

 [the Ministry of Education and Science](https://context.reverso.net/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/the%2BMinistry%2Bof%2BEducation%2Band%2BScience) OF THE REPUBLIC OF KAZAKHSTAN

M.Auezov South Kazakhstan State University

« APPROVED BY»

The Rector\_\_\_\_\_\_\_\_\_\_\_\_

d.h.s., academician Kozhamzharova D.P.

 «\_\_\_»\_\_\_\_\_\_\_\_\_\_20\_\_y.

[**Education Programme**](https://context.reverso.net/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/Education%2BProgramme)

6B07110 – «Automation and control»

|  |  |
| --- | --- |
| [Registration number](https://context.reverso.net/%D0%BF%D0%B5%D1%80%D0%B5%D0%B2%D0%BE%D0%B4/%D0%B0%D0%BD%D0%B3%D0%BB%D0%B8%D0%B9%D1%81%D0%BA%D0%B8%D0%B9-%D1%80%D1%83%D1%81%D1%81%D0%BA%D0%B8%D0%B9/Registration%2Bnumber) | - |
| Code and classification of the field of education | 6B07 - Engineering, processing and construction branches |
| Code and classification of training areas | 6B071 – «Engineering and engineering business» |
| Group of educational programs | В063 – «Automation and control» |
| Type of EP | *current* |
| ISCE level | 6 |
| NQF level | 6 |
| SQF of education level | 6 |
| Language of learning | Kazakh, Russian, English |
| Typical duration of study | 4years |
| Form of study | Full time |
| The complexity of the EP, not less | 240 credits |
| Distinctive features of EP | - |
| University Partner ( JEP ) | - |
| University Partner ( TDEP ) | - |
| Social Partner ( DE ) | - |

Shymkent, 20\_\_

Drafters:

|  |  |  |
| --- | --- | --- |
| Name | Position | Sign  |
| Musabekov Akhmetbek Akylbekovich | c.t.s., as.professor, head of chair |  |
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| Ranbaev Bachyt Nakitovich | Director of “PromGrazhdanstroy" LLP  |  |
| Iskak Darkhan Sansyzbayuly | Director of “SuMeterComputerization" LLP |   |

EP was considered by the Methodological Commission of the High School “Informational technologies and power engineering” / Considered by the Committee on Innovative Learning Technologies and Methodological Support,

Protocol № \_\_\_\_\_ from \_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ 20\_\_.

Chairman of MC (Committee) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Makhanova Z.A.

 Sign

Protocol №\_\_\_\_\_ from «\_\_\_\_» \_\_\_\_\_\_\_\_\_\_20\_\_.

Considered and recommended for approval at the meeting of Educational and Methodical Council of M. Auezov SKSU.

protocol № \_\_\_ from \_\_\_\_\_\_\_\_\_\_\_\_.

Approved by the decision of the Academic Council of the University

 protocol № \_\_\_\_\_ from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 20\_\_.

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**Introduction**

**1. Scope**

Designed for the implementation of bachelors training by educational program (hereinafter - EP) 6B07110 «Automation and control» in RSE on right of economic management «M.Auezov South Kazakhstan State University»of RK MES.

**2. Regulatory documents**

Education Act of the Republic of Kazakhstan (as amended and supplemented on 07/04/2018);

Standard rules for the operation of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan from October 30, 2018 No. 595 (registered with the Ministry of Justice of the Republic of Kazakhstan on October 31, 2018 No. 17657);

State obligatory standards of higher and postgraduate education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan, October 31, 2018 No. 604;

The rules for the organization of educational process on credit technology education, approved by order of the Minister of Education and Science of the Republic of Kazakhstan on April 20, 2011 No. 152 as amended and supplemented of October 12, 2018 No. 563

Register of approved professional standards, approved by Protocol No. 266 of the Industry Commission meeting in the field Of "Maintenance of auxiliary systems, instrumentation and automation" dated December 27, 2019.

**3. Educational programs concept**

The goal of the educational program is coordinated with the mission of university and is aimed at preparing the intellectual elite of the country with advanced entrepreneurial skills, fluent in three languages, demonstrating conceptual, analytical and logical thinking skills, creative approach in professional activities, being able to work in national and international teams obtaining the lifelong strategy.

The educational program is harmonized with the 6th level of the National Qualifications Framework of the Republic of Kazakhstan, with Dublin descriptors, 1 cycle of the Framework for Qualification of the European Higher Education Area, also with Level 6 of the European Qualification Framework for Lifelong Learning.

The educational program is focused on professional and social order through the formation of professional competencies associated with the necessary types of research, practical and business activities, adjusted to meet the requirements of stakeholders.

The uniqueness of EP6B07110 "Automation and control" it consists in the fact this program is focused on the acquisition by a graduate of competencies, skills in the development and operation of automated control systems for various processes and industries. Bachelor graduates have the opportunity to continue their studies at the master's program in any field of technical education.

The educational program aims to achieve learning outcomes through the organization of educational process using the principles of Bologna process, student-centered learning, accessibility and inclusion.

Program learning outcomes are achieved through the following training events:

- classroom training: lectures, seminars, practical and laboratory classes - held in view of innovative teaching technologies, the use of the latest achievements of science, technology and information systems;

- extracurricular training: the independent work of the student, including under the guidance of a teacher, individual counseling;

- conducting professional practices, implementation of course and diploma works (projects).

- scientific research work of a master's degree student (SRWMS): independent scientific work of a student, including the implementation of a master's thesis and scientific training.

The university has taken measures to maintain academic integrity and academic freedom, protection from any kind of intolerance and discrimination against students.

The quality of EP is ensured by the involvement of stakeholders in its development and evaluation, systematic monitoring and review of its content.

**4.Entry Requirements**

Established in accordance with the Standard rules of admission to training in the organization of education, implementing educational programs of postgraduate education. Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 of 10.31.2018

**1. EDUCATION PROGRAMME PASSPORT**

**1.1The purpose and objectives of education program by specialty**

EP objectives:

Training of specialists in demand on the labor market who are able to carry out design, installation, and maintenance work of automated control systems (ACS), owning specialized technical and software automation tools.

EP tasks:

-formation of socially responsible behavior in society, understanding the importance of professional ethical standards and following these standards;

- providing basic undergraduate training to enable them to continue their studies throughout their lives, to adapt successfully to changing conditions throughout their professional careers, to have entrepreneurial skills;

- providing conditions for acquiring a high general intellectual level of development, mastery of a competent and developed speech, a culture of thinking and skills of the scientific organization of labor in the field of automation and control of technological processes and production;

- creation of conditions for intellectual, physical, spiritual, aesthetic development to ensure the possibility of their employment in the specialty or continuing education at subsequent levels of education.

**1.2 List of qualifications and positions**

The graduate of this EP is awarded with degree of «bachelor of engineering and technology» according to EP 6B07110 – «Automation and Control». Bachelors in the specialty 6B07110 «Automation and Control» can hold primary positions of engineering and technical workers; managers - site master, shop manager (site), shift supervisor, workshop manager; specialists - design engineer, design engineer, engineer for setting up and operating equipment and automation systems; engineer in organizations and enterprises where automated process control and production control systems, automated information and control systems, automated design systems for various purposes (industrial production, research institutions, design and design organizations) are used and developed without according to the qualification requirements of the Qualification directory of posts, manage s, professionals and other employees, approved by order of the Minister of Labor and Social Protection of Population of the Republic of Kazakhstan dated May 21, 2012 № 201-m.

**1.3 Qualification characteristics of the educational program graduate**

**1.3.1 Scope of professional activity**

The field of professional activity is the field of automation, informatization and management of various technological processes and industries, as well as technical systems associated with the use of information processing tools and methods.

**1.3.2Objects of professional activity**

The objects of professional activity of graduates are automated process control systems of various industries, automated information and control systems, automated systems for receiving, processing and transmitting data, automated systems for designing systems, objects, devices.

**1.3.3Subjects of professional activity**

The subjects of the professional activity of the bachelor in EP 6B07110 – «Automation and Control» are: development, implementation and operation of automated process control systems in various industries; methods of analysis, forecasting and management of technological processes, technical systems and high-tech research objects.

**1.3.4Types of professional activity**

The bachelor in the specialty 6B07110 – «Automation and Control» can perform the following forms of professional activity:

Service and operational activities: operation of automatic, automated and information systems, means of collecting, processing and transmitting data and information flows, diagnosing, monitoring and control, their technical, information, mathematical and software; prevention, repair, adjustment of technical means of automation and control in various industries.

Production and technological activities: development and implementation of effective methods and algorithms for automation, informatization and operation of industrial process equipment; organization and effective conduct of production control of technological processes, quality of finished products; effective use of materials, equipment, algorithms and programs for the selection and calculation of parameters of technological processes and control devices; implementation of metrological calibration of basic means of measuring indicators of product quality.

Organizational and managerial activities: the organization of the work of the team of performers, making management decisions in situations involving the selection of the variety and solutions; finding a compromise between different requirements (cost, quality, safety and deadlines) in both long-term and short-term planning and the determination of optimal solutions; evaluation of production and non-production costs to ensure the required product quality.

Design activity: formulation of design goals and objectives under given criteria and constraints; the development of generalized solutions to problems, the analysis of these options, the prediction of the consequences, the finding of compromise solutions in multi-criteria conditions; modeling, development, design and implementation of projects for automation systems and process control, taking into account energy, technological, design, operational, ergonomic and economic indicators.

Experimental research activities: conducting experimental studies for the diagnosis, analysis and assessment of the state of technological equipment using modern methods and means of monitoring and analysis; development of mathematical and computer models of complex systems, industrial and technological processes; experiment planning and use of methods for mathematical processing of results.

**2. EP learning outcomes**

PO1 Free to communicate in the professional environment and society in punishable, Russian and English languages.

PO2 Demonstrate natural science, mathematics, social, socio-economic and engineering knowledge in professional activities, methods of mathematical data processing, theoretical and experimental research, regulatory documents and elements of economic analysis.

PO3 Possess information and computational literacy, the ability to generalize, analyze and perceive information, set goals and choose ways to achieve it.

PO4 To make an informed choice of measuring, control and management tools for the development of information-measuring and automated control systems based on knowledge of electronics, microelectronic technology, structural diagrams and principles of operation of automation elements and devices, to possess the skills of operation and repair of automation equipment.

РО5 Develop optimal, reliable automation and control systems based on the use of database management systems and expert systems, knowledge of modeling methods and identification of control objects, as well as experimental research methods.

PO6 Draw up control loops and calculate the optimal settings of the regulators, using knowledge of the theoretical foundations of linear and non-linear automatic control systems.

PO7 To develop and analyze systems for collecting, converting and transmitting signals - information carriers in control systems based on knowledge of the laws and methods of the applied information theory.

PO8 Develop control programs of industrial controllers for the logical control of various technological equipment and evaluate their effectiveness by comparing with existing analogues.

RO9Classify the systems of automatic regulation and control of typical technological processes and production, make an informed choice for a specific situation.

PO10 Develop technical specifications, prepare design documentation for automation and control systems using specialized computer-aided design systems.

PO11 Use research, entrepreneurial, and uncertainty skills.

PO12 Effectively work individually and as a member of a team, correctly defend your point of view, adjust your actions and use various methods.

**3 COMPETENCES OF EP GRADUATE**

**3.1** Successful completion of training in EP contribute to the formation of the following competences of a graduate:

* core competencies (CC)
* professioanalcompetencies(PC).

***Core competencies:***

*(CC1) in the field of native language*

- the ability to express and understand concepts, thoughts, feelings, facts and opinions in the field of music education in written and oral forms (listening, speaking, reading and writing), as well as interact linguistically and creatively in a variety of social and cultural contexts: during study, at work, at home and at leisure;

*(CC2)in the field of foreign languages*

-ability to master basic communication skills in a foreign language - understanding, expressing and interpreting concepts, facts and opinions in the professional field, both verbally and in writing (listening, speaking, reading, writing) in the relevant range of social and cultural contexts, mastering skills mediation and intercultural understanding;

*(CC3)fundamental mathematical, scientific and technical training*

- the ability and willingness to apply educational potential, experience and personal qualities acquired during the study of mathematical, natural science, technical disciplines at the university, to determine ways of monitoring and evaluating the solution of professional problems, the development of mathematical and natural science thinking;

*(CC4)computer*

- the ability to confidently and critically use modern information and digital technologies for work, leisure and communications, mastering the skills of using, restoring, evaluating, storing, producing, presenting and exchanging information through a computer, communicating and participating in collaborating networks using the Internet for professional activities;

*(CC5)social*

- the ability to own social and ethical values ​​based on public opinion, traditions, customs, norms and to be guided by them in their professional activities; know the cultures of the peoples of Kazakhstan and abide by their traditions; observe the basics of the legal system and legislation of Kazakhstan, know the trends of social development of society; be able to adequately navigate in various social situations; be able to find compromises, relate your opinion with the opinion of the team; own business ethics, ethical and legal standards of conduct; strive for professional and personal growth; work in a team, correctly defend their point of view, propose new solutions; demonstrate tolerance towards other individuals;

*(CC6)economic, managerial and entrepreneurial*

- the ability to know and understand the goals and methods of state regulation of the economy, the role of the public sector in the economy; master the basics of economic knowledge; possess the skills of critical thinking, interpretation, creativity analysis, drawing conclusions, evaluation; manage projects to achieve professional goals, manage staff, demonstrate entrepreneurial skills.

*(CC7) cultural training*

- the ability to know and understand the traditions and culture of the peoples of Kazakhstan, is tolerant to the traditions and culture of other nations of the world, aware of the attitudes of tolerant behavior; not subject to prejudice, has high spiritual qualities, formed as an intelligent person

*(CC8) additional competencies*

- ability to master the skills of critical thinking, interpretation, creativity analysis, drawing conclusions, evaluation; have creativity and an active lifestyle; make decisions of a professional nature under conditions of uncertainty and risk.

***Professioanal competencies***

PC1- Knowledge of the fundamentals of the processes of chemical technology, the principles of operation of technological equipment, computer skills in the collection, storage and processing of information to implement monitoring and control in automation objects;

PC2 - Possession of the fundamental principles of constructing linear and nonlinear automatic control systems, knowledge of the classification of systems according to basic algorithmic features and the corresponding schemes, advantages and disadvantages of closed and open systems, the role of feedback in control systems, efficient use of database management systems and expert systems;

PC3 - Knowledge of the architecture and principles of the operation of electrical and electronic elements, devices and microprocessor systems used for monitoring and control; the ability to use standards, methodological and normative materials, modern design methods, choose measurement, control and management tools, have the skills to maintain and repair automation equipment to solve typical tasks of automation of technological processes and production;

PC4– Ability to perform a system analysis of technical systems, technological processes and production, develop mathematical models of control objects and carry out their identification, program industrial controllers for the purpose of logical control of technological equipment; own methods for ensuring the reliability of technical means, safety and vital functions of staff during the operation of automated control systems;

PC5 - The ability to implement modern automation methods at various production facilities, in scientific research and organizational management using the main economic categories and principles of organization of production; to carry out a feasibility study of the implemented design solutions for the development of automation and control systems.

**3.2Matrix of correlation of EP learning outcomes in general with modules formed by competencies**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Formed competencies** | **PO1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **P11** | **PO 12** |
| CC1 | + |  |  |  | + |  |  |  |  | + |  |  |
| CC2 | + |  |  |  |  |  |  |  |  |  |  |  |
| CC3 |  | + |  |  |  |  |  |  |  |  |  |  |
| CC4 |  |  | + |  |  |  | + |  |  | + |  |  |
| CC5 | + | + |  |  |  |  |  |  |  |  |  | + |
| CC6 |  |  |  |  |  |  |  |  |  |  | + | + |
| CC7 |  |  |  | + |  |  | + |  |  |  |  |  |
| CC8 | + |  |  |  |  |  |  |  |  |  | + | + |
| PC1 |  | + | + |  |  |  | + |  |  |  |  |  |
| PC2 |  |  |  |  | + | + | + |  |  |  |  |  |
| PC3 |  | + |  | + |  |  |  |  | + | + |  |  |
| PC4 |  |  | + |  | + |  |  | + | + |  |  | + |
| PC5 |  | + |  | + |  | + |  | + |  | + | + | + |

**4.SUMMARY TABLE REFLECTING THE VOLUME ASSIMILATED CREDITS OF EDUCATION PROGRAM MODULES**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Course of Study | Semester | The number of mastered modules | The number of studied disciplines | Number of credits KZ | Total hours | Total KZ credits | The number of |
| OC | HSC | EC | Theoretical | Physical training | Training Practice | Practical training and Predegree practice | Final examination | exam | dif.offset |
| 1 | 1 | 5 | 6 | - | 1 | 28 | 2 | - | - | - | 900 | 30 | 6 | 1 |
| 2 | 5 | 3 | 2 | 2 | 26 | 2 | 2 | - | - | 900 | 30 | 5 | 3 |
| 2 | 3 | 4 | 1 | 4 | 3 | 28 | 2 | - | - | - | 900 | 30 | 6 | 2 |
| 4 | 8 | 3 | 1 | 3 | 24 | 2 | - | 4 | - | 900 | 30 | 6 | 2 |
| 3 | 5 | 4 | - | 1 | 5 | 30 | - | - | - | - | 900 | 30 | 4 | 1 |
| 6 | 5 | - | 1 | 2 | 24 | - | - | 6 | - | 900 | 30 | 3 | 1 |
| 4 | 7 | 3 | - | - | 4 | 20 | - | - | - | - | 600 | 20 | 4 | - |
| 8 | 4 | - | - | 4 | 20 | - | - | - | - | 600 | 20 | 2 | - |
| 9 | 1 | - | - | - | - | - | - | 8 | 12 | 600 | 20 | - | 1 |
| Total | 19 | 19 | 13 | 9 | 24 | 200 | 8 | 2 | 18 | 12 | 7200 | 240 | 36 |

**5. Information about disciplines**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **The name of the module** | **CYCLE** | **HSK/EC** | **Component name** | **Short description of the discipline (30-50 words)** | **Number of credits** | **Generated PRO (codes)** |
| Module of the social science | GED | OC | Contemporary History of Kazakhstan |  It allows to classify the conceptual foundations of national history, interpret the origins, the continuity of the Kazakh statehood and current problems of the history of modern Kazakhstan.Exposure to the analysis of the activities of the national intelligentsia in shaping the ideology of the liberation movement and the stages of the socio-economic modernization of Kazakhstan. Characterize the creation of a democratic state of law. Evaluation of the contribution of the First President to the theory and practice of public administration. | 5 | РО1, РО2 |
| GED | OC | Philosophy | The basics of the emergence of philosophy are examined, the features of the emergence of a culture of thinking are revealed, the concepts of “philosophy”, “worldview”, the essence and content of the concepts of “genesis”, “consciousness” are revealed. The relationship between the concepts of “knowledge” and “creativity” is considered, the essence and content of the category of the philosophy of freedom are revealed, the skills of identifying the essence of the philosophical problem, critical thinking, research skills of philosophical aspects, problems of practice and knowledge are developed. | 5 | РО1, РО2 |
| Module of socio-political knowledge  | GED | OC | Social and Political Studies | Theories of sociology, social structure and stratification of society are studied, the role and place of politics in society is explained, the main stages of formation and development of political science, including youth policy, the role of politics in the system of public life are considered, the essence of the state is revealed, the relationship between the state and civil society is revealed. Develop skills in sociological research, analysis of socio-political information. | 4 | РО1, РО2 |
| GED | HSK | Ecology and Fundamentals of Life Safety | Knowledge of the foundations of the law of ecology, the ability to assess the ecological state of the environment when exposed to natural and man-made factors, legislation and legal acts in the field of life safety; classification of hazardous and harmful industrial and domestic factors. The ability to determine the boundaries of the biosphere, the radiation dose; boundaries of foci of chemical damage. Possess skills of rescue and other urgent work. | 3 | РО2, РО11 |
| GED | EC | Fundamentals of entrepreneurship skills and anti-corruption culture  | Examines the role of the state in market development, competition, demand, supply. Instills skills for calculating costs, income, turnover indicators and capital turnover. Allows you to critically explore the markets of factors of production, factor income. Forms knowledge by right. It instills the skills of analyzing the legality of events, the ability to refer to regulatory acts. Increases the level of legal awareness, legal culture. | 3 | РО2, РО11 |
| GED | EC | Fundamentals of Economics and Law  | Generates knowledge about the organization of the company, doing business. Develops skills in business planning, production and sales, market analysis; calculation of profit, income, profitability, solvency, liquidity of the company.Considers the essence of the factors of corruption. Forms an anti-corruption worldview, culture. It develops a civil stance towards corruption, realizes the values of the moral consciousness of countering corruption. Instills the skills of critical analysis of corruption. |  | РО2, РО11 |
| GED | OC | Cultural Studies and Psychology  | Understanding the social and ethical values of society as a product of integration processes in the systems of basic knowledge of the disciplines of the socio-cultural-psychological module; analyze the characteristics of psychological institutions in the context of their role in the modernization of Kazakhstani society; form programs for solving conflict situations in society, including professional society; be able to correctly express and defend their own opinion of social importance. | 4 | РО1, РО12 |
| Module of communicative mobility  | GED | OC | Foreign Language  | The study of lexical and grammatical minimum. Ability to build simple and complex sentences in the communicative aspect. Expressing your thoughts on social issues. Speech styles: concept, functions, scope of use; scientific style of speech, its features; vocabulary of scientific style of speech. Abstracts, review and review. Synopsis, its types. Abstract. Essay. Report. Business letter. | 10 | РО1, РО12 |
| GED | OC | Kazakh (Russian) language  | Development of cognitive and communicative activities in the Russian (Kazakh) language in the areas of interpersonal, social, intercultural communication. Bringing skills to discuss ethical, cultural, socially significant norms in discussions, teamwork, teamwork, flexibility, creativity. Development of practical skills interpreting the information of the text, explaining their stylistic, genre specificity in various areas of communication. | 10 | РО1, РО12 |
| GED | OC | Physical training | Preservation and strengthening of health, development of human psychophysical abilities in the process of conscious motor activity. Development of human abilities and the formation of a healthy lifestyle, social adaptation through physical education, physical fitness and physical development. Formation of personality, in the unity of the diversity of their physical, mental and moral qualities, health promotion, increasing the physical potential of students' work capacity. | 8 | РО1, РО12 |
| GED | OC | Information and Communication Technologies | Knowledge of computer systems, software. Development of skills in the use of information resources for searching and storing information, working with spreadsheets, working with databases. The use of methods and means of information protection; design and creation of websites, multimedia presentations. Skills of using e-government and e-books, various cloud mobile technologists, SMART technology management. | 5 | PO2, PO3, PO5 |
| BD | HSK | Professional Kazakh (Russian) Language  | Development of skills to extract the necessary information from the text, its interpretation in educational and professional communication. Development of the ability to establish contacts at the professional level, competently build communications based on the goals and situation of communication. Inviting creativity, innovation, collegiality in the process of building a speech behavior program in Russian (Kazakh) language in the field of professional communication. | 3 | PO1, PO12 |
| BD | HSK | Professionally Oriented Foreign Language  | Conducting a historical review on the subject of automation and control. Mathematical description of automatic control schemes. Laplace transform. Statistical and dynamic properties of basic elements (terms). Flowcharts, resulting transfer functions. Logical function Introduction to management systems. Feedback in automatic control. Examples of modern control systems.  | 3 | PO1, PO12 |
| BD | EC | Latin script-based Kazakh alphabet | The formation of Kazakh sounds, taking into account the peculiarities of their pronunciation, the study of the phonetic features of Kazakh words and phrases based on Latin script. The development of literacy skills based on the Latin alphabet. The ability to read texts in the Kazakh language using Latin graphics | 3 | PO1, PO12 |
| BD | EC | Mukhtar Study | The life and work of M.O. Auezov is studied; analyzes the creative laboratory of the writer, his biography in the context of creativity; as the creator of the science of Abaevology; Researchers Fat Manas. Acquaintance with M. Auezov as a prominent public figure. The skills of analyzing the literary heritage of M. Auezov in world and eastern literature are developing. Feelings of patriotism and love for the motherland are inculcated. |  | РО1, РО12 |
| BD | EC | Abay Study | The first biographer of Abay Alikhan Bukeikhanov and his article “Abay (Ibrahim) Kunanbaev”. M.O. Auezov is the founder of the science of “Abaevology”. Teachings of Abai "About a complete man." Moral and ethical views of the humanist and public figure Abay Kunanbayev. The cult of the heart in the understanding of Abay. Pedagogical and psychological views of the poet. Nature, cognitive abilities in the understanding of Abay. Abaeology at the present stage. |  | РО1, РО12 |
| BD | EC | Actual problems and the modernization of public consciousness | Demonstration of knowledge of the fundamentals of historical science, the place and role of philology in the life of society and man; Understanding the place and significance of man in the historical process and political organization of society. To instill skills in the analysis of causal relationships of the historical development of the state; using the position and category of philosophy to evaluate and analyze various social trends and facts. Analysis of the main events of Russian history; features of the genesis and development of philosophical knowledge. Mastering the skills of conducting a philosophical dialogue and polemic. |  | РО1, РО2 |
| BD | EC | Academic writing | The concept of academic writing. Basic concepts and types of academic writing. Various citation methods: direct citation and links. Proficiency in the compilation and preparation of scientific documentation (dissertations, reports, reviews, abstracts, abstracts, reports, articles), bibliography and references, proficiency in professional and corporate ethics, the ability to store confidential information, knowledge of the basics of modern information and bibliographic culture. |  | РО1, РО12 |
| Mathematical and natural scientific foundations | BD | HSK | Higher Mathematics 1 | Knowledge of methods for solving matrices and determinants. Knowledge of elements of vector algebra. Ability to perform operations on complex numbers. The use of elements of analytical geometries. The ability to distinguish between types of equations of a line and a plane. Acquaintance with the second order curves. The use of formulas and methods for the differential calculus of functions of one variable. The solution of the integral of various functions. Application of the Newton-Leibniz formula. | 4 | PO2, PO3, PO6 |
| BD | HSK | Higher Mathematics II | Knowledge of the method of finding partial derivatives. The ability to find the derivative in the direction of the gradient. The solution of ordinary differential equations. The solution of various types of differential equations of the first and second orders. Application of signs of convergence of series. Problem solving in probability theory and mathematical statistics. | 4 | PO2, PO3, PO6 |
| BD | HSK | Physics I | The study of classical mechanics, taking into account vibrations and waves, mechanics and kinematics of a continuum; fundamentals of molecular kinetic theory, thermodynamics and transport phenomena; fundamentals of electrodynamics, Maxwell theory, acoustics, solid mechanics, thermodynamics and heat engineering. | 6 | PO2, PO4 |
| BD | HSK | Physics II | Wave and geometric optics; fundamentals of quantum physics; electrostatics and electromagnetic fields, elements of atomic and nuclear physics; condensed matter physics and elementary particles, metrology and radiophysics, physics of elementary particles and nanostructures and nanoparticles. | 4 | PO2, PO4 |
| Fundamentals of Chemical Technology | BD | EC | General chemistry | Atomic-molecular teaching, the structure of matter, the general laws governing the course of chemical processes, chemical processes in solutions. Covalent chemical bonding, energy and kinetics of chemical processes, chemical equilibrium, electrolyte solutions and the basics of electrochemical processes. The subject of organic chemistry. Theory of the chemical structure of Butlerov. Classification of organic compounds. Types of organic reactions. Methods for obtaining polymers. Polymer properties and their application. | 4 | PO2, PO5 |
| BD | EC | Petrochemistry | Basic concepts and laws of chemistry. The structure of the substance, the general laws of chemical reactions, chemical and technological processes. The subject of organic and inorganic chemistry. Hydrocarbons and their derivatives. Oil. Types and origin of oil. Oil production and refining. Distillation. Cracking. Reforming. |  | PO2, PO5 |
| BD | EC | Technological processes and equipment  | Theoretical bases of chemical technology processes. Hydromechanical and mechanical processes. Types of heat transfer, their characteristics. Evaporation. Mass transfer processes. Molecular and convective mass transfer. The basic equation of mass transfer. General information and applications of mass transfer processes and devices: Features of catalytic processes, factors limiting chemical-technological processes. Elements of modeling chemical and technological processes. | 3 | PO2, PO9 |
| BD | EC | Oil refining technological processes | Theoretical foundations of oil refining processes. Hydromechanical processes: sedimentation, filtration, centrifugation, rectification.Types of heat transfer, their characteristics. Evaporation. Mass transfer processes. Molecular and convective mass transfer. The basic mass transfer equation. General information and applications of mass transfer processes and apparatuses: Features of catalytic processes, factors limiting oil refining processes. Elements for modeling chemical-technological processes. |  | PO2, PO9 |
| BD | EC | Basics of technological processes | Studies the typical patterns of technological processes, the composition, structure of chemical production and the criteria for its effectiveness, the raw material and energy base of chemical industries, chemical processes and reactors. Forms the skills of system analysis and the optimal organization of technological processes, calculate and analyze the material balance of chemical technological processes, describe the elements of technological schemes, analyze models of chemical engineering. | 3 | PO2, PO9 |
| BD | EC | Industry Technology | Studies the scientific foundations of technological processes, the features of the organization of chemical production, the development of a technological scheme with the selection of basic devices. It considers technologies for the production of sulfuric, nitric and phosphoric acids, mineral fertilizers, feed and food phosphates, silicate materials, and processing of solid fuels. It forms the skills of choosing the optimal technological mode of the most important chemical industries, the calculation of material technological flows. |  | PO2, PO9 |
| Module fundamentals of electrical engineering and electronics | BD | HSK | Theoretical foundations of electrical engineering | DC electrical circuits. Voltage on the circuit. Ohm's law. Kirchhoff's laws. Electric circuits of sinusoidal current. Modes of operation two-terminal. Electric circuits of a three-phase sinusoidal current and a periodic non-sinusoidal current. Periodic non-sinusoidal currents in linear electrical circuits. Features of the three-phase systems. Equations for free currents and voltages. The theory of the electromagnetic field. Basic equations of electrostatics. | 6 | PO4, PO6 |
| BD | EC | Electronics | Electron-hole pn junction. Metal-semiconductor transition. Semiconductor diodes. Bipolar transistors. Field unipolar transistors. Photoelectronic devices. The foundations of optoelectronics. Basics of microelectronics. Classification and manufacturing technology IC.Classification and basic parameters of amplifiers. Operational amplifiers. Harmonic oscillators. Basics of digital electronics. Digital devices. Combination Digital Devices. | 5 | PO4, PO6 |
|  |  | Digital technology and microcontrollers | Arithmetic and logical foundations of digital technology. Combination digital devices. Sequential digital devices. Analog-to-digital and digital-to-analog converters. Microprocessors. Single-chip microcontrollers. General characteristics and structural organization, program model and command system, event timers / counters, serial interface. The use of microprocessors and microcontrollers in control systems |  | PO4, PO8 |
| ChD | HSK | Training Practice | Acquaintance of students with a bachelor's training program in the field of automation of the management of technological processes and production, the terms and technologies of mastering the program, with the basic requirements for the professional training of a university graduate. Acquaintance with the scope, objects, objects and types of professional activity, with the prospects for the development and application of automated control systems. Mastering the basic principles of working with computer technology, software and sources of scientific and technical information. Obtaining practical skills in maintaining documentation and compiling a report on the work performed. | 1 | PO2, PO9 |
| Theory of automatic control  | ChD | HSK | Linear systems of automatic regulation  | Mathematical models of linear automatic control systems (ASR). Typical input signals and reactions to them. The transfer function of the object. Getting the characteristic equation. Stability of linear systems. Equations and dynamic functions of typical dynamic links. Structural schemes of automatic systems. Determination of transfer functions of multi-loop systems. Determination of the stability of a dynamic system. Algebraic stability criteria. Quality management process.  | 5 | PO6, PO9 |
| ChD | HSK | Nonlinear systems of automatic regulation  | Typical nonlinear characteristics. The concept of absolute stability. Exact methods for studying stability and self-oscillations. Methods for the study of systems with piecewise linear characteristics. Approximate methods for the study of nonlinear systems. Discrete and impulse automatic control systems with discrete and impulse elements. Application of the discrete Laplace transform and z-transform to the study of pulse systems. Analysis and synthesis of pulse control systems.  | 4 | PO6, PO9 |
| Computer graphics and software | ChD | EC | Programming automation tasks | Familiarity with the methods and tasks of computer information processing systems for management purposes. Knowledge of the typical components of technical tasks: analysis, synthesis, decision making. The right choice of data types, the compilation of structural data types. Classification of algorithmic language operators. Development of the program structure. Programming linear, branching, cyclic structures of algorithms. Acquisition of skills to work with integrated programming systems. Development of algorithms and programming in a basic procedurally-oriented language. | 5 | PO3, PO7 |
| ChD | EC | Object oriented programming | Knowledge of the basic concepts and concepts of object-oriented programming (OOP): encapsulation, inheritance, polymorphism. Acquaintance with OOP platforms: Java technology, DLL - dynamic libraries, technology for DDE program interaction, OLE - object linking and implementation. An overview of object-oriented programming languages: C ++ - a system OOP language; C # - language for .Net; Delphi - visual OOP system, Object Pascal |  | PO3, PO7 |
| BD | EC | Engineering and computer graphics | The discipline studies the basic provisions of descriptive geometry, engineering graphics, the practical implementation of general technical and specialized drawings in accordance with GOST, the skills of working with modern computer programs in the computer-aided design environment AutoCAD, 3D modeling, skills to build and read technical drawings. | 3 | PO3, PO10 |
| BD | EC | Design automation systems and graphics | The main components of automated systems. Design stages and composition of technological process automation projects. The composition of the working documentation for the creation of automation systems TP. Functional, structural, schematic electrical circuits of automation systems. Design of external electrical and pipe wiring diagrams. Drawings of equipment location and wiring. Project management.  |  | PO3, PO10 |
| The module elements, devices and measurement automation | BD | EC | Elements and devices of automation | Elements and devices of primary and secondary transformation. Intelligent and programmable sensors, structure, composition, purpose, principle of operation. Devices and systems of communication, coordination with the object. Elements and devices for monitoring and control of electrical, pneumatic and hydraulic automatics. Elements and devices for input, transmission, processing, storage and display of information. Executive and control devices. Robotic systems. | 6 | PO4, PO9 |
| BD | EC | Automation of control objects | Basic concepts, definitions, structures, functions, properties of automated process control systems (APCS). Technical means of automation. Quantitative assessment, coding, transmission, protection, storage, organization of information exchange in the information support of the process control system. Modeling of technological control objects. Control algorithms for automated process control systems. Features of the design of process control systems. Software systems for managing production processes. |  | PO4, PO9 |
| BD | EC | Information and measuring systems | Measurement errors. Types of instruments for measuring temperature, pressure, liquid level and bulk materials. Measurement of the amount and flow of liquids and gases. Measurements of the physicochemical properties of liquids and gases. Conductometric method, potentiometric, chromatographic methods of analysis. Measurement of viscosity, density of liquids and gases. Thermoconduction, thermomagnetic, thermochemical gas analyzers. Intelligent wireless and wired sensors of technological parameters. | 4 | PO3, PO4 |
| BD | EC | Information devices of control systems | Features and specificity of modern information management systems of the enterprise. The concept of an integrated corporate information system of the enterprise. The concept of material management production. Concepts of planning production resources. Corporate information systems architecture. The specifics of distributed data entry and integration layer in corporate information systems. The main modules of corporate information systems.  |  | PO3, PO4 |
| ChD | HSK | Manufacturing Practice 1 | Acquaintance with the elements and devices of the primary and secondary signal conversion, input, transmission, processing, storage and display of information, executive and regulatory devices. Ability to calculate and analyze measurement errors. Know the device and understand the principles of operation of devices for measuring temperature, pressure, liquid level and bulk materials, quantity, flow rate and physico-chemical properties of liquids and gases. Development of skills in the preparation of reporting documentation. | 3 | PO3, PO4 |
| Bases of modeling and reliability of control systems | BD | EC | Modeling and identification of control objects | General information about mathematical models of their structure and classification. Possession of experimental design and regression analysis methods for constructing a mathematical model of the control object. Identification of control objects by the method of correlation analysis and analytical method. Modeling and identification of dynamic characteristics of objects. Possession of methods and means of determining the frequency characteristics of the control object. Analysis of criteria and indicators of identification quality. Estimation of parameters and condition of objects. | 5 | PO3, PO5 |
| BD | EC | Identification methods of control systems | The main stages of the study in the identification of typical technological processes. Analysis of the types of identifiable objects and the types of signals used in the identification of dynamic systems. Identification of the static characteristics of an object by methods of the theory of automatic control. Identification of the dynamic characteristics of objects by the method of harmonic influences and by impulse transition functions. Identification using adaptive models. |  | PO3, PO5 |
| ChD | EC | The reliability of control systems | Key indicators and methods for assessing the reliability of management systems. Criteria for evaluating and quantitative characteristics of the main indicators of reliability of management systems. Indicators of reliability of recoverable objects. Calculation of the reliability of the CAP of continuous technological processes. Reliability of information systems and software. Operator reliability and operational reliability of systems. Examples of highly reliable software technical complexes and control systems. | 4 | PO5, PO10 |
| ChD | EC | Quality control | Factors affecting product quality. Deming cycle. The PDCA cycle is a continuous quality improvement cycle. Product quality and standardization. Methods for assessing the quality of automation and control equipment. The main methods of qualimetry. Comprehensive assessment of product quality. Mathematical criteria for assessing the reliability of expert conclusions. Automated systems for monitoring and managing the quality of electronic devices. |  | PO5, PO10 |
| Methods of designing automation systems and economic calculations | ChD | EC | Economy and organization of production | Production as a management process. Production process and its organization. Types and forms of organization of production. Organization of repair, energy, transport, storage facilities. Production capacity of the enterprise. Personnel management of the enterprise. Planning of production costs, income and profitability: financial resources of the enterprise, planning production costs. | 3 | PO2, PO11 |
| ChD | EC | Entrepreneurship  | Introduces the mechanism of entrepreneurial activity, taking into account the accumulated domestic and foreign experience in business development. Develops the ability to apply civil law governing business activities. Develops critical thinking and the ability to make management decisions in terms of risk and uncertainty. It forms business planning skills, the ability to work both in a team and independently. |  | PO11, PO12 |
| ChD | EC | Systems of design automation | Methodology of designing hierarchical process control systems. The main components of automated systems. Decomposition of an automated process control system. Design stages and composition of technological process automation projects. General requirements for the design documentation. Functional, structural, basic electrical circuits of automation systems. Algorithmization in automated systems. Algorithms for automated control systems of industrial control systems. Development of AS software. Classification of basic concepts of project management. | 5 | PO9, PO10 |
| ChD | EC | Design of telemechanics and automation systems | Designing automatic control systems. Functional schemes of automation. Technical and software means of automation and remote control systems. Stages of design and composition of project documentation. Mathematical and software. Methods for determining hardware reliability. Algorithmization in automated systems. Algorithms for automated process control systems. Requirements for the content of documents developed during the creation of automated systems. |  | PO9, PO10 |
| Bases of technological measurements and databases | BD | EC | Technological measurements and devices | Classification of measuring instruments and automation of technological processes of installations. Basic information about measurements, measuring instruments and their errors. Technological measurements. Classification of instruments for measuring: pressure, liquid level and bulk materials, temperature, liquid and gas flow rates. Using LabVIEW graphical software to control technological parameters. Functional diagrams of automatic control of technological parameters. | 5 | PO4, PO7 |
| BD | EC | Technological measurements in oil processing | On the role of primary converters in the process of control and management of technological processes in oil refining. Classification of measuring instruments and automation of technological processes in oil refining. Classification of instruments for measuring: pressure, liquid level and bulk materials, temperature, liquid and gas consumption in oil refining. Methods and instruments for analyzing and measuring the parameters of substances. State FS standards.  |  | PO4, PO7 |
| BD | EC | Database | Classification of database management systems. DBMS Architecture. The infological, datalogical and physical levels of data design. Database design. Normalization of relations. General characteristics of the MS Visual FoxPro DBMS. Structural design models. Object-oriented models. Classification of CASE-tools. System structure type. Object-oriented systems. Principles of work with client-server DBMS. Open systems. Clients and servers of local networks.  | 6 | PO3, PO5 |
| BD | EC | Expert systems in control | Classification of intelligent information systems. Methods and objectives of the presentation and formation of knowledge. Classification of knowledge representation methods. Production models. Formal logical models. The structure of knowledge bases. Knowledge Interpreter. Output control strategy. Fuzzy knowledge. Effective strategies for managing fuzzy knowledge processing. Technology development of expert systems. Knowledge structuring technology. Prospects and problems of the development of artificial intelligence systems. |  | PO3, PO5 |
|  | ChD | HSK | Manufacturing Practice 2 | Study of production technology, consolidation and deepening of theoretical knowledge obtained in the study of disciplines related to methods and means of technological measurements at industrial facilities, as well as in oil refining; with database management systems and expert systems used in the management. Student participation in the activities of a manufacturing or research organization; improvement of professional skills in the field of automation and control. | 6 | РО2, РО5 |
| Bases of the information theory and optimization of management | ChD | EC | Applied information theory | The concept of a signal and its model. Models of discrete communication channels. Bandwidth discrete channel without interference, continuous communication channel. Coding as a process of expressing information in digital form. Anti-interference coding. Building a binary group code. Corrective group codes. Hamming codes. Technical means of encoding and decoding group codes. Technical means of encoding and decoding cyclic codes. | 3 | PO3, PO7 |
| ChD | EC | Information bases of сontrol | Physical bases of methods for measuring the physicochemical properties of liquids and gases. Gas chromatograph and its elements. Viscosity measurement of liquids. Measurement of the density of liquids and gases. Thermoconduction, thermomagnetic, thermochemical gas analyzers. Programmable controllers for automatic control and management of technological parameters of objects in the petrochemical industry and oil refining. Intelligent wireless and wired sensors of technological parameters of world leading companies. |  | PO3, PO7 |
| BD | EC | Optimization methods | Generalized formulation of the optimization problem. Task formalization. Methods of experimental one-dimensional optimization. Direct search methods. Dichotomy method, reverse half step method, Bolzano method Fibonacci method, golden section method. Powell method. Approximation methods. Multidimensional optimization. Analytical and experimental search problems for multidimensional optimization. Linear programming. Simplex linear programming method. Transportation task Nonlinear optimization problems. | 5 | PO2, PO5 |
| BD | EC | Extreme control systems | The structure of automated systems of extreme process control. Components of a modern automated system of extreme process control. Extreme and self-adjusting automatic control systems. Scopes of extreme regulators. Ways to organize the movement to the extremum. The main characteristics of extreme regulators. The use of computers in extreme regulators. Areas of application of linear programming methods. Problem statement, its interpretation. |  | PO2, PO5 |
| Basics of typical and local automatic control systems | ChD | EC | Automation of typical technological processes and production | Transformation of technological information. Technical means of automation of standard technological processes and complexes. Automation of continuous and discrete technological processes. Typical schemes of automatic regulation of technological parameters. Tasks and algorithms for optimal control of technological processes. Examples of automated process control systems in various industries. Typical solutions for SCADA — systems in various industries. | 5 | PO2, PO9 |
| ChD | EC | Typical design solutions for control systems | The introduction of an information system. Types and models of enterprises. Fundamentals of analysis of linear stationary control systems. Poly-Gaussian random-impact models and methods for analyzing them. Synthesis of linear stationary systems. The calculation of the transfer functions of corrective devices. Synthesis of systems with incomplete information on input effects. Synthesis of automatic control systems with random input effects. Synthesis of optimal systems. |  | PO2, PO9 |
| ChD | EC | Automated control systems | The use of microprocessor automation and software systems for the automation of technical systems The implementation of model laws of regulation in industrial regulators. Digital and discrete-logic control systems. Hardware tools for the implementation of automatic control and discrete logic control in the automation of technical systems. Means of collecting analog and discrete information, means of giving commands to control objects. | 6 | PO4, PO10 |
| ChD | EC | Automation of means in oil refining | The use of microprocessor tools and software systems for automating processes in oil refining. Features of static and dynamic characteristics of control objects in oil refining. Industrial systems of automatic control. Algorithms and laws of regulation. Digital and discrete-logic control systems. Means of collecting analog and discrete information, means of giving commands to control objects. Refining. |  | PO4, PO10 |
| The module elements, devices and measurement automation | ChD | EC | Computer networks and systems in automation | Principles of building computer networks. Local Area Networks (LAN). Types and characteristics of LAN. LAN technology standards. Requirements for computer networks. Cable types and structured cabling systems. Network adapter features. Repeaters and hubs. LAN switch The structure of the network operating system. Wireless networks and technologies. The use of wireless networks to monitor and control technological processes.  | 4 | PO3, PO4 |
| ChD | EC | Computer networks and telecommunication systems | Computer architecture, basic hardware configuration. Principles of building computer networks. Topology of computer networks. Methods of access to the workstation. Methods of wireless data transmission technology (Radio Waves). Communication cables, communication lines, communication channels. Network hardware. The structure of the network operating system. Selection and justification of the network topology and equipment for the control of technological processes of oil refining. |  | PO3, PO4 |
| ChD | EC | Methods of modeling of chemical engineering procedures | The role of mathematical modeling is the main method of cybernetics. Knowledge of the method of moments and determination of moments from experimental data. Analysis of mathematical models of typical processes of chemical technology. Knowledge of the basic concepts of chemical kinetics. Compilation of mathematical models of chemical, isothermal reactors. Calculation of reactors according to response curves without taking into account the macrostate of the system. Using software for modeling objects and systems. | 5 | PO2, PO5 |
| ChD | EC | System analysis of chemical engineering | The mathematical description of the system. Classification of systems. Analysis of typical technological processes from the perspective of system analysis. Complex physicochemical system (CPhS). Mathematical formalization of CPhS. Technological, functional and modular operators. Analysis and synthesis of object artificial systems. Qualitative analysis of the structure of CPhS. Synthesis of the structure of the functional operator CPhS. Subjective decision making systems. Artificial Intelligence Systems. |  | PO2, PO5 |
| Problems of microprocessor and controller control systems | BD | EC | Microprocessor complexes in control systems | The structure of the basic microprocessor system. Microprocessor architecture. The organization of the memory subsystem. Organization of I / O subsystem. Peripherals. Single-chip microcontrollers. Software embedded microprocessor systems. Methods to improve the performance of microprocessor systems. Equipment for debugging microprocessor devices and systems. Software and hardware management systems. | 5 | PO4, PO6 |
| BD | EC | Microprocessor means and software and hardware complexes | The structure of the basic microprocessor system. Microprocessor architecture. The organization of the memory subsystem. Organization of I / O subsystem. Peripherals. Single-chip microcontrollers. Software embedded microprocessor systems. Methods to improve the performance of microprocessor systems. Equipment for debugging microprocessor devices and systems. Software and hardware management systems. |  | PO4, PO6 |
| BD | EC | Programming industrial controllers | Purpose, device, conditions and principle of operation of the PLC, its integration into the control system.Familiarity with PLC system and application software. Overview of programming systems for industrial controllers. Mastering the skills of working with the instrumental program complex of industrial automation CoDeSys. Organization of data and user data types. Variable memory allocation, direct and bit addressing. Using software organization components (POUs). Development of control programs in the languages ​​of the IEC61131-3 standard. Using standard and advanced library components of IEC programming complexes. | 6 | PO4, PO8 |
| BD | EC | Software of SCADA systems | The role of SCADA systems in modern process control systems. The study of functional capabilities and technical characteristics, hardware and software platforms for the implementation of SCADA systems. Mastering the design technology of automation systems based on SCADA systems. Work with the tool kit of the SCADA systemTraceMode. Mastering Project development strategies depending on the structure and complexity of the ACS. Development of algorithms and data processing programs. Management of personnel access rights, storage of technological information using industrial data archives. Organization of interaction with a relational database managed by a DBMS. |  | PO4, PO5 |
| Module final certification | ChD | HSK | Predegree or industrial practice | Study of production technology and design characteristics of apparatus and equipment. Analysis of the composition, structure and functioning of the automation system. Acquisition of practical skills in setting up measuring, regulation and logical control tools. Mastering the technology of designing automation and control systems. The calculation of the economic efficiency of the designed automation system. Organization of measures to ensure life safety and environmental cleanliness. | 8 | PO3, PO1, PO5, PO6, PO9, PO11 |
|  |  | Writing and defence of degree work (project) or passing of graded exam  | Analysis of the technological process. System-technical synthesis of control system. Development of information support of control systems. Development of management and control structure. Hardware-technical synthesis of the control system. Development of automation concepts. Design of the operator's point. Design of installation of automation. Development and research of control algorithm. Individual task. Development of solutions for environmental protection. Life safety. Feasibility study of the effectiveness of the management system. | 12 | PO1, PO3, PO4, PO5, PO7, PO8, PO11 |

**AGREEMENT SHEET**

by Education Program code 6B07110 – «Automation and control»

Director of AID \_\_\_\_\_\_\_\_\_\_\_\_\_G. Omashоva *signature*

Head of ASD \_\_\_\_\_\_\_\_\_\_\_\_\_ Zhangabay N.Zh.

 *signature*

Head of DNPiK \_\_\_\_\_\_\_\_\_\_\_\_\_ Bazhirov T.S.

 *signature*