digital control. Rea-lization digital control of model laws, and RMS-position-speed algorithms. Criteria for the quality of regulation-tion, the stock steadily-sti, performance. Overview of the main characteristics of the Industrial Logic Controllers- moat firms TREI, and their capabilities. Description of the work and purpose. Application area. Composition. Layouts. Description and Operation mo-modules
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.

Prerequisites

Software for microcontrollers and industrial controllers

Postrequisites

Design of automated systems

Programmable logic controllers

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27766 (3010822)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Microcontrollers, basic concepts, definitions and classifications. Local PLC. Network complex controllers. CSF small scale. Full-CSF. The composition and structure of microprocessor systems. Programmable parallel, serial interfaces, structure interface types. Composition and structure of the basic model of microprocessor controllers. Software microprocessor controllers. Tehnicheskiesredstva implementation of industrial networks Profibus, CAN, DeviceNet, CANopen, Interbus, AS-Interface, ControlNet, Foundation Fieldbus and typical fields of application Real time operating system, the structure of the resident of the special software, programming languages. The mathematical description of a typical loop digital control. The implementation of digital control of model laws, the position and speed of the algorithm. Criteria for quality control, supply stability, speed.
Overview of the main characteristics of industrial logic controllers of TREI, and their opportunities. Description of the work and purpose. Application area. Composition. Layouts. Description and operation units

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.

Prerequisites

Application software of control systems

Postrequisites

Design, installation, commissioning and maintenance of automation systems

Industrial Controls

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27765 (3010821)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Microcon-trollers, basic concepts, defined-tion and classification. Local PLC. Network Controllers-ditch complex. CSF small scale. Full-scale DCS. The composition and structure of microprocessor systems. Programmable parallel, serial interfaces, structure interface types. Composition and structure of the basic model of micro-processor controller.

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.

Prerequisites

Software for microcontrollers and industrial controllers

Postrequisites

Design of automation and remote control systems

Module 3. Microcontrollers in control systems

Microelectronics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27660 (3010825)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Classification, system of symbols and basic parameters of digital integrated circuits. Synthesis and study of the simplest logic circuits. . Logical functions and their transformation. The study of logic circuits and functions. Synthesis of combinational digital devices. Decoders and multiplexers.

Purpose of studying of the discipline

Formation of students ` knowledge on the basics of electronics methods of design and calculation of electronic devices

Learning Outcomes

ON 2 Owns various kinds of design and operating principle of operation microelectronic devices.
ON 4 Develops algorithms and software for microcontrollers in control systems.

Prerequisites

Theoretical bases electrical engineers

Postrequisites

Software for microcontrollers and industrial controllers

Nanoscale electronic devices and novel simulation techniques

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27679 (3010827)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Molecular wires. Silicone deposition. Quantum dots: one-electron transistors (SET). Single-electron Transistor SET. Nanoprovoda. Wiring. Sensors based on Si-NW. Nanobioelectronics. Magnetic and molecular technologies. CAD tools for modeling at the molecular level. Introduction to the physics of carbon devices: CNT, Grafen. Wiring. Schemes and Architecture. Nano-devices based on metal. Nano-devices based on silicon. Nano-devices based on 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.

Prerequisites

Microelectronics

Postrequisites
Technology of installation in microelectronics

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

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27673 (3010826)
Course	2
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The fundamentals of resistance theory. Basics of measuring impedance. Correlation between the current and voltage in AC circuits - the temperature and the factors of the dependences of the components. AC characteristics of diodes and transistors and other semiconductor components. Analysis of the nanolayer on semiconductors. Fundamentals of nanocrystalline solar cells. Impedance analysis of solar panels. The use of direct current to test the efficiency of solar cells. Photovoltaic instruments and methods for characterization.
it.
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.
Prerequisites
Microelectronics
Postrequisites
Programmable logic controllers

Software for microcontrollers and industrial controllers

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27724 (3010875)
Course	2
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Modern management tools require the use of flexible reconfigurable hardware, the most important of which are programmable logic controllers. Programmable controllers are embrace of the most complex technical systems, automation and control systems, and therefore require a basic knowledge in the field of software and programming..
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.
Prerequisites
Microelectronics
Postrequisites
Industrial Controls

Software and hardware complexes management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27826 (3010844)
Course	3
Term	2

Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The basic concepts of SCADA-systems. Selection of SCADA-systems. Hardware sredst Islands. Real time operating system. Industrial networks. Review protocol products. IEC IEC1131-3. SCADA-system Trace Mode. SCADA-system Plcwin, Genesis for Windows, Genie for Win-dows. SCADA-System SIMATIC WinCC

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

Prerequisites

Dispatch control system

Postrequisites

Design of automated systems

Design of systems based on programmable logic integrated circuits

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27836 (3010862)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Tehnicheskiesredstva implementation of industrial networks Profibus, CAN, DeviceNet, CANopen, Interbus, AS- Interface, ControlNet, Foundation Fieldbus and typical fields of application. Real time operating system, the structure of a resident of a special PC SOFTWARE-cheniya programming languages. The mathematical description of a typical loop digital control. Rea- lization digital control of model laws, and RMS-position-speed algorithms. Criteria for the quality of regulation-tion, the stock steadily-sti, performance.Overview of the main characteristics of the Industrial Logic Controllers- moat firms TREI, and their capabilities. Description of the work and purpose. Application area. Composition. Layouts. Description and Operation mo-modules

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.

Prerequisites

Control methods intelligent systems

Postrequisites

System of electric drive control

Automated electric drive

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32960 (3010864)
Course	4
Term	1
Credits count	5
Lections	15hours

Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Logical management of electric drives. The mathematical description and principles of construction management systems. Closed systems control the speed and torque of the electric DC speed control system of the asynchronous electric drive control system of technological systems management software implementation.

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.

Prerequisites
Software and hardware complexes management

Postrequisites
Final examination

System of electric drive control

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27868 (3010865)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
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

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.

Prerequisites
Software and hardware complexes management

Postrequisites
Final examination

Packaging technologies in microelectronics

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32961 (3010854)
Course	4
Term	1

Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
Assembly Technology in microelectronics. The levels of the Assembly. The technology of Assembly of micromodules by surface mounting. Mounting of semiconductor crystals. Installation of microelectromechanical systems. Specialized mounting.
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
Prerequisites
Microelectronics
Postrequisites
Final examination

Module 4. Theoretical bases of control systems.

Introduction to the profession

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27651 (3010899)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline "introduction to the profession" is aimed at developing students` knowledge gained in the school course of computer science and the formation of students` professional and technical ideas about information technology, computer technology and software. The discipline is also based on the formation of views on the prospects of IT specialties and their work activities and on the continuation of knowledge in the field of IT after graduation from the bachelor`s degree program.
Purpose of studying of the discipline
The main purpose of studying the discipline "introduction to the profession" is to master the theoretical foundations of information technology necessary for the study, understanding and development of applied information technologies and systems.
Learning Outcomes
ON 6 Able to studies the basic principles and methods of construction of control systems.
ON 7 Able to studies the basic principles and devices for processing and transmission of information
Prerequisites
School course
Postrequisites
Technical means of automation and control

Theoretical bases electrical engineers

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27657 (3010820)
Course	1
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
Direct current circuits. Nodal potentials method. Equations of state of the circuit in matrix form: Transformations, linear electrical circuits. The basic properties of electrical circuits. The principle of superposition, the property of reciprocity, input and mutual conductance of the branches. Compensation theorem.

Purpose of studying of the discipline
Teaching students the basics of electrical engineering, necessary for the study of special disciplines and practical activities in the specialty: creation and use of automated devices and technical conditions for managing production processes; theoretical and practical training of specialists for the selection of the necessary electrical and electrical measuring instruments.

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.

Prerequisites
School course

Postrequisites
Microelectronics

Educational practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32964 (3010870)
Course	1
Term	2
Credits count	2
Study practics	60hours
Total	60hours
Knowledge control form	Total mark on practice

Short description of discipline

Purpose of studying of the discipline
- Consolidation and deepening of theoretical knowledge gained in the learning process;
- Acquiring the first skills in research activities, skills and abilities in accordance with the specialty of training;
-Gaining primary skills in working with applied Microsoft office programs;
-Improving the skills of working with a personal computer and the use of information technology;
- Consolidation of the passed material when performing individual tasks.

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

Prerequisites
Basic and profile disciplines of the EP

Postrequisites
Industrial practice 1

Methods of optimization of technological process management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27686 (3010837)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Optimal control system. Optimal control problems, optimality criteria. Methods of optimal control theory. The necessary and sufficient conditions for a minimum of smooth functions of one and several variables. Basic numerical methods of unconditional minimization, (methods of zero, one of the first and second order). Task convex-logo program. The Lagrangian. the problem of linear programming pro. Simplex method for solving linear programming-ming. Optimization on graphs. The Pontryagin Maximum Principle. The simplest problem of variational calculus. 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.
Prerequisites
Mathematics
Postrequisites
Linear systems of automatic control

Optimal control system

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27701 (3010839)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Optimal control system. Optimal control problems, optimality criteria. Methods of optimal control theory. The necessary and sufficient conditions for a minimum of smooth functions of one and several variables. Basic numerical methods for unconstrained minimization (methods of zero, first and second order). Convex programming problem. The Lagrangian. linear programming problem. Simplex method for solving linear programming problems. Optimization on graphs. The Pontryagin Maximum Principle. The simplest problem of variational calculus. 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.
Prerequisites
Mathematics
Postrequisites
Nonlinear systems of automatic control

Modeling and identification of objects of management

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27661 (3010840)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
On-ing information about mathematical models of a mo-and their classification. The set of models, structure models. Lee-linear models and sets-linear models of basic definitions. The general scheme of Identification-tion. The main stages of identification. Priori and a posteriori information. Criteria and indicators of the quality of identification .. Structures Nye statistical identification. Statistical tests were made. Criteria and methods of orientation- causal relation- ny coordinate model. Organization of statistical decision- making procedures at the stage of identification of the model structure. Methods of identifi- cation based on the simplest TEN- tiruyuschih signals. Determination of the frequency characteristics. Approximation-tion of the experimental frequency characteristics. Defining re-Khodnev characteristics. Approximation- tion time characteristics. Eden fication based methods Rate- tion. The main methods for estimating the parameters. Estimation by the method of least squares. Markov evaluation. Estimates by the method of maxi mum likelihood estimation of the minimum average risk. Bayesian estimation. technology to implement algorithms
Purpose of studying of the discipline
Suggest the SIS- dark approach, considering the process of constructing a mathematical model of evolution as a developing Zion

procedure

Learning Outcomes

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

Prerequisites

Introduction to the profession

Postrequisites

Information and Control Systems. (course work)

Industrial practice 1

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32965 (3010871)
Course	2
Term	2
Credits count	5
Working practice	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline

Purpose of studying of the discipline

Acquaintance with the activities of enterprises, organizations and institutions with a sufficient level of automation, the acquisition of the first skills in the practical use of measuring instruments and automation.

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.

Prerequisites

Educational practice

Postrequisites

Industrial practice 2

System modeling software

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27844 (3010896)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

History of development and purpose of specialized software packages for dynamic systems modeling. Types of models and modeling. The value of circuit simulation programs. The program of circuit modeling in Windows Electronics WorkBench 5.12 c. Basic concepts of automatic control systems

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.

Prerequisites

PCS Software.

Postrequisites

Design, installation, commissioning and maintenance of automation systems

Methods of scientific research

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27855 (3016167)
Course	4
Term	1

Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
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
Prerequisites
Introduction to the profession
Postrequisites
Final examination

Methods and means of scientific research

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27857 (3016165)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
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
Prerequisites
Metrology and measurement
Postrequisites
Final examination

Processing of experimental data

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27856 (3016166)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
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
Prerequisites
Metrology and measurement
Postrequisites
Final examination

Technologies and Applications of Superconductive Materials

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32945 (3010853)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
Superconductivity (The Basic Properties of Superconductors, Critical Parameters, Classification and Magnetization). . Brief Introduction to Fabricating Technologies of Practical Superconducting Materials. .High Temperature Superconductivity (Overview of Superconducting Materials with Tc.Higher than 23 K). Applications of Superconductor in Electronics eg. Electromagnetic Energy Converters. Applications in Magnet Technologies and Power Supplies. Superconductivity in Nanoscale Systems.

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

Prerequisites
Microelectronics

Postrequisites
Final examination

Module 5. Receiving, processing and transmitting information.

Metrology and measurement

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27664 (3010874)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Measurement of electrical quantities Electromechanical instruments and transducers Digital measurement instruments Detection and elimination of systematic errors. .Knows the prospects and trends in the development of management information technologies; principles of operation, technical characteristics and design features of the developed and used measuring instruments

Purpose of studying of the discipline
The objectives of practical Metrology are metrological support of production, i.e. the establishment and application of scientific and organizational foundations, technical means, rules and norms necessary for OEI and the required accuracy of measurements.

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

Prerequisites
Introduction to the profession

Postrequisites
Methods and means of scientific research

Technical means of automation and control

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	27663 (3010848)
Course	2
Term	1
Credits count	5

Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Electric cars of a direct current Electric machines of an alternating current Dynamics of open electric drives Closed electric drive Control of valve converters in drives Discrete drive with stepper motors.

Purpose of studying of the discipline
Subject "Technical means of automation and management" contributes to the following objectives of professional activities:
obtaining General ideas about the design principles of modern industrial machinery, units and production complexes.
mastering the methods, techniques, and methods of selecting automation tools for industrial mechanisms, aggregates, and technological complexes.

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

Prerequisites
Introduction to the profession

Postrequisites
Applied Information Theory

Fundamentals of Information Processes

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27714 (3010851)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The concept of information. Stages of treatment of information: perception, preparation, transmission and storage, processing and use of information. Information systems and data transmission systems. Basic concepts and definitions. Semantic, syntactic and pragmatic information. Quantitative assessment of the information. Structural measures information. Geometric measure. Combinatorial measure. Additive measure (measure Hartley). The concept of a signal and its model. Presentation of deterministic signals: time, frequency, and vector (geometry). Spectra of periodic and non- periodic signals. Sampling and quantization. General formulation of the problem. Quantization signals. The quantization noise. Quantization signals in the presence of interference.

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.

Prerequisites
Mathematics

Postrequisites
Dispatch control system

Basics of collecting and information transfer

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27711 (3010850)
Course	2

Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of 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.

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.

Prerequisites

Technical means of automation and control Mathematics

Postrequisites

Local Area Networks

Applied Information Theory

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27703 (3010849)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The concept of information. Stages of treatment in-formation: perception, preparation, transmission and storage, processing and use of information. Infor-mation systems and re-giving information. Basic concepts and definitions. Semantic, syn taksicheskaya pragmatic and in-formation. Quantitative assessment of the information. Structural measures information. Geometric measure. Combinatorial measure. Additive measure (measure Hartley). The concept of a signal and its model. Presentation of deterministic signals: VRE- mennaya, frequency and vector (geo metric). Spectra of periodic and non-periodic-ray signals. Sampling and quantization. General formulation of the problem. Quantization signals. The quantization noise. Quantization signals in the presence of interference.

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.

Prerequisites

Technical means of automation and control Mathematics

Postrequisites

Wireless control systems

Linear systems of automatic control

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	27823 (3010841)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The equation of dynamics and statics of automatic control systems. Description in the form of differential equations. Transmission function. Transfer functions of elements of automatic control systems. Proportional, integrating, differentiating links. Time and frequency characteristics of the proportional, integrating, differentiating link. Determination of SAR transfer functions using structural transformation methods.

Purpose of studying of the discipline

Training of a highly qualified specialist who knows the basics of the theory of automatic regulation and is able to perform calculation work on the development, implementation and operation of linear automatic control systems with extensive use of modern element base, automation devices

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.

Prerequisites

Methods of optimization of technological process management

Postrequisites

Nonlinear systems of automatic control

Diagnostics and reliability of control systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27827 (3010845)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The concept of quality and reliability. Hoz mainly the definitions and the Cree-ter reliability. The main stages of calculating the reliability of components and systems. Stick quantitative reliability. Indicators on- reliability hardware auto- mation. Basic laws of probability distributions used in reliability theory. Methods- defined division of reliability indices. Methods for calculating the reliability of non-redundant equipment automatic control systems. The main stages of the calculation of the reliability of automatic control devices for different types of failures reliability of automatic control systems. Basic concepts and definition of redundancy. Structural redundancy without repairing. Structural redundancy with Sun- emergence. Optimal reserve- ing. Calculation of reliability with in- formational redundancy. Former pluatatsionnye data on the reliability of technical systems and the organization of their collection. The experimental data Efficiency auto-mation systems, methods to improve the efficiency, reliability and automation equipment and systems

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.

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
Discipline component	Electives
SubjectID	27830 (3010847)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Basic laws of probability distributions used in reliability theory. Methods for determination of reliability indices. Methods for calculating the reliability of non-redundant equipment automatic control systems. The main stages of the calculation of the reliability of automatic control devices for different types of failures reliability of automatic control systems. Basic concepts and definition of redundancy. Structural redundancy without repairing. Structural redundancy with recovery. Optimal 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.

Prerequisites
Modeling and identification of objects of management

Postrequisites
Automation of industrial plants and facilities

Information and Control Systems. (course work)

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27825 (3010843)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Assign-set, function, composition, structure, characteristics and classification of information networks. Multilevel-nevye architecture of information networks. Information highway, supertrassy, the core technology of information runs. Species-sti channels. Wired, optovolo-horse, radio, satellite TV. Method of data transmission on the physical layer. Method before chi data link layer. Guidelines and standards for coding and data compression, channel-forming equipment, modes of information transfer. Circuit switching, multi-rate switching channels, quick channel switching, asynchronous transfer mode, fast switching pack-ing, broadcast frames, packet switching. Hosts packet comm tation. Organization of access to packet switched networks into single and batch mode. The configuration of networks on radio channels. Architecture networks using satellites O channels. Architecture and integrated services digital networks on-servicing; Model protocols broadband integrated services digital networks. Network interfaces for asynchronous transfer mode information. Standards pairing information networks. Organization and support server networking. Access to databases of information networks. Tendencies and prospects of development of information networks

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.

Prerequisites

Application software of control systems

Postrequisites

Design of automation and remote control systems

The reliability of control systems.

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27829 (3010846)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The concept of quality and: The concept of quality and reliability. Hoz mainly the definitions and the Cree-ter reliability. The main stages of calculating the reliability of components and systems. Stick quantitative reliability. Indicators on- reliability hardware auto- mation. Basic laws of probability distributions used in reliability theory. Methods-defined division of reliability indices. Methods for calculating the reliability of non- redundant equipment automatic control systems. The main stages of the calculation of the reliability of automatic control devices for different types of failures reliability of automatic control systems. Basic concepts and definition of redundancy. Structural redundancy without repairing. Structural redundancy with Sun-emergence. Optimal reserve-ing. Calculation of reliability with in- formational redundancy. Former pluatatsionnye data on the reliability of technical systems and the organization of their collection. The experimental data Efficiency auto-mation systems, methods to improve the efficiency, reliability and automation equipment and systems

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.

Prerequisites

Modeling and identification of objects of management

Postrequisites

Automation of typical technological and logical processes

Cloud technologies in automation

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27843 (3010881)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Cloud technologies. Application of cloud technologies for processing and storing signals from sensors. OwenCloud. Configuring the connection of programmable logic controllers with OwenCloud. Connecting a programmable relay to OwenCloud. Ethernet and RS-485 interfaces. Owen ModBus RTU.

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

Prerequisites

Mobile device programming

Postrequisites

Internet of Things technologies

Application of mobile systems for remote control

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27839 (3010879)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Protocols and interfaces for wireless and wired data transmission of mobile systems. Connecting databases to mobile systems. Standards for OPC servers and SCADA systems for working with mobile systems. OPC UA. Multi- Protocol MasterOPC Server. TeslaScada. Emulation of sensor signal processing. WEB applications

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

Prerequisites

Fundamentals of programming mobile systems

Postrequisites

The hardware of the Internet of Things

Industrial practice 2

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	32966 (3010872)
Course	3
Term	2
Credits count	5
Working practice	150hours
Total	150hours
Knowledge control form	Total mark on practice

Short description of discipline

Purpose of studying of the discipline

deepening of students` knowledge through practical study of means and systems of automation and informatization of production; consolidation of theoretical and practical knowledge acquired by students in the study of basic and specialized disciplines; study of job duties of technical workers of enterprises; economic issues of organization and planning of production; issues of ensuring the safety of life-activities at 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.

Prerequisites

Industrial practice 1

Postrequisites

Production practice 3

Remote control of the Arduino platform

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27841 (3010880)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours

Total	150hours
Knowledge control form	Examination

Short description of discipline
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
Prerequisites
Programming of mobile applications for Java
Postrequisites
Internet of Things software platforms

Nonlinear systems of automatic control

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	27847 (3010842)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Purpose of studying of the discipline
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.
Prerequisites
Linear systems of automatic control
Postrequisites
Final examination

Wireless control systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27864 (3010831)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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.

Prerequisites
Applied Information Theory
Postrequisites
Final examination

Computer networks

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27862 (3010869)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The architecture of computing systems. The components you-LAN. Distribution of computer resources. Email. File servers. Protocols, con-li and adapters. Workstations. Network software. Peer LAN. Expansion and management LAN. Analysis Combine bridge. Combining the LAN and global computer networks- nye. Data processing, reference model for Open Systems Interconnection. Classification of networks for data distribution methods. Characteristics networks. The organization and functioning of the networks. Network operating systems, basic networking standards means of interaction processes in the network server. Peer means of improving the reliability of the network. Integration of local networks into regional and global networks. Networking Tools, protocols, services, functions, conditioning, maintenance and development of applications, especially implementation. Network operating systems, protocols, services, operation, generation, maintenance, and application development. Global networks. Internet, basic services and services, protocols, standards, and prospects. The practical construction and administration of networks based on switches, D-LINK and CISCO.
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.
Prerequisites
Basics of collecting and information transfer
Postrequisites
Final examination

Local Area Networks

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32962 (3010832)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The architecture of computing systems. The components you-LAN. Distribution of computer resources. Email. File servers. Protocols, con-li and adapters. Workstations. Network software. Peer LAN. Expansion and management LAN. Analysis Combine bridge. Combining the LAN and global computer networks-nye. Data processing, reference model for inter-action of open systems. Class-fication networks, distribution methods for dividing the data. Characteristics networks. The organization and functioning-tion networks. Network operating systems, basic networking standards-thou means of interaction processes-owls in the networks, server. Peer means of improving the reliability of the network. Integra- tion of local networks into regional and global networks. Networking Tools, protocols, services, functions, conditioning, maintenance and development of applications, especially implementation. Network operating systems, protocols, services, valued-conditioning, generation, accompanied-denie and application development. Global networks. Internet, basic services and services, protocols, stan- dards, and prospects. The practical construction and administration of networks based on switches, D-LINK and CISCO

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.
Prerequisites
Basics of collecting and information transfer
Postrequisites
Final examination

Installation, commissioning and operation of tools and automation systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32946 (3010852)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
To give the basic CBE Denia about the features of a typical installation of equipment is used in industrial automation systems.
Requirements for electrical wiring, Tubing. Mounting of boards, panels and cabinets. Installation and exploitation is pressure sensors, Temp-ture. Installation and operation of the level meters.
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.
Prerequisites
Information and Control Systems. (course work)
Postrequisites
Final examination

Design, installation, commissioning and maintenance of automation systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27863 (3010868)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
The purpose and objectives of design. The composition and structure of automated systems and complexes. Stages of design, organization design process information support. Description of the data sets, coding and classification of information, the formation of the database, distributed processing, documenting messages. Workflow logistics. Choice of standard technical means for collecting, transforming information and scaling their metrological characteristics, especially the choice of control computers, microcontrollers and Ethernet. General characteristics of the design documentation. The composition and content of the graphical and text parts of the project and working documentation. Typing design solutions. Graphical representation of the design decisions.

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.
Prerequisites
Programmable logic controllers
Postrequisites
Final examination

Prediploma practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30533 (3010873)
Course	4
Term	2
Credits count	15
Undergraduate practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline
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.
Prerequisites
Production practice 3
Postrequisites
Final examination

Production practice 3

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30535 (3010890)
Course	4
Term	2
Credits count	15
Working practice	450hours
Total	450hours
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.
Prerequisites
Industrial practice 2
Postrequisites

Prediploma practice

Module 6. Mechatronics and robotics.

Computer graphics and bases of ADS

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	26053 (3010855)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The basic rules of design drawings. Con struktorskaya documentation IMAGE-tion, lettering, signs. Iso-mapping elements and symbols of parts of the thread. Working drawings of parts, sketching machine parts, assembly units image. Assembly drawing products. Conversion of the drawing. The concept, types of computer graph-ki. Raster graphics. Vector graphics. Fractal graphics. Hoz mainly the concept of three-dimensional graphics. Presentation of graphical data: formats, ways of describing color palette, driving-system of color. Tools for working with raster graphics. Tools for working with vector graphics. Gra-Graphical editors Corel Draw, AutoCAD, KOMPAS. Geometric-mechanical modeling, graphics, primitives and their attributes, view a video and its machine generation, graphic language, spatial graphics, modern standards of computer-term charts, graphics DIAL-tions systems, application interak-tive graphics systems. Coman-dy image control on the screen. Data entry. Setting coordinates. Settings for the object snap. Methods for selecting objects, basic commands. Serial viewing objects. Basic commands modification of drawings in the AutoCAD, KOMPAS. Simulation lines surfaces, solid modeling in three-dimensional space. View objects in three-dimensional space. Work with the User Coordinate System. Creating a new user coordinate system, basic commands. Team display 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.

Prerequisites

School course

Postrequisites

Design of automation and remote control systems

Fundamentals of engineering and computer graphics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27646 (3010856)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The basic rules of design drawings. Con struktorskaya documentation IMAGE-tion, lettering, signs. Iso-mapping elements and symbols of parts of the thread. Working drawings of parts, sketching machine parts, assembly units image. Assembly drawing products. Conversion of the drawing. The concept, types of computer graph-ki. Raster graphics. Vector graphics. Fractal graphics.

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.

Prerequisites

School course

Postrequisites

Design of automation and remote control systems

Systems of design automation

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27647 (3010857)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The basic rules of design drawings. Design documentation, images, signs, symbols. Images and symbols of elements of parts of the thread. Working drawings of parts, sketching machine parts, assembly units image. Assembly drawing products. Conversion of the drawing. The concept, types of computer graphics. Raster graphics. Vector graphics. Fractal graphics. The basic concepts of three-dimensional graphics. Presentation of graphical data: formats, ways of describing color, color palette, color management system. Tools for working with raster graphics. Tools for working with vector graphics. Graphic Editors Corel Draw, AutoCAD, KOMPAS. Geometric modeling, graphics, primitives and their attributes, view a video and its machine generation, graphic language, spatial graphics, modern standards of computer graphics, interactive graphics system, the use of interactive graphics systems. Display-control commands on the screen. Data entry. Setting coordinates. Settings for the object snap. Methods for selecting objects, basic commands. Serial viewing objects. Basic commands modification of drawings in the AutoCAD, KOMPAS. Simulation lines surfaces, solid modeling in three-dimensional space. View objects in three-dimensional space. Work with the User Coordinate System. Creating a new user coordinate system, basic commands. Team display 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.

Prerequisites

School course

Postrequisites

Design of automated systems

Automation of heattechnical processes and installation.

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27697 (3010838)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

requirements to results of mastering the discipline. The formation of experimental skills, the programme envisages implementation of practical work.
The work of heat supply systems at the same time provides for the implementation of many technological processes associated with production, transportation and consumption of thermal energy.

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.

Prerequisites

Technical means of automation and control

Postrequisites

Linear systems of automatic control

Dispatch control system

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27793 (3010829)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

Application software for PLC programming. Application software for PLC programming standard structure PLC. Typical structure of a PLC-based automation SCADA system. ASU program to FBD. The main function of language FBD. ASU program in IL. The main functions of the language IL. Program at ASU ST. The main functions of the language ST. ASU program to SFC. The main components of the SFC language study of the structure-represented industrial enterprises. Organization of interaction between the individual elements of the process control system. Review of network architectures and network protocols. Minutes ASI, HART, CAN. Proto-Cola ModBus, ProfiBus-DP, ProfiBus-PA, ProfiBus-FMS. Tendency to develop-ment of industrial networks.

Purpose of studying of the discipline

Learning Outcomes

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

Prerequisites

Fundamentals of Information Processes

Postrequisites

Software and hardware complexes management

Control methods intelligent systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27815 (3010887)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

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.

Prerequisites

Development of user interfaces.

Postrequisites

Design of systems based on programmable logic integrated circuits

Fundamentals of programming mobile systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27806 (3010876)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Android platform device. Overview of programming environments. Emulators. Emulation. Standard Android emulator. The main types of Android applications. Security Application architecture, main components. ialogs and multi- screen applications. Processing sensor signals in Android applications

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.

Prerequisites

Information and communication technology

Postrequisites

Application of mobile systems for remote control

Application software of control systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27773 (3010828)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

Applied software for program-ming PLC. Applied pro-software tools for programming the PLC-tion Typical structure of the PLC. Typical structure of a PLC-based automation SCADA system. ASU program to FBD. The main function of language FBD. ASU program in IL. The main functions of the language IL. Program at ASU ST. The main functions of the language ST. ASU program to SFC. The main components of the SFC language study of the structure of industrial enterprise-prises. Organization of interaction between the individual elements of the process control system. Review of network architectures and network protocols. Minutes ASI, HART, CAN. Protocols ModBus, ProfiBus-DP, ProfiBus-PA, ProfiBus-FMS. Tendencies of development of industrial-represented networks.

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.

Prerequisites

Data transmission systems and automation and control interfaces

Postrequisites

Information and Control Systems. (course work)

Programming of mobile applications for Java

Discipline cycle	Basic disciplines

Discipline component	Electives
SubjectID	27810 (3010877)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Fundamentals of Java programming. Java for mobile applications. Data types in Java. The main differences between Java and C ++. Development of simple programs. Swing library. Development and use of interfaces. Development of a graphical interface. Multithreading. Java emulators. The simplest UML diagrams

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.

Prerequisites
Information and communication technology

Postrequisites
Remote control of the Arduino platform

Mobile device programming

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27813 (3010878)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Features and purpose of mobile devices. Review of mobile platforms. Principles of programming mobile devices. Google Android. Iphone OS. Windows Mobile. Application development environment. Hardware capabilities of mobile devices in applications. Software libraries. Databases in Android. SQLite. User interface

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.

Prerequisites
Information and communication technology

Postrequisites
Cloud technologies in automation

PCS Software.

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27796 (3010830)
Course	3
Term	1
Credits count	5
Lections	15hours

Practical and seminar classes	30hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

Application software for PLC programming. Application software for PLC programming standard structure PLC. Typical structure of a PLC-based automation SCADA system. The main function of language FBD. The main functions of the language IL. The main functions of the language ST. The main components of the SFC language study of the structure of industrial enterprises. Organization of interaction between the individual elements of the process control system. Review of network architectures and network protocols. Minutes ASI, HART, CAN. Protocols ModBus, ProfiBus-DP, ProfiBus-PA, ProfiBus-FMS. Trends in the development of industrial networks.

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

Prerequisites

Basics of collecting and information transfer

Postrequisites

System modeling software

Robotic systems and complexes with the basics of artificial intelligence.

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27800 (3010858)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Designs manipulators of industrial robots. Drives of industrial robots. General characteristics of the used devices (manipulators) of robots.
Functions of computing devices. Structure and purpose of elements of uniprocessor control devices. The structure of multi-microprocessor computing devices. Software and programming languages for microcomputers and microprocessors. Operating systems of microcomputers.
Adaptation and adaptation levels. Principles of constructing a system of sensation. Software control system adaptive robots. Languages and systems for programming adaptive robots.
Auxiliary equipment of industrial robotic systems. Robots on maintenance of technical equipment. The use of robots as the main technological equipment. The use of remotely controlled robots and manipulators.
Creation of intellectual systems and expert systems. Fundamentals of the theory of image recognition and the system of image recognition, Communication with a computer in natural language and a system of speech communication. Fundamentals of the theory of solving robotic tasks, including elements of artificial intelligence when performing technological operations. Construction of control systems for special robotic machines with elements of artificial intelligence when processing complex surfaces.
parameters of external disturbances, methods

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.

Prerequisites

Interfaces of robotic systems

Postrequisites

Information devices and systems in mechatronics

Electronic devices of robotic systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27803 (3010859)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	0hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

the main operations of signal processing: amplification, filtering, spectrum transformation, storage, transmission., Electrical conductivity of semiconductors. The P-N transition is its main property. The transition is a metal semiconductor. Impulse and power diodes, zener diodes, varicaps, Schottky diodes. The main characteristics, application in SAU.pravlyaemye sources of light and elements based on them. Converters of light energy into electrical (photodetectors) -photoresistors, photodiodes, phototransistors. Optocouplers Types of feedback, the effect of feedback on the properties of the amplifier. Kinds of feedback, the effect of feedback on the properties of the amplifier. The main characteristics of amplifiers. The stability of amplifiers with feedback

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.

Prerequisites

Development of user interfaces.

Postrequisites

Information devices of robotic systems

Information devices and systems in mechatronics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27831 (3010860)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Mechatronics, robotics, information systems and devices. General information. Place and role of information systems. Composition, classification and main types of information systems mechatronic devices. Typical devices and information systems in mechatronics. Technical vision systems. Metrological support of information systems. Digital processing of sensor signals. Computer-aided design of information devices and systems. Information systems for various purposes.

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.

Prerequisites

Robotic systems and complexes with the basics of artificial intelligence.

Postrequisites

Final examination

Information devices of robotic systems

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	27832 (3010861)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Sensors and their characteristics, information model of the measurement process, methods of error compensation. Sensitive elements of sensors. Measuring circuits of sensors. Kinesthetic sensors. Measurement of speed and dynamic factors. Vision systems, tactile type systems. Location information systems. Classification, principles of action, basic parameters.

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.

Prerequisites

Robotic systems and complexes with the basics of artificial intelligence.

Postrequisites

Executive systems of industrial robots

Automation of industrial plants and facilities

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27872 (3010835)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

Overview of automation tech-ray systems. Objects of the actual management in technical systems. Industrial-WIDE automatic councils-ment. Discrete Logic Systems-ray control

Purpose of studying of the discipline

Learning Outcomes

ON 6 Able to studies the basic principles and methods of construction of 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
Discipline component	Electives
SubjectID	27871 (3010834)

Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Overview of automation tech-ray systems. Objects of the actual management in technical systems. Industrial-WIDE automatic councilsment. Discrete Logic Systems-ray control
Purpose of studying of the discipline
Learning Outcomes
ON 6 Able to studies the basic principles and methods of construction of control systems.
Prerequisites
The reliability of control systems.
Postrequisites
Final examination

Automation of typical technological processes.

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27870 (3010833)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Overview of automation tech-ray systems. Objects of the actual management in technical systems. Industrial-WIDE automatic councilsment. Discrete Logic Systems-ray control.
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.
Prerequisites
Diagnostics and reliability of control systems
Postrequisites
Final examination

The hardware of the Internet of Things

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27355 (3010882)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Microcontroller systems for collecting data processing and transmission. The role of various components in a complex system

construction. Sensors of physical quantities. The variety of physical quantities sensors used in IoT applications, the differences in the interfaces used and the characteristics of the sensors. Ranges of measured values, discreteness, accuracy, cross-sensitivity, influence of external conditions on measurement results, power consumption of sensors.

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.

Prerequisites

Application of mobile systems for remote control

Postrequisites

Final examination

Executive systems of industrial robots

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	32151 (3010863)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Be able to develop the technology of electronic product installation; to select appropriate processes to run Assembly lines or repair;to design goods when considering the mounting techniques;to ensure the logistics in the field of installation;to control the quality of installation. Actuators of robots. Basic information. Kinematics of multiples- the manipulators. Design of manipulators of industrial robots. Drives of industrial robots. General characteristics of the actuators manipulators robots. The main characteristics and methods of control of electric and hydraulic actuators. Calculation and selection of actuators for industrial robots.

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.

Prerequisites

Information devices and systems in mechatronics

Postrequisites

Final examination

Internet of Things software platforms

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27860 (3010883)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Real- time operating systems. MQTT data transfer protocol. Software platforms PTC ThingWorx, IBM Bluemix, Rightech IoT Cloud, Microsoft Azure, Artik Cloud. Tizen OS. Receiving data from the cloud. Sending data to the cloud. Programming of modern microcontrollers. Lines of modern modules. Development of applications for modules. The development environment.

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.

Prerequisites

Remote control of the Arduino platform

Postrequisites

Final examination

Design of automated systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27854 (3010867)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The concept of automated control systems and their classification. Reasons why automate or use computer tools. Levels of information. Requirements for the system being developed. Ergonomic requirements. Engineering and psychological requirements. Information requirements. Security. Technical and economic demands. Functional subsystems. Provide and manage the subsystem. Concept. Comments to the stages.

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.

Prerequisites

Software and hardware complexes management

Postrequisites

Final examination

Design of automation and remote control systems

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27866 (3010866)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The purpose and objectives of design. The composition and structure of automated systems and com- plexes. Stages of design Designing- organization process of information provision. Description of the data encoding- tion and classification of information, development of a database, distribution, divided by data processing, dock-mentirovanie messages. Organiza-tion of the design process of techno-cal software. The choice of standard hardware collection, transformation-tion of information and scaled-tion, their metrological characterized- tics, especially the choice of administrations, lyayuschih computers, microcontrollers and Ethernet. Total characterized Stick design documentation. Co- composition and content of graphical and textual parts of the project and working documentation. Typing design solutions. Graphical representation of the design decisions

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.

Prerequisites

Information and Control Systems. (course work)

Postrequisites

Final examination

Internet of Things technologies

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27859 (3010884)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Basic principles, standards, architecture of the IoT. Ways to interact with Internet things. The IoT concept and its constituent technologies. RFID RFID, tags, readers, standards, applications. Basic concepts and principles of sensor networks. Basic architecture, nodes, data transmission methods, protocols and technologies for data transmission in wireless sensor networks (WSS). Mobile BSS.

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.

Prerequisites

Cloud technologies in automation

Postrequisites

Final examination

Final examination

Writing and defending a graduation project or preparing and passing a comprehensive exam.

Thesis project

Credits count	8

Comprehensive exam

Credits count	8

4.Summary table on the scope of the educational program

«6B07104 - Automation and control»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh language	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Russian language	GER/CC	1	5	150		45		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Kazakh language	GER/CC	2	5	150		45		35	70	Examination
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Russian language	GER/CC	2	5	150		45		35	70	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	15	30		35	70	Examination
Organization and planning of production	BS/CCh	7	3	90	15	15		20	40	Examination
Cost management	BS/CCh	7	3	90	15	15		20	40	Examination
Economics of enterprise	BS/CCh	7	3	90	15	15		20	40	Examination
Module 2. Microelectronic devices										
CAD microelectronic circuits	BS/CCh	3	3	90	15	0	15	20	40	Examination
CAD of microelectronic devices	BS/CCh	3	3	90	15	0	15	20	40	Examination
Technology of installation in microelectronics	BS/CCh	3	3	90	15		15	20	40	Examination
Interfaces of robotic systems	AS/CCh	4	5	150	15	30	0	35	70	Examination
Development of user interfaces.	AS/CCh	4	5	150	15	30	0	35	70	Examination

Data transmission systems and automation and control interfaces	AS/CCh	4	5	150	15	30		35	70	Examination
PIC Microcontrollers	BS/CCh	5	5	150	15	15	15	35	70	Examination
Programmable logic controllers	BS/CCh	5	5	150	15	15	15	35	70	Examination
Industrial Controls	BS/CCh	5	5	150	15	15	15	35	70	Examination
Module 3. Microcontrollers in control systems										
Microelectronics	BS/US	3	5	150	15	15	15	35	70	Examination
Nanoscale electronic devices and novel simulation techniques	BS/CCh	4	5	150	15	30		35	70	Examination
Verification of the property of microelectronic components and devices by impedance spectroscopy	BS/CCh	4	5	150	15		30	35	70	Examination
Software for microcontrollers and industrial controllers	BS/CCh	4	5	150	15		30	35	70	Examination
Software and hardware complexes management	BS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Design of systems based on programmable logic integrated circuits	BS/CCh	6	5	150	15	30		35	70	Examination
Automated electric drive	AS/CCh	7	5	150	15	15	15	35	70	Examination
System of electric drive control	AS/CCh	7	5	150	15	15	15	35	70	Examination
Packaging technologies in microelectronics	AS/CCh	7	5	180	15	30	30	35	70	Examination
Module 4. Theoretical bases of control systems.										
Introduction to the profession	BS/US	1	3	90	15	15		20	40	Examination
Theoretical bases electrical engineers	BS/US	2	5	150	15	15	15	35	70	Examination
Educational practice	BS/US	2	2	60						Total mark on practice
Methods of optimization of technological process management	BS/CCh	3	5	150	15	30		35	70	Examination and term work/Project
Optimal control system	BS/CCh	3	5	150	15	30		35	70	Examination and term work/Project
Modeling and identification of objects of management	BS/US	4	5	150	15	30		35	70	Examination
Industrial practice 1	BS/US	4	5	150						Total mark on practice
System modeling software	BS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Methods of scientific research	AS/CCh	7	3	90	15	15		20	40	Examination
Methods and means of scientific research	AS/CCh	7	3	90	15	15		20	40	Examination
Processing of experimental data	AS/CCh	7	3	90	15	15		20	40	Examination
Technologies and Applications of Superconductive Materials	AS/CCh	7	5	180	15	30	30	35	70	Examination
Module 5. Receiving, processing and transmitting information.										
Metrology and measurement	BS/US	3	5	150	15	15	15	35	70	Examination
Technical means of automation and control	BS/US	3	5	150	15	15	15	35	70	Examination

Fundamentals of Information Processes	BS/CCh	4	5	150	15	15	15	35	70	Examination
Basics of collecting and information transfer	BS/CCh	4	5	150	15	15	15	35	70	Examination
Applied Information Theory	BS/CCh	4	5	150	15	15	15	35	70	Examination
Linear systems of automatic control	AS/US	5	5	150	15	15	15	35	70	Examination
Diagnostics and reliability of control systems	BS/CCh	6	5	150	15	30		35	70	Examination
Diagnostics and reliability of components and systems automation	BS/CCh	6	5	150	15	30		35	70	Examination
Information and Control Systems. (course work)	BS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
The reliability of control systems.	BS/CCh	6	5	150	15	30		35	70	Examination
Cloud technologies in automation	BS/CCh	6	5	150	15	30		35	70	Examination
Application of mobile systems for remote control	BS/CCh	6	5	150	15	30		35	70	Examination
Industrial practice 2	BS/US	6	5	150						Total mark on practice
Remote control of the Arduino platform	BS/CCh	6	5	150	15	30		35	70	Examination
Nonlinear systems of automatic control	AS/US	6	5	150	15	15	15	35	70	Examination
Wireless control systems	AS/CCh	7	5	150	15	15	15	35	70	Examination
Computer networks	AS/CCh	7	5	150	15	15	15	35	70	Examination
Local Area Networks	AS/CCh	7	5	150	15	15	15	35	70	Examination
Installation, commissioning and operation of tools and automation systems	AS/CCh	7	5	180	15	30	30	35	70	Examination
Design, installation, commissioning and maintenance of automation systems	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
Prediploma practice	AS/CCh	8	15	450						Total mark on practice
Production practice 3	AS/CCh	8	15	450						Total mark on practice
Module 6. Mechatronics and robotics.										
Computer graphics and bases of ADS	BS/CCh	1	3	90	15	15		20	40	Examination
Fundamentals of engineering and computer graphics	BS/CCh	1	3	90	15	15		20	40	Examination
Systems of design automation	BS/CCh	1	3	90	15	15		20	40	Examination
Automation of heattechnical processes and installation.	BS/CCh	3	5	150	15	30		35	70	Examination and term work/Project
Dispatch control system	BS/CCh	5	5	180	15	30	30	35	70	Examination and term work/Project
Control methods intelligent systems	BS/CCh	5	5	150	15	0	30	35	70	Examination
Fundamentals of programming mobile systems	BS/CCh	5	5	150	15	30		35	70	Examination
Application software of control systems	BS/CCh	5	5	150	15	30	0	35	70	Examination and term work/Project
Programming of mobile applications for Java	BS/CCh	5	5	150	15	30		35	70	Examination

Mobile device programming	BS/CCh	5	5	150	15	30		35	70	Examination
PCS Software.	BS/CCh	5	5	180	15	30	30	35	70	Examination and term work/Project
Robotic systems and complexes with the basics of artificial intelligence.	BS/CCh	5	5	150	15	0	30	35	70	Examination
Electronic devices of robotic systems	BS/CCh	5	5	150	15	0	30	35	70	Examination
Information devices and systems in mechatronics	BS/CCh	6	5	150	15	30		35	70	Examination
Information devices of robotic systems	BS/CCh	6	5	150	15	30		35	70	Examination
Automation of industrial plants and facilities	AS/CCh	7	6	180	15	15	30	40	80	Examination and term work/Project
Automation of typical technological and logical processes	AS/CCh	7	6	180	15	15	30	40	80	Examination and term work/Project
Automation of typical technological processes.	AS/CCh	7	6	180	15	15	30	40	80	Examination and term work/Project
The hardware of the Internet of Things	AS/CCh	7	5	150	15	30		35	70	Examination
Executive systems of industrial robots	AS/CCh	7	5	150	15	15	15	35	70	Examination
Internet of Things software platforms	AS/CCh	7	5	150	15	30		35	70	Examination
Design of automated systems	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
Design of automation and remote control systems	AS/CCh	7	5	150	15	30		35	70	Examination and term work/Project
Internet of Things technologies	AS/CCh	7	5	150	15	30		35	70	Examination
Final examination										
Thesis project		8	8	240						
Comprehensive exam		8	8	240						