

## The list of academic disciplines of the university component

**6B07 - Engineering, manufacturing and construction industries**  
(Code and classification of the field of education)

**6B071 - Engineering and Engineering affairs**  
(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)

**set of 2024**

**Developed**

By the Academic Committee of the OP  
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**Reviewed**

at the meeting of the Commission on Academic Quality of the Faculty of Engineering and Technology  
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Construction  
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Protocol No. 1, "6" June 2024

**Approved**

at a meeting of the University Academic Council by protocol No. 6/1 of January 19, 2024.  
  
at a meeting of the University Academic Council by protocol No. 11 of June 28, 2024.

## Bases of economics, law and ecological knowledge

|                        |                                 |
|------------------------|---------------------------------|
| Discipline cycle       | General educational disciplines |
| Course                 | 1                               |
| Credits count          | 5                               |
| 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.*

### Learning outcomes by discipline

- 1) Analyzes the issues of safety and preservation of the natural environment as the most important priorities of life;*
- 2) Shows knowledge of the basics of environmental management and sustainable development, assesses the impact of man-made systems on the environment;*
- 3) Shows knowledge of the main regulatory legal acts of the Republic of Kazakhstan, their understanding and application;*
- 4) Demonstrates knowledge of the laws of the development of economic processes, clearly formulates his own position, finds and clearly sets out arguments in its defense;*
- 5) Is able to characterize the types of entrepreneurial activity and the entrepreneurial environment, draw up a business plan, create an entrepreneurial structure and organize its activities;*
- 6) Knows the fundamental provisions about the role of leadership in managing large and small social groups.*

### Prerequisites

*School course*

### Postrequisites

*Basic and profile disciplines of the EP*

## Introduction to the profession

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 1                 |
| Credits count          | 3                 |
| 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*

### Learning outcomes by discipline

- 1) To explain the basic concepts, classifications and areas of application of information systems;*
- 2) understand basic information processes;*
- 3) Describe professional competencies of IT specialties and employment prospects.*

### Prerequisites

*School course*

### Postrequisites

*Technical means of automation and control*

## Mathematics

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 1                 |
| Credits count          | 5                 |
| 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.

### **Learning outcomes by discipline**

- 1) Applies modern mathematical methods to solve applied problems
- 2) Creates algorithms for solving professional problems by mathematical methods
- 3) Plans activities aimed at solving research tasks
- 4) Selects methods of mathematical analysis and modeling, theoretical and experimental research of applied problems
- 5) Uses mathematical symbolism to express quantitative and qualitative relations of objects
- 6) Applies methods of visual graphical representation of research result

### **Prerequisites**

School course

### **Postrequisites**

Methods of optimization of technological process management

## **Theoretical bases electrical engineers**

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 1                 |
| Credits count          | 5                 |
| 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.

### **Learning outcomes by discipline**

- laws of electric circuits of constant, sinusoidal and non-sinusoidal current;
- calculation of three-phase circuits;
- basic methods for calculating transient processes in electrical circuits;
- the theory of the electromagnetic field;
- calculation of magnetic circuits.

### **Prerequisites**

School course

### **Postrequisites**

Microelectronics

## **Educational practice**

|                        |                        |
|------------------------|------------------------|
| Discipline cycle       | Basic disciplines      |
| Course                 | 1                      |
| Credits count          | 2                      |
| Knowledge control form | Total mark on practice |

### **Short description of discipline**

The rules of operation when creating tables using the Excel application program, the rules of operation when creating graphic material (drawings) using the Compass application program. Rules of operation when creating database tables using the Access application program, Fixing the material covered when performing individual tasks.

### **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.

### **Learning outcomes by discipline**

Study the software applications used in automated management systems. To study the main features of working with applications that

allow working with graphics, tables and databases.

### **Prerequisites**

Basic and profile disciplines of the EP

### **Postrequisites**

Industrial practice 1

## **Metrology and measurement**

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 2                 |
| Credits count          | 5                 |
| 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

### **Learning outcomes by discipline**

To master the basic methods, methods and means of obtaining, storing, processing information, working with a computer as a means of managing information; 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

To be able to use methods of automated control of product accuracy and its operational management; determine the main characteristics and parameters of electrical circuits and signals; use software packages for calculations, modeling and design automation of measuring tools and automation systems.

### **Prerequisites**

Introduction to the profession

### **Postrequisites**

Methods and means of scientific research

## **Microelectronics**

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 2                 |
| Credits count          | 5                 |
| 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.

### **Learning outcomes by discipline**

Have an idea of the principle of operation of modern analog and digital integrated circuits

### **Prerequisites**

Theoretical bases electrical engineers

### **Postrequisites**

Software for microcontrollers and industrial controllers

## **World of Abai**

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 2                 |
| Credits count          | 3                 |
| 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.

## Learning outcomes by discipline

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

- 1) Analyzes the philosophical and artistic foundations of works, historical facts related to the creative heritage of Abai Kunanbayev, Shakarim Kudaiberdiyev, Mukhtar Auezov
- 2) Uses in practice the humanistic ideas of Abai's philosophical and artistic works
- 3) Assesses the place and significance of Abai's works in the history of literature and science

### Prerequisites

Kazakh(Russian) language (2)

### Postrequisites

Final examination

## Technical means of automation and control

|                        |                   |
|------------------------|-------------------|
| Discipline cycle       | Basic disciplines |
| Course                 | 2                 |
| Credits count          | 5                 |
| 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

### Learning outcomes by discipline

The process of studying the discipline is aimed at the formation of the following competencies: General Professional (OPK):

OPK-1-Readiness to use fundamental General engineering knowledge;

OPK-4-Willingness to combine theory and practice to solve engineering problems;

OPK-7-Readiness to choose measuring instruments in accordance with the required accuracy and operating conditions

Professional (PC)

PC-3-Readiness to use the physical and mathematical apparatus for solving problems that arise in the course of professional activity;

PC-8-the Ability to use information tools and technologies in solving problems that arise in the course of professional activity;

PC-11 Willingness to identify objects for improvement in engineering and technology

### Prerequisites

Introduction to the profession

### Postrequisites

Applied Information Theory

## Modeling and identification of objects of management

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

### Short description of discipline

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

### Learning outcomes by discipline

Upon completion of the development of the discipline

Develop models of technological processes, production facilities, automation tools and systems, control, diagnostics, testing and process management, product lifecycle and quality using modern computer-aided design tools.

And gets the competence: Studies the basic principles and methods of building management systems.

### **Prerequisites**

Introduction to the profession

### **Postrequisites**

Information and Control Systems. (course work)

## **Industrial practice 1**

|                        |                        |
|------------------------|------------------------|
| Discipline cycle       | Basic disciplines      |
| Course                 | 2                      |
| Credits count          | 5                      |
| Knowledge control form | Total mark on practice |

### **Short description of discipline**

To study how to collect, analyze and process the data necessary to solve the tasks; to choose software and tools for data processing in accordance with the task, analyze the results of calculations and substantiate the conclusions

### **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.

### **Learning outcomes by discipline**

To acquire the first skills in the practical use of measuring tools and automation.

### **Prerequisites**

Educational practice

### **Postrequisites**

Industrial practice 2

## **Linear systems of automatic control**

|                        |                      |
|------------------------|----------------------|
| Discipline cycle       | Profiling discipline |
| Course                 | 3                    |
| Credits count          | 5                    |
| 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 5 Able to analyze control systems with the aim of mathematical model designing, to build and explore mathematical models of control objects, to solve problems related to the control system and using modern math methods

### **Learning outcomes by discipline**

- \* the role and place of automatic systems in the tasks of automation of technical facilities and production facilities;
- the history of the development of the discipline;
- \* basic principles and schemes of automatic regulation, the main types of automatic control systems, their mathematical description and the main tasks of the study;
- \* methods for describing automatic control systems in the form of transfer functions;
- \* methods for studying the stability of linear automatic control systems

### **Prerequisites**

Methods of optimization of technological process management

### **Postrequisites**

Nonlinear systems of automatic control

## **Industrial practice 2**

|                        |                        |
|------------------------|------------------------|
| Discipline cycle       | Basic disciplines      |
| Course                 | 3                      |
| Credits count          | 5                      |
| Knowledge control form | Total mark on practice |

### **Short description of discipline**

Mastering the development of an algorithm for solving a problem with a focus on the use of specific technical means, a mathematical model for the problem is being developed, mastering in practice the methods of pre-design inspection of an informatization object, conducting a systematic analysis of the survey results when building an information system model

### **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.

### **Learning outcomes by discipline**

To master the methodology for the design, implementation and operation of individual tasks and subsystems of information and control systems, studies automated tools and systems that implement information systems, acquires the skills of research and design of subsystems of information and control systems.

### **Prerequisites**

Industrial practice 1

### **Postrequisites**

Prediploma practice

## **Nonlinear systems of automatic control**

|                        |                      |
|------------------------|----------------------|
| Discipline cycle       | Profiling discipline |
| Course                 | 3                    |
| Credits count          | 5                    |
| Knowledge control form | Examination          |

### **Short description of discipline**

The discipline examines the mathematical description of typical nonlinear transfer links, provides examples of the construction of transfer functions of links and their frequency characteristics. Examples of the influence of various parameters on the characteristics of links are given. The issues of mathematical description of a model consisting of several transmission links connected in various ways are investigated. Methods and software tools for obtaining frequency characteristics for further analysis of the behavior of nonlinear systems are being studied.

### **Purpose of studying of the discipline**

The purpose of studying the discipline "Nonlinear automatic control systems" is to train a specialist who deeply knows the basics of the theory of automatic control and is able to perform calculation work on the creation of automatic systems with extensive use of modern computer technology.

### **Learning Outcomes**

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

### **Learning outcomes by discipline**

Apply the acquired knowledge for the synthesis and analysis of nonlinear automatic control systems

Calculate the characteristics of nonlinear systems according to the specified parameters

- on the features of the description, analysis and synthesis of nonlinear automatic control systems;
- about the features of the modes of nonlinear automatic control systems, the principles of their construction;
- on the ways of development and improvement of non-linear ATS;

to know:

- the role and place of automatic systems in the tasks of automation of technical facilities and production;
- the history of the development of the discipline;
- fundamentals of the theory of nonlinear systems: methods of mathematical description and modeling, the most important properties, types of nonlinear systems;
- methods for studying the stability of periodic modes and transients in nonlinear systems;
- methods of describing discrete systems: methods of mathematical description, research of stability and quality of regulation.

be able to:

- apply mathematical methods to analyze the general properties of nonlinear systems, on this basis, master the methods of analysis and synthesis of nonlinear automatic control systems;
- perform computational work on the stability and quality analysis of nonlinear systems;
- perform basic calculation work on the study of nonlinear automatic control systems.
- perform computational work on the stability and quality analysis of discrete systems;

to acquire practical skills:

- calculation and design of nonlinear automatic control systems;
- selection of automation equipment in the development of nonlinear automatic control systems.

### **Prerequisites**

Linear systems of automatic control

### **Postrequisites**

Final examination