САФИ ӨТЕБАЕВ АТЫНДАҒЫ АТЫРАУ МҰНАЙ ЖӘНЕ ГАЗ УНИВЕРСИТЕТІ
ATYRAU OIL AND GAS UNIVERSITY NAMED AFTER SAFI UTEBAEV

БЕКІТІЛДІ / APPROVED
"Атырау мұнай және газ университеті" КеАҚ
Ғылыми кеңесінің шешімімен / Decision
Academic Council AUNG
Chairman of the Board-Rector _____
2021 ж./у "30" 04 , No. 20 хаттама / protocol

БІЛІМ БЕРУ БАҒДАРЛАМАСЫ
EDUCATIONAL PROGRAM

7М07103 "Өндірісті автоматтандыру және басқару"
Білім беру бағдарламасының атауы

7М07103 "Automation and production management"
Name of the educational program

Atyrau, 2021

Faculty Information technologies

EP name Automation and production management

OP type:

☐ **The current**

☒ **New**

☐ **Innovative**

DEVELOPERS (Academic Committee):

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1. GENERAL INFORMATION

1.1 Program loop:
First cycle: Master's degree 7 NQF / ORC / ISCED

1.2 Awarded degree: Master of Engineering and Technology in the educational program 7B07103 - "Automation and production management "

1.3 Total amount of loans: 120 academic credits / 120 ECTS

1.4 Typical training period: 2 years

1.5 Distinctive features of the EP

The program includes the study of the fundamental principles of building modern control systems based on computer technology. The main areas of research are the study of systems in the state space, the construction of optimal automatic control systems, system diagnostics, computer design of automatic systems, modern technical and technological solutions used in the construction of automatic control systems.

Distinctive features of the program are that it is a logical continuation of the bachelor's program and provides for the expansion and deepening of knowledge both in the field of the theory of development and creation of automatic control systems, and in the field of computer technologies, which make it possible to apply the theoretical knowledge gained in practice and allows you to engage in teaching in higher and secondary educational institutions.

2. PURPOSE AND RATIONALE OF OP

2.1 Purpose of the EP

The main purpose of the educational program is to train highly qualified personnel in the field, the development of the design and operation of automation systems for technical objects and technological processes, the organization of work on the creation of automatic control systems.

As a result of mastering the EP, the student acquires knowledge, skills and abilities that allow to achieve the following goals:

- implementation of the second level (stage) of professional education in the multilevel structure of higher education in the Republic of Kazakhstan based on the competence-based approach;
- provision of training of specialists combining education of the relevant direction and in-depth professional specialization, possessing the skills of research, production, technological and pedagogical activities;
- increasing the demand for graduates in countries that have joined the Bologna Agreement on the creation of a single educational space in Europe.

Training under the program will allow:

- master a deep understanding of professional practical problems, managerial skills and techniques, analytical, consulting activities, master the most important and sustainable knowledge that requires in-depth fundamental and special training and provides a holistic perception of the scientific picture of the world;
- develop creative potential, develop a readiness among undergraduates to solve innovative non-standard tasks, the ability to quickly restructure their activities in connection with changes in external conditions.

2.2 Rationale for EP for students

The objective of the program is to train a new generation of specialists in the field automation of systems, networks, their modes, stability and reliability:
- possessing the skills of designing and highly efficient use of automated systems; as well as equipment for the automation of technological processes;
- able to use the system of knowledge about the principles of automation to develop and substantiate management policies for enterprises, organizations and institutions;
- ready-to-use modern information technologies and technical means for solving professional problems in the field of automation;
- ready to work in a competitive environment on the labor market in the conditions of modernization of enterprises, organizations and institutions, ensuring their stable and reliable work;
- able to solve professional problems in the field of management and strategic development of the economy of industrial enterprises and systems in general, primarily through the introduction of modern equipment and technologies.

EP is a complex of the main characteristics of education (volume, content, planned results), developed taking into account the requirements of the labor market and taking into account the development of science, culture, economics, technology, technology and the social sphere, based on the state educational standard in the relevant direction of higher education ... The educational program regulates the goals, expected results, content, organizational and pedagogical conditions and technologies for the implementation of the educational process, forms of certification, assessment of the quality of the graduate's training in this area of training and includes: curriculum and working (variable) curricula in areas of training, calendar curriculum, work programs of disciplines (modules), practice programs,

2.3 Demand in the labor market

The specificity of the EP consists in the features of the field of professional activity of masters, including the design, development, maintenance and operation of automation and control tools and systems for various purposes. The trainees are future workers in the design, development and maintenance of various control systems in the field of automation of technological processes and production, automated management of the product life cycle and its quality. The labor market has a need for graduates of this direction.

This EP forms graduates to meet the needs of the labor market in the region with highly qualified specialists.

The educational program contributes to the satisfaction of the needs of specialists in the direction of "Automation and production management" in modern conditions and in the future, taking into account the development of the industry through contracts concluded on cooperation with enterprises and organizations and branches of the department at paratner enterprises of the corresponding industry.

After completing the basic educational program, graduates can work as highly qualified specialists, heads of departments at leading enterprises of engineering companies, design organizations, in industry institutes, enterprises of the oil and gas industry, and engage in teaching activities in higher and secondary educational institutions.

2.4 Area of professional activity

The area of professional activity of masters includes:

- a set of means, methods and methods of science and technology aimed at automating existing ones and creating new automated and automatic technologies and industries;
- substantiation, development, implementation and control of norms, rules and requirements for products for various service purposes, its life cycle, the processes of its development, manufacturing, quality management, application (consumption), transportation and disposal;
- development and research of automation and control tools and systems for various purposes, including the life cycle of products and their quality, in relation to specific production conditions on the basis of domestic and international regulatory documents;
- research in the field of design and improvement of structures and processes of industrial enterprises within a single information space;
- creation and application of algorithmic, hardware and software for automation systems, management and control of technological processes and industries, ensuring the release of high-quality, safe, competitive products that free a person in whole or in part from direct participation in the processes of obtaining, transforming, transferring, using, protecting information and production management;
- research in order to ensure the highly efficient functioning of automation tools and systems, control, monitoring and testing to the specified requirements, while observing the rules of operation and safety.

Graduates of the program are highly qualified personnel for enterprises engaged in the development and maintenance of modern automatic control systems in various industries and possessing a set of means, methods and methods of science and technology aimed at automating existing and creating new automated and automatic technologies and industries; able to develop and research tools and automation and control systems for various purposes in relation to specific production conditions on the basis of domestic and international regulatory documents; able to conduct research in the field of design and improvement of structures and processes of industrial enterprises within a single information space, create and apply algorithmic,

Types of professional activities of the graduate

Master of EP can perform the following types of professional activities:

- innovative;
- production and technological;
- organizational and managerial;
- design and engineering;
- scientific and pedagogical.

The master's program has three options for implementation, depending on which it prepares masters for the following types of professional activities:

- research;
- production and technological;
- pedagogical.

with specialized training as: an engineer in organizations and enterprises where automated control systems for technological processes and production, automated information and control systems for various purposes, automated systems for receiving, processing and transmitting data for various purposes, automated systems for designing systems are used and developed;

in scientific and pedagogical training as: teacher of state and non-state secondary, secondary specialized and higher educational institutions; researcher of research and other organizations of any form of ownership.

General cultural competences Master's degree in the direction of training 7M07103 "Automation and production management " is formed by an understanding of modern trends in the development of scientific knowledge and actual methodological and philosophical problems of natural sciences; knowledge of the methodology of scientific knowledge and the ability to apply scientific methods of knowledge in professional activities; the ability to think creatively and be creative in solving new problems and situations.

Master's professional competencies are formed by the ability to carry out information-analytical and information-bibliographic work with the involvement of modern information technologies; generalize the results of experimental research and analytical work; the ability to apply methods of calculating elements and nodes of automation and control systems, to carry out design work and draw up design and technological documentation in accordance with standards, specifications and other regulatory documents; the use of information and computer technologies in the field of professional activity, the use of modern methods for the development of energy-saving and environmentally friendly automation and control systems.

Tasks of the professional activity of the graduate

A master's degree in training should be prepared for the solution of the following professional tasks in accordance with the profile direction of the OEP master's program and types of professional activity:

Research activities:

- setting and formulating scientific research tasks based on the results of search, processing and analysis of scientific and technical information;
- development of new technical and technological solutions based on the results of scientific research;
- creation of computer models that allow the development and research of automation and control tools and systems for various purposes in relation to specific production conditions on the basis of domestic and international regulatory documents;
- development of a plan and implementation of scientific research, processing and analysis of their results, formulation of conclusions and recommendations;
- coordination of work to support the implementation of the results of work in production;
- preparation of scientific and technical reports, analytical reviews, certificates and acts;
- protection of intellectual property, publication of scientific results.
- experience of public speaking, participation in scientific seminars, conferences.

Production and technological activities

- automation of existing and creation of new automated and automatic technologies and industries;
- development and research of means and systems of automation and control for various purposes in relation to specific conditions of production on the basis of domestic and international regulatory documents;
- research in the field of design and improvement of structures and processes of industrial enterprises within the framework of a single information space;
- the use of automation systems, management and control of technological processes and industries, ensuring the release of high-quality, safe, competitive products;
- development of design solutions for the reconstruction of operating enterprises;
- marketing analysis of enterprises and, in particular, the equipment used;
- development of technical descriptions of control systems;
- control over the course of technological processes, the choice of technical means to ensure the quality of products;

- research of the causes of defects in production and the development of proposals for its prevention and elimination;

Pedagogical activity:

- development of new courses of lectures using interactive forms of education and new computer technologies;
- development and writing of guidelines for conducting workshops;
- development of educational and methodological documentation for conducting classes;
- conducting laboratory and practical exercises;
- development of methods for monitoring students' knowledge;
- preparation of multimedia materials for the educational process.

2.5 Objects of professional activity

The objects of professional activity of the masters of the program are:

products and equipment for various service purposes of enterprises and organizations, production and technological processes of its manufacture;

systems for the automation of production and technological processes for the manufacture of products for various service purposes, management of its life cycle and quality, control, diagnostics and testing;

means of technological equipment for automation, control, monitoring, diagnostics, testing of the main and auxiliary industries, their mathematical, software, information and technical support, as well as methods, methods and tools for their design, manufacture, debugging, production testing, operation and scientific research in various branches of the national economy;

research in the field of automation of technological processes and production, management of the life cycle of products and their quality;

3. EXPECTED LEARNING OUTCOMES OF EP

Upon successful completion of this program, the student will:

- Organize effective and stress-resistant work performed individually or collectively to solve professional problems, plan and evaluate work results (PO1)
- Collect, process, analyze and systematize information on the research topic, use the achievements of science, technology and technology in their professional activities, communicate and express their thoughts in a foreign language in a professional environment, scientifically argue and convince when justifying decisions. (PO2)
- Use the methods of modern economic theory in assessing the effectiveness of the systems and devices being developed and investigated, as well as the results of their professional activities. (PO3)
- Create physical, mathematical and computer models of objects of professional activity, apply mathematical methods in solving engineering problems, use modern software products. (PO4)
- Design objects of professional activity, their systems and elements, calculate and determine parameters and indicators, research and form rational modes of equipment operation, analyze and evaluate the introduction of new technologies. (PO5)
- Carry out theoretical and experimental research in the objects of professional activity, plan and organize work on the maintenance, operation and repair of equipment, monitor and evaluate the technical condition of the equipment, develop recommendations, draw up analytical reports on theoretical or experimental work. (PO6)

4. EDUCATIONAL PLAN OF OP

Module code	Module components (code and name)	Loop and component	Final control form	Number of academic credits	Number of academic hour.	Formed competencies (codes from section 5	Let's take anxiety
1 semester							
Scientific and pedagogical training module	IPhN120 History and Philosophy of Science	BD / VK	exam	5	150	KK1, KK2, KK3	
	IYa 1202 Foreign language (professional)	BD / VK	exam	5	150	KK4	
	PY 1203 Management Psychology	BD / VK	exam	2	60	KK5	
	PBS 1204 High School Pedagogy	BD / VK	exam	5	150	KK6	
Automation and Control Theory Module	ITNP 1205 Information Technology in Science and Industry	BD / KV	exam	5	150	PK9, PK11	
	PSAU 1205 Design of automation and control systems						
	SNATP 1206 Modern directions of development of automation of continuous technological processes	BD / KV	exam	5	150	PK10, PK11	
	IRATU 1206 History of the development of automation and control theory						
Module Scientific Research Methods	R&D, including internship and master's thesis	NIRM	report	3	90	PK8	
Total for the semester				30			
2 semester							
Module Scientific Research Methods	MMMI 1301 Mathematical Models and Methods in Engineering/ SUU 1301 Control Device Circuitry	PD / KV	exam	5	150	PK1, PK2	
	AP 1302 Academic writing	PD / VK		3	90	PK3, PK4	
	Research work of a master's student, including an internship and a master's thesis.	NIRM	report	4	120	PK8	
System and technology of automatic control module	UPRAS 1207 Management of the process of development of automated systems.	BD / KV	exam	5	150	PK12	
	SUTP 1207 Technical process control systems.						
	KTAU 1303 Computer automation and control technology.	PD / KV	exam	5	150	PK12, PK13	
	TiT 1303 Telecontrol and telecontrol						
	APOSA 1304 Algorithmic and software for automation tools and systems.	PD / KV	exam	5	150	PK13, PK14	
	APOAS 1304 Hardware and software for automated enterprise management systems.						
Scientific and pedagogical training module	PP 1208 Pedagogical Practice. Teaching practice	BD / VK	report	3	90	KK7	
Total for the semester				30			

3 semester							
Module Scientific Research Methods	ISPAP 2305 Integrated design and management systems for automated and automated production	PD / KV	exam	5	150	PK3, PK5, PK6	
	ILPP 2305 Integrated logistics support for products in the life cycle stages						
	R&D, including internship and master's thesis.	NIRM	report	5	150	PK7	
	TA 2306 Automata Theory	PD / KV	exam	5	150	PK2, PK4, PK6	
	TIOSU 1306 Technical and information support of control systems.						
	ISKAP 2307 Information systems for quality management in automated and automated production.	PD / KV	exam	5	150	PK5	
	IKCU 2307 Information channels of control systems.						
	MUUAS 2308 Microprocessor control devices for automated systems	PD / KV		5	150	PK6	
	IIIS 2308 Intelligent information and measurement systems						
Manufacturing process automation module	APNP 2309 Automation of petrochemical production processes	PD / KV	exam	5	150	PK15	
	APB 2309 Automation of drilling processes						
Total for the semester				**30**			
4 semester							
Module Scientific Research Methods	R&D, including internship and master's thesis.	NIRM	report	12	360	PK7	
Module Scientific Research Methods	IP 2310 Research practice.	PD / VK	report	6	180	PK8	
Final Assessment Module	final examination		exam	12	360	PK16	
	Registration and defense of a master's thesis.		Master's thesis defense				
Total for the semester				**30**			
Total:				**120**			

5. MAP OF TRAINING MODULES
(modules description)

A: INFORMATION FOR ADMINISTRATION			
1	**Module code**	**MNPP01**	
2	**Module name**	**Scientific and pedagogical training module** 1) IPhN1201 History and Philosophy of Science (DB VK, 5 credits) 2) IYa 1202 Foreign language (professional) (VK DB, 5 credits) 3) PVSh 1204 Pedagogy of higher education (BD VK, 5 credits) 4) PU 1203 Psychology of Management (DB VK, 2 credits) 5) PP 1208 Pedagogical practice (DB VK, 3 credits)	
3	**Module developers**	Nigmetov B.S., Utelbaev K.T., Imangalieva N.T. Kulzhanova N.	
4	**Module owner**	Faculty name	
5	**Other faculties involved in the implementation of the module**	**Faculties**	**% participation**
		Basic Faculty	
6	**Duration of mastering the module** Semester and academic year	1	
7	**Language of teaching and assessment**	Kazakh, Russian	
8	**Number of academic credits**	20	
9	**Module prerequisites**	Higher education program	
B. DETAILED INFORMATION ABOUT LEARNING AND TEACHING			
10	**Module Description**		

The history of science is a necessary component of the content of education in the preparation of undergraduates for further raising the level of research work. The history of science and special sciences makes it possible to comprehend the dynamics of the development of science, its impact on the development of society. Historical knowledge allows the future specialist to compose a holistic image of science, to consciously approach various aspects and contexts of the study of science itself.

The philosophy of science is a necessary condition for the development of links between science and various sections of philosophical knowledge, expansion and deepening of the philosophical problems of certain special scientific disciplines. Philosophical knowledge not only stimulates the development of science, but is also organically included in science as an integral part of scientific knowledge.

The purpose and objectives of the course of pedagogy of higher education (PVS) are aimed at forming the foundations of the professional and pedagogical culture of a teacher of higher education, mastering the theoretical foundations of modern pedagogical science and developing readiness for creative solution of professional problems.

Knowledge of pedagogy helps specialists in modern society to independently acquire knowledge throughout their lives, and therefore to self-study and self-education. Possession of educational technologies implements the modern paradigm of education

Lifelong education.

Psychology of management - aims to consider the psychological problems of managerial work, managerial interaction between people, the personality of the leader, his activities in various fields and at different levels. Management psychology also tries to answer the questions: why interpersonal conflicts arise, how to organize people to perform tasks, what stimulates employees in the process of joint activities, what are the conditions for creating a healthy socio-psychological climate in an organization, etc. The subject of "psychology of management" is the psychological aspects of management relations,

functioning in the process of interpersonal and intergroup interaction of people in the process of work. Organizational and socio-psychological aspects of management represent the knowledge of how to work with people, to influence them, to control them. The aim of the course is to form the student's systemic ideas about the socio-psychological laws of managerial activity, to reveal the specifics of the use of socio-psychological knowledge in the structure of a manager's activity, to master the skills of analyzing socio-psychological principles that underlie effective management	
11	**Module objectives**
Ts 1.1	- clarification of the main strategies of scientific research and the historical foundations of the formation of scientific knowledge
Ts1.2	-development of the ability of undergraduates to comprehend the actual problems of history and philosophy of science as a modern world tradition of philosophical understanding of the nature of science;
Ts1.3	- the formation of a scientific and methodological worldview based on knowledge of the characteristics of modern science; - improving the skills of scientific understanding of reality. Comprehension of the dynamics of the development of science, its impact on the development of society, the formation of a holistic image of science, awareness of various aspects and contexts of the study of science itself;
Ts 2	The professional orientation involves the subordination of the goals of teaching a foreign language to the general goal of teaching specialists and the corresponding content of training with a predominance of professional topics. In this context, there is a close cooperation of teachers of a foreign language with teachers of other disciplines. Development of communicative competencies and skills in the field of the specialty of undergraduates. Development of academic competencies, conducting scientific debate and polemics, making reports and lectures, reading scientific literature, writing an article, abstracting and annotating, understanding lectures and taking notes, etc.
Ts.3. 1	Formation of the competencies of undergraduates in the design, planning and organization of an integral pedagogical process for the preparation of future specialists at the university.
Ts3.2	formation of knowledge about the theoretical and methodological foundations of higher education pedagogy;
Ts4.1	- the purpose of teaching the discipline is: the formation of a common scientific, philosophical-methodological, ideological and disciplinary-theoretical base for the scientific and scientific-pedagogical activities of future specialists.
Ts4.2	- clarification of the methodological foundations and problems of modern science, mastering the theory of the method as a special teaching about the principles, approaches, techniques, methods of scientific activity, mastering the logic and methodology of science, developing a methodological culture of research work.
Ts4.3	- to raise the self-awareness of undergraduates, to form value guidelines for the development of scientific knowledge, the practice of research activities.
Ts5	• Acquaintance of undergraduates with the specifics of the activities of a higher school teacher. Consolidation, deepening and implementation in practice of the knowledge gained in the learning process and skills of a creative approach to solving scientific and pedagogical problems, for the design and conduct of creative training sessions, extracurricular activities. • Acquaintance of undergraduates with the specifics of the activities of a teacher of historical disciplines and the formation of skills in performing pedagogical functions; • Acquisition in practical activity of pedagogical skills, skills and competencies in the direction of "Automation and Control", as well as consolidating the experience of independent professional activity
12	**Learning outcomes**
The code	*RO description* — Goal codes
KK1	The process of studying the discipline "History and Philosophy of Science" is — Ts 1.1

	aimed at the formation of the following competencies: • the ability to critically analyze and evaluate modern scientific achievements, generate new ideas when solving research and practical problems, including in interdisciplinary fields; • the ability to design and carry out complex research, including interdisciplinary, based on a holistic systemic scientific worldview using knowledge in the field of history and philosophy of science; • willingness to participate in the work of Kazakhstani and international research teams to solve scientific and scientific and educational problems; • the ability to use the foundations of knowledge in the history of science and philosophy of science to solve problems in interdisciplinary fields; • the ability to plan and solve problems of their own professional and personal development.	
KK2	As a result of mastering the discipline, the undergraduate must know: modern concepts of history and philosophy of science;	Ts1.2
KK3	be able to: analyze contemporary problems of history and philosophy of science; own: conceptual and methodological apparatus of modern history and philosophy	Ts1.3
KK4	-Know the language of texts in the specialty (newspaper and journalistic, scientific and educational); translation as a type of speech activity (oral and written forms); -be able to abstract newspaper, magazine texts. -form at undergraduates skills in using modern lexical and grammatical structures and terminology. - the ability to creatively adapt the achievements of foreign science, technology and education to domestic practice, a high degree of professional mobility; - ability for free scientific and professional communication in a foreign language environment; - readiness for communication in oral and written forms in Kazakh, Russian and foreign languages for solving problems of professional activity.	Ts 2
KK5	- goals, object, subject, main categories and concepts of pedagogical science of higher education	Ts.3.1
KK5	theoretical foundations of the design, organization and implementation of the modern educational process at the university in the framework of the Bologna process, diagnostics of its results;	Ts3.2
KK6	the system of professional and pedagogical values, the norms of professional ethics of a higher school teacher;	Ts4.1
KK6	Knowledge of the theoretical, methodological and methodological foundations of management psychology; The history of the formation and development of the fundamental ideas and concepts of management psychology in the theory and practice of management;	Ts4.2
KK6	methods and technologies of professional activity of a leader in the field of management psychology (leadership of people);	Ts4.3
KK7	Know: the basic principles, methods and forms of organizing research and scientific-production work. Be able to: use them in team management Own: methods of control and assessment of the socio-psychological climate in the team, professionally significant qualities of trainees	Ts5
13	**Literature** **Main literature:** 1. History and philosophy of science. Under. ed. Kryaneva Yu.V., Motorina L.E.-M .: INFRA-M. 2011.-416s.	

	2. Myrzaly S.K. Gylymnyn tarikhy men of philosophy. Almaty: Bastau, 2014. 3. Stepin V.S. History and philosophy of science.-M .: Academic project, 2011.-423p. 4. Khasanov M.Sh., Petrova V.F. History and philosophy of science. Almaty: Kazakh University, 2013.-150p. 5. Philosophy of science. Under. ed. A.I. Lipkin. M .: Eksmo, 2009.- 608s. 6. Altayev A.Sh. European Union: history and modernity. Textbook Almaty. Publishing house "Kyzdar University" - 2015. 7. Bertrand R. "History of Western Philosophy" - M .: Publisher Litres, 2018. - 1195 p. 8. Johnston D. "Philosophical куsқasha tarikhy. Socrattan Derridana deyin ". Gylymi ed. Nurysheva G.Zh. - Astana, 2018.– 216 b. 9. Hess R. "Philosophical tadauly 25 kitaby". Gylymi ed. Raev D.S. - Astana, 2018. – 360 p. 10. Hess R. "25 Key Books on Philosophy." - M .: Ural LTD, 2000 .-- 368 p. 11. Evan Frendo with David Bonamy. English for Oil & Gas. Vocational English Course Book, 2013 12. Smagulova A.S. Manay gaz salasyna arnalgan arylshyn tili. - Almaty, 2015 13. 1. BMJäger. Technical English for Geosciences. Springer-Verlag Berlin. - Heidelberg Pub., 2008 14. RCSelley, LR M. Cocks, and IRPlimer. Encyclopedia of geology. 5 volumes, Elsevier Ltd. Pub., 2005 15. Fundamentals of Electrical Engineering Ch. A. Gross., Th. A. Roppel. CRC Press, New York. 2012. 16. English for technical universities. V.A. Radovel. - "Dashkov and K". - Moscow, 2012. 17. Hyne NJ Nontechnical guide to petroleum geology, exploration, drilling and production (2nd Edition), 2011 18. Philip Kotler Gary Armstrong Principles of Marketing. - Pearson, 2011 19. Richard Clark and David Baker Oxford English for Careers Finance. - Oxford University Press, 2011 **Additional literature:** 1. Education quality management system. - Shymkent OQMU, 2004. 2. Dzhakupov S.M. Management of students' cognitive activity in the learning process. - Almaty: Kazakh university, 2002. 3.Smirnov S.D. Pedagogy and psychology of higher education: from activity to personality.-M., 2001. 4.Mynbaeva A.K., Sadvakasova Z.M. Innovative teaching methods, or how interesting it is to teach.-Almaty, 2009.

A: INFORMATION FOR ADMINISTRATION		
1	**Module code**	**MNMI02**
2	**Module name**	**Module Scientific Research Methods** 1) MMMI 1301 Mathematical models and methods in engineering/ SUU 1301 Control Device Circuitry (PD VK, 5 credits) 2) AP 1302 Academic writing.(PD VK, 3 credits) 3) ISPAP 2305 Integrated design and management systems for automated and automated production / ILPP 2305 Integrated logistics support for products at the stages of the life cycle (PD / CV, 5 credits) 4) TA 2306 Theory of automata / TIOSU 2306 Technical and information support of control systems. (PD / KV, 5 credits) five)ISKAP 2307 Information systems for quality management in automated and automated production. / IKCU 2307 Information channels of control systems. (PD / KV, 5 credits) 6) MUUAS 2308 Microprocessor control devices for automated systems / IIIS 2308 Intelligent information and measurement systems (PD / KV, 5 credits) 7)Research work of a master's student, including an internship and a master's thesis. (NIRM, 24 credits) eight) IP 2310 Research Practice (PD / VK, 6 credits)
3	**Module developers**	D. N. Shabdirov
4	**Module owner**	Faculty of Information Technology

5	**Other faculties involved in the implementation of the module**	**Faculties**	**% participation**
		Faculty of Information Technology	80
		Basic Faculty	20
6	**Duration of mastering the module** Semester and academic year	1, 2,3,4	
7	**Language of teaching and assessment**	Kazakh, Russian	
8	**Number of academic credits**	58	
9	**Module prerequisites**	1.The program of higher education 2. Modern directions of development of automation of continuous technological processes 3. The history of the development of automation 4. Information technology in science and production	

B. DETAILED INFORMATION ABOUT LEARNING AND TEACHING

10 Module Description

Mathematics is the basis for in-depth study of engineering specialties. Without modern mathematics with its developed analytical and numerical apparatus, progress in various fields of human activity is impossible. Mathematical methods have become an integral part of every technical discipline. All this leads to the need to strengthen the applied orientation of the mathematics course and increase the level of fundamental mathematical training. Integrated design and management systems for automated and automated production considers the concept of an automated workstation (AWP) and the main capabilities and areas of application.

Integrated logistics support for products at the stages of the life cycle includes product life cycle management and automation of product life cycle processes.

The concept of an automaton, preconditions for its occurrence, and basic definitions are given.

Technical and information support of control systems. Implementation of automation and control systems in automated control systems. Information subsystem.

Quality management information systems in automated and automated production. Quality Management as a Factor of Enterprise Success in Competition. Approaches to product quality management.

Information channels of control systems. Scheme of data transmission in information channels (IC) of technological process control systems. Mathematical models and methods for analysis and research of processes in discrete-continuous IC. Description of the characteristics of signals and systems in the time domain. Microprocessor control devices for automated systems. Review of the current state and prospects for the development of microprocessor technology. Architectural features and classification of microprocessor devices by purpose, bit capacity, control method, design and technological characteristics. Brief description of the capabilities and applications of microprocessor tools. Intelligent information and measurement systems. The concept of an intelligent system (IS). Basic properties of IP. IP classification. History and main directions of development of the theory of artificial intelligence. The place of expert systems in the theory of artificial intelligence. Components of ES: knowledge base, inference mechanism, mechanism for acquiring and explaining knowledge, intelligent interface. Stages of ES design: identification, conceptualization, formalization, implementation, testing, trial operation. Algorithms for learning neural networks.

NIRM is aimed at training and formation of knowledge about specific technologies of automatic control among undergraduates: about the automation of processes in petrochemical industries; automation of drilling processes

Practical Applications of Automation is aimed at training and formation of knowledge about specific technologies of automatic control among undergraduates: about the automation of processes in

petrochemical industries; automation of drilling processes.	
11	**Module objectives**
Ts **1.1**	mastering the methods of mathematical modeling; study of mathematical algorithms, the limits of their applicability, to know the purpose and principles of operation of the basic mathematical methods for solving applied problems in the field of engineering and economics; application of laws in the most important practical applications.
Ts1.2	mastering the techniques of setting and solving mathematical problems; mastering the mathematical apparatus that helps to model, analyze and solve engineering and economic problems with applications, if necessary, using computer technology.
Ts2.1	Formation of students' skills in writing academic texts, such as essays, essays, annotations, literature review, etc., skills in creating and editing reports and presentations, and skills in the correct compilation of bibliographic descriptions.
Ts **3**	The purpose of the research work is to formulate the training of undergraduates for scientific and research activities in the field of automation, innovations in various sectors of the national economy.
Ts4.1	The acquisition of knowledge by students aboutbasic concepts of an integrated design and management system. Studying the structure and function of an integrated design and management system, concepts of MES and ERP systems, industrial controllers, networks and interfaces.
Ts4.2	To form students' knowledge, abilities and skills in product life cycle management. Know the stages of the product life cycle, assessing product quality at the stages of the life cycle. Explore the automation of product life cycle processes. To study the methods of creating a single information space at enterprises.
Ts5.1	The acquisition of knowledge by students aboutbasic concepts of an automaton, prerequisites for its occurrence, basic definitions, synchronous and asynchronous automata, methods of defining an automaton, canonical equations, Moore diagram, automaton function.
Ts5.2	Study of the main tasks arising in the construction of information and control subsystems, software for control systems of technological processes.
Ts6.1	Learning to acquire knowledge aboutquality management methods, the structure of a computer quality management system, the design of quality management information systems and information systems design technology.
Ts6.2	Study of data transmission schemes in information channels (IC) of technological process control systems, mathematical models and methods for analyzing and researching processes in discrete-continuous IC.
Ts7.1	Learn to do it yourself review of the current state and prospects for the development of microprocessor technology. Know the architectural features and classification of microprocessor devices by purpose, bit depth, control method, design and technological characteristics. Learn to give a brief description of the capabilities and applications of microprocessor tools.
Ts7.2	Study history and main directions of development of the theory of artificial intelligence, the place of expert systems in the theory of artificial intelligence, components of ES: knowledge base, inference mechanism, mechanism for acquiring and explaining knowledge, intelligent interface, stages of ES design: identification, conceptualization, formalization, implementation, testing, trial operation.
Ts8	Expansion of professional knowledge acquired by undergraduates in the learning process, informing practical skills and skills of conducting independent scientific work
Ts **9**	Learn to independently plan an experiment, choose the best techniques and equipment for experimental research, rationally determine the conditions and range of experiments, and process the results.
12	**Learning outcomes**
The code	*RO description* / Goal codes

PK1	*As a result of studying the disciplines, the student should know:* - the basics of linear algebra with elements of analytical geometry, the basics of mathematical analysis, the basics of the theory of differential equations, their main applications in the practice of professional activity; complex calculus theory, series theory and functions of several variables, elements of vector analysis and field theory; basic methods of probability theory and mathematical statistics. - study mathematical algorithms; - to study methods of finding solutions to engineering and economic problems;	Ts1.1
PK2	*As a result of mastering the disciplines, the student should be able to:* - apply mathematical methods to solve typical professional problems; navigate mathematical reference literature; acquire new mathematical knowledge using modern educational and information technologies to solve professional problems; - to use methods and tools for building a computer quality management system, tools and algorithms for the implementation of quality management tools. - to solve engineering and technical and economic problems using the means of applied software; apply methods of analysis of options, development and search for compromise solutions; apply methods of creating and analyzing models that allow predicting the properties and behavior of objects of professional activity; show initiative, take responsibility for decisions within the framework of their professional competence - to solve problems of a theoretical and applied nature related to the sections of the theory under consideration, to prove statements, to build models of objects and concepts. *As a result of studying the disciplines, the student is able to master:* - methods of constructing the simplest mathematical models of typical professional tasks; mathematical methods for solving natural science problems; methods of analysis of meaningful interpretation of the results obtained; -skills in the development of computer quality management systems; means and algorithms of quality management tools. - skills in the application of elements of the analysis of the stages of the product life cycle and their management. - skills in software development using modern programming languages, specialized libraries. - modern methods of objective description, research and design of discrete-continuous information channels in process control systems. - the mathematical apparatus of the theory of intelligent systems, methods of proving statements in this area. - skills in the development of technical, information and algorithmic support for the development of automation and control systems *As a result of studying the disciplines, the student must be competent:* - to generalize, analyze, perceive information, set goals and choose ways to achieve it; - to use the physical and mathematical apparatus for solving computational and analytical problems arising in the course of professional activity, - select and apply appropriate methods for modeling technological processes	Ts1.2 Ts4.2 Ts7.1 Ts7.2
PK3	*As a result of mastering the disciplines, the student should be able to:* -the production structure of the enterprise providing the practice; the composition and form of the relationship between production units, the methods of enterprise management used; normative and technical documentation - to investigate technological devices as control objects; analyze and perform	Ts2.1 Ts3

	information search for automation equipment and control systems; develop automatic and automated product quality management systems *As a result of studying the disciplines, the student is able to master:* - work in the field of automation of technological processes in the oil and gas industry	
PK4	*As a result of mastering the disciplines, the student should be able to:* - basic concepts of an integrated design and management system for automated and automatic production for various purposes, its functions and structure; invariant methods of modeling control processes and methods of software and hardware implementation of design procedures; interconnection of design processes, production preparation and management; SCADA systems, their functions, use for design, documentation, control and management of complex industries for various purposes; concept of industrial information databases. -to manage the stages of the product life cycle with the help of specific software systems, use the basic principles of automated product life cycle management and the operation of a virtual enterprise, methods of planning, provision, assessment and automated quality management at all stages of the product life cycle. *As a result of studying the disciplines, the student is able to master:* - skills in building integrated design and management systems for automated and automated production, using SCADA systems	Ts4.1
PK5	*As a result of mastering the disciplines, the student should be able to:* - basic concepts from the considered sections of the theory of automata (such as abstract and structural automata, behavior of automata, problems of completeness and expressibility, etc.), definitions and properties of mathematical objects used in these areas, formulations of statements, methods of their proof, possible areas of their applications. - to develop software and hardware intelligent interfaces of information systems. Use educational, reference, special and periodical literature; *As a result of studying the disciplines, the student is able to master:* - mathematical apparatus of the theory of intelligent systems, methods of proving statements in this area.	Ts3.1 Ts5.1 Ts5.2
PK6	*As a result of mastering the disciplines, the student should be able to:* - apply modern methods of developing technical, information and algorithmic support for the development of automation and control systems - to formulate the tasks of information processing, to use methods and means of automated control, data processing and operational management of continuous production; modern methods of objective description, research and design of discrete-continuous information channels in process control systems. *As a result of studying the disciplines, the student is able to master:* - the ability to draw up, present and report the results of the work performed; the ability to make decisions in the field of automation; the ability to determine effective production and technological modes of operation of facilities; the ability to evaluate the innovative qualities of new products; the ability to implement various forms of educational work	Ts3.1 Ts4.1 Ts6.1 Ts6.2
PK7	acquire skills in formulating the goals and objectives of scientific research; the ability to select and substantiate research methods; work with applied scientific packages and programs used in research and development.	Ts8
PK8	in the context of the development of science and changing social practice, is able to re-evaluate the accumulated experience, analyze their capabilities, readiness to acquire new knowledge, use various means and technologies of teaching; willingness to participate in work on projects and their individual	Ts9

	components; possess the skills of design and operation, as well as research of physical processes occurring in automatic systems	
13	**Literature** **Basic literature:** 1. Paul, B. MATHEMATICS [Text] = Mathematics: pupil's book 3A / Broadbent Paul.- London: Macmillan Publishers Limited, 2009.- 112 p. 2. Aydos, E.Zh. Zhogary mathematics - 1[Mətin]. 1 kitap: oқulyk / E.Zh. Aydos. - Almaty: Bastau, 2015. - 320 b.- (Kazakhstan Republics BilimzhəneFylymministirligi). 3. Aidos, E.Zh. Zhogary mathematics - 2[Mətin]. 2 kitap: oқulyk / E.Zh. Aydos.- Almaty: Bastau, 2015.- 520 b.- (Kazakhstan Republics BilimzhəneFylymministirligi). 4.Shipachev, V.S. Higher Mathematics Course [Text]: Textbook / V.S. Shipachev; Edited by Acad. A.N. Tikhonov. - 4th ed. - Moscow: ONIKS, 2009. - 608 p. 5. Rykov, V.V. Mathematical Statistics and Experiment Design[Text]: study guide / V.V. Rykov, V.Yu. Itkin; rets .: M.A. Fedotkin, V.A. Kashtanov, Moscow: MAKS Press, 2010, 308 p. 6. Akritas, M. Engineer men ғalymdarға arnalған yқtimaldyқ theories of men statistics[Mətin]: oқulyk / Michael Akritas; aғyl.tilinen auditorium: B. Rysbayuly, G. Darkenbaeva. - Almaty: Book Print, 2017.- 688 b.- (Zhogary onu oryndarynyk kauymdastygy). 7. Golitsyna OL Programming languages: Textbook / OL. Golitsyna, T.L. Partyka, I.I. Popov. - 2nd ed., Rev. and add. - M .: Forum, 2010 .-- 400 p. URL: http://znanium.com/bookread.php?book=226043 8. Kuvshinskaya Yu. M., Zevakhina NA, Akhapkina Ya. E., Gordienko EI; Ed. Kuvshinskaya Yu.M. - ACADEMIC LETTER. FROM RESEARCH TO TEXT. Textbook and workshop for academic bachelor's degree - M.: Yurayt Publishing House - 2019 - 284p. - ISBN: 978-5-534-08297-5 - Electronic text // EBS URITE - URL: https://urait.ru/book/akademicheskoe-pismo-ot-issledovaniya-k-tekstu-424762 9. Popkov OZ Fundamentals of converting technology: textbook for students. universities. - M .: Publishing house. House of MEI, 2007. 10. Skhirtladze AG Integrated design and management systems [Text]: textbook for universities / AG Skhirtladze, T. Ya. Lazareva, Yu. F. Martemyanov. - Moscow: Academy, 2010 .-- 348 p. 11. Smirnov, Yu.A. Physical foundations of electronics. [Electronic resource]: textbook. allowance / Yu.A. Smirnov, S.V. Sokolov, E.V. Titov. ? Electron. Dan. ? SPb. : Doe, 2013.? 560 s. ? Access mode: http://e.lanbook.com/book/5856 **additional literature** 1. Ospanov, T. Mathematicians theories negizderi [Mətin]: oқulyk / T. Ospanov, Ormanalina S. Ormanalina Sh. - 2-shi basylym.- Astana: Folio, 2012.- 352 b.- (Kasiptik bilim). 2. Zhogary mathematics[Mətin] = yskasha course: oқu құraly / G.S. Bazarbayeva, Raikhan M. Baimadieva F.Ə.- Almaty: Evero, 2014.- 201 b. 3.Reilly, K. Physicter men engineerlergearnalғanmathematicalyқ adister[Metin]. Vol.2: oқulyқ / K. Riley, M. Hovson, S. Bens; Aud. J.N. Tasmambetovzhənet.b.- Almaty: Dauir, 2014.- 488 b.- (Republic of Kazakhstan). 4.Economics of business finance mathematics[Mətin]. Vol. 1: oқulyқ / Jacques Jean; aғyl.tilinen auditorium: Zh.N. Tasmambetovzhənet.b.- 8-shi basylym.- Almaty: Polygraphkombinat, 2016.- 440b.- (Zhogary onu oryndarynyk kauymdastyky). 10 copies. 5. A. V. Andreev, M. I. Gorlov-Rostov. Fundamentals of electronics: textbook. manual for stud. wednesday specialist. study. institutions. - D: Phoenix, 2003. 6 Modern automation in technological process control systems: Textbook. pos. / V.P. Ivshin, M. Yu. Perukhin - M .: NITs Infra-M, 2013 - 400 p. - Access mode:http://znanium.com/catalog.php?item=bookinfo&book=363591 7. Serebryakov V.A. Theory and implementation of programming languages. - M .: Fizmatlit, 2012 .-- 236s. Url:http://e.lanbook.com/books/element.php?pl1_id=5294	

	8. Nepomnyashchy, OV Designing sensor microprocessor control systems [Electronic resource]: Monograph / OV Nepomnyashchy, EA Veisov. - Krasnoyarsk: Siberian Federal University, 2010 .-- 149 p. - ISBN 978-5-7638-1985-4. Access mode: http://znanium.com/bookread.php?book=442126	
A: INFORMATION FOR ADMINISTRATION		
1	**Module code**	**MTAU03**
2	**Module name**	**Automation and Control Theory Module** one) ITNP 1205 Information technology in science and production / PSAU 1205 Design of automation and control systems (DB / KV, 5 credits) 2) SNATP 1206 Modern trends in the development of automation of continuous technological processes / IRATU 1206 History of the development of automation and control theory (DB / KV, 5 credits)
3	**Module developers**	D. N. Shabdirov
4	**Module owner**	Faculty of Information Technology
5	**Other faculties involved in the implementation of the module**	**Faculty** / **% participation** Faculty of Information Technology / 100
6	**Duration of mastering the module** Semester and academic year	1
7	**Language of teaching and assessment**	Kazakh, Russian
8	**Number of academic credits**	10
9	**Module prerequisites**	1.The program of higher education
B. DETAILED INFORMATION ABOUT LEARNING AND TEACHING		
10	**Module Description**	
Module "Theory of automation and control»Is aimed at training and formation of knowledge about information technologies of management among undergraduates; about modern directions of development of automation of continuous technological processes; on the design of automation and control systems; about the history of the development of automation and control theory.		
11	**Module objectives**	
Ts1.1	Learning to acquire knowledge aboutprinciples of information processing, forms of its presentation, information processes and technologies. Study of modern trends in the development of computer software and networks and modern information technologies.	
Ts1.2	Formation of students' knowledge and skills in the fielddesign, organization of design of automation and control systems based on uniform standards. Study of the content of pre-design work on the study of the object and the choice of a rational level of automation, stages and stages of design	
Ts2.1	Study of fundamental problems and mathematical methods of modern systems theory, new objects and control problems in technology, economics, social and biological systems.	
Ts2.2	Formation of control theory as an exact scientific discipline that has its own basic concepts and laws, automata in the ancient world, in the Renaissance and the Middle Ages, "Android" automation, the first robots, the industrial revolution, the mechanization of physical labor, the main stages in the history of the science of management: automatic control theory, cybernetics, general systems theory, modern control theory.	

12	**Learning outcomes**	
The code	*RO description*	Goal codes
PK9	*As a result of mastering the disciplines, the student should be able to:* -computer classification and criteria for choosing the type and configuration; Computers, including peripherals, for solving specific problems; methodology for working with basic Internet and Ethernet services; sources of information in computer networks and methods of its search; methods of using modern information and multimedia technologies in science and education; *As a result of studying the disciplines, the student is able to master:* - skills of the ability to improve and develop their intellectual and general cultural level; the ability to independently acquire new knowledge and skills with the help of information technologies and use in practice, including in new areas of knowledge that are not directly related to the field of activity; the ability to apply in practice modern methods and means of determining the operational characteristics of elements of machine-building industries and software tools, certification testing of products; the ability to apply new educational technologies, including computer and distance learning systems.	Ts1.1
PK10	*As a result of mastering the disciplines, the student should be able to:* -the main problems of modern control theory, mathematical methods and algorithms for solving urgent control problems in complex systems. *As a result of studying the disciplines, the student is able to master:* Analysis of development prospects and formation of a general theory of control systems	**Ts2.1**
PK11	*As a result of mastering the disciplines, the student should be able to:* - methodologically substantiate scientific research and design solutions in the development of systems and controls, use scientific and technical literature *As a result of the study of disciplines, the student to own* skills of methodological analysis of scientific research of its results	**Ts1.2** **Ts2.2**

13	**Literature** **Main literature**

1. University student: learning technologies and professional career .: Textbook / Ed. S. D. Reznik - 3rd ed., Revised. and add. - M .: NITs Infra-M, 2013 .-- 509 p .: 60x90 1/16. - (Management in high school). (n) ISBN 978-5-16-004587-0, 1000 copies. http://znanium.com/bookread.php?book=373095 2. University teacher: technology and organization of activities: Textbook. allowance / Ed. S. D. Reznik. - 3rd ed., Add. and revised - M .: INFRA-M, 2011 .-- 361 p.: 60x90 1/16. - (Management in high school). (hardcover) ISBN 978-5-16-004478-1, 1500 copies. http://znanium.com/bookread.php?book=251309 3. Egorov, OG Problems of modern school development (From work experience) [Electronic resource]: monograph / OG Egorov. - 2nd ed., Erased. - M .: FLINT, 2013 .-- 408 p. - ISBN 978-5-9765-1546-8.http://znanium.com/bookread.php?book=466011

4. Avlukova, Yu.F. Fundamentals of computer-aided design [Electronic resource] / Yu.F. Avlukov. - Minsk: Higher school, 2013 .-- 219 p. - ISBN 978-985-06-2316-4. - URL: http://biblioclub.ru/index.php?page=book&id=235668.

5. Shandrov BV Technical means of automation [Text]: textbook for universities / BV Shandrov, AD Chudakov. - Moscow: Academy, 2007 .-- 368 p.

6. Shishov OV Technical means of automation and control [Electronic resource]: tutorial / OV Shishov. - Moscow: INFRA-M, 2012 .-- 397 p. - (Higher education). - In the lane. - ISBN 978-5-16-005130-7. - Access mode: http://znanium.com/bookread.php?book=242497.

7. Theoretical foundations for the development and modeling of automation systems [Electronic resource]: tutorial / A. M. Afonin, Yu. N. Tsaregorodtsev, A. M. Petrova [and others] - Moscow:

	Forum: SIC INFRA-M, 2014 . - 192 p. -ISBN 978-5-91134-479-5. - Access mode: http://znanium.com/bookread.phpbook=424277 ..
	additional literature
	1. Information technologies in professional activity: textbook / N.V. Maximov, T.L. Partyka, I.I. Popov. - M .: Forum, 2010. - 496 p .: ill .; 60x90 1/16. - (Professional education). (hardcover) ISBN 978-5-91134-399-6, 2000 copies.http://znanium.com/bookread.php?book=180612
	2. Information technologies and systems: Textbook. allowance / E.L. Fedotov. - M .: ID FORUM: NITs Infra-M, 2013. - 352 p .: ill .; 60x90 1/16. - (Higher education). (hardcover) ISBN 978-5-8199-0376-6, 500 copies.http://znanium.com/bookread.php?book=374014
	3. Management of the organization: the result. student certification, pre-diploma. practice and diploma. project: Uch. settlement; Under total. ed. EM. Korotkov, S.D. Reznik. -3rd ed. -M .: INFRA-M, 2009. -368 p.: 60x88 1/16. - (Higher education). (O) ISBN 978-5-16-003465-2, 2000 copies. http://znanium.com/bookread.php?book=90540
	4. Kudryavtsev E.M. Basics of computer-aided design: textbook. - M. Academy, 2008.
	5. Golovitsyna M.V. CAD Basics: Textbook. allowance. —M .:• INTUIT.RU, 2008.
	6. Councils B.Ya. Theoretical foundations of automated•management: textbook. - M.: Higher School, 2006

A: INFORMATION FOR ADMINISTRATION			
1	**Module code**	**MSTAU04**	
2	**Module name**	**System and technology of automatic control module** one) UPRAS 1207 Management of the process of development of automated systems / SUTP 1207 Control systems for technical processes. (DB / KV, 5 credits) 2) KTAU 1303 Computer automation and control technologies / TiT 1303 Telecontrol and telecontrol (PD / HF, 5 credits) 3) APOSA 1304 Algorithmic and software for automation tools and systems / APOAS 1304 Hardware and software for automated enterprise management systems. (PD / KV, 5 credits)	
3	**Module developers**	D. N. Shabdirov	
4	**Module owner**	Faculty of Information Technology	
5	**Other faculties involved in the implementation of the module**	**Faculty**	**% participation**
		Faculty of Information Technology	100
6	**Duration of mastering the module** Semester and academic year	2	
7	**Language of teaching and assessment**	Kazakh, Russian	
8	**Number of academic credits**	fifteen	
9	**Module prerequisites**	1.The program of higher education 2. Design of automation and control systems 3. Modern directions of automation of continuous technological processes 4. The history of the development of automation and control theory	
B. DETAILED INFORMATION ABOUT LEARNING AND TEACHING			
10	**Module Description**		
System and technology of automatic control moduleis one of the basic modules of the professional cycle			

in the training of specialists in the field of automation and plays an essential role in the formation of their engineering thinking. As a result of studying this module, undergraduates develop the scientific knowledge and understanding necessary for the design, installation, commissioning and operation of theoretical knowledge and practical skills in the field of control and automation of systems.		
11	**Module objectives**	
Ts**1.1**	Formation of knowledge on management functions to ensure the effective functioning of the enterprise, on the analysis and solution of specific management and marketing tasks that arise during the operation of the enterprise;	
Ts1.2	Formation among studentsthe concepts of control and technological process, composition and functions of an automated process control system, the main components of an automated process control system, modern automation systems for controlling technological processes, SCADA systems, programming languages for controllers, reliability of an automated process control system.	
Ts2.1	Formation of students' knowledge and skills in the fieldmodeling, classification of models, types of modeling and computer technologies	
Ts2.2	To acquaint students with the main aspects of the organization of telemechanics, basic concepts and classification of telemechanics systems, with structural control schemes at a distance with one-way and two-way transmission of messages, with messages and signals, with the conversion of continuous messages into discrete signals.	
Ts3.1	Expansion of professional knowledge on the purpose of technical, algorithmic, software, information and organizational support and the scheme of interaction of individual software with each other. Study of the algorithmic support of the APCS.	
Ts3.2	The study of the main tasks arising in the construction of information and control subsystems, software for control systems of technological processes, as well as the implementation of automation and control systems in the automated control system.	
12	**Learning outcomes**	
The code	*RO description*	Goal codes
PK12	Know: -Methodological and theoretical foundations of organization management in the amount necessary for solving various scientific and practical problems; essence, content, goals, principles and functions of management and marketing; - Concepts, purposes and classification of APCS; The main methods and stages of building an automated process control system; technical support for building an automated process control system; APCS architecture, functional purpose of individual parts of the system; principles of development of algorithms for control of typical objects Be able to: -perform management functions to ensure the effective functioning of the enterprise; - to formulate and solve with the help of a computer the tasks of synthesis and research of technological processes and control systems; Have skills: - analysis and solution of specific management tasks; evaluation of project efficiency - ways of using the APCS; methods and means of control of technological processes	Ts 1.1 Ts1.2
PK13	Know: - methods for constructing models and identifying the processes, phenomena and objects under study; statistical decision making technology - the main problems of the modern theory of control of remote objects,	Ts3.1

	mathematical methods and algorithms for solving urgent problems of controlling objects at a distance be able to: - apply physical and mathematical methods when modeling tasks in the field of automation of technological processes and production, life cycle management and its quality - develop mathematical models and solve problems of analysis and synthesis of control systems for remote objects using modern information technologies	
PK14	Know: -Principles of building automated control systems; programming languages of the IEC-61131-3 standard; functionality of upper and middle level software -Appointment, structures and functions of ACS, main subsystems and tasks to be solved be able to: -Develop algorithmic support; develop software; ensure the integrated operation of the upper and middle software level -Formulate the tasks of information processing, develop control algorithms for specific technological production Have skills: -Software development tools; various ways of building automated control systems; skills of importing / exporting data of the developed software of automated control systems - the skills of analyzing the technological process as a control object, automated enterprise management systems	Ts3.1 Ts3.2
13	**Literature** **Main literature** 1. Muzipov Kh.N. Automation of the design of systems and controls. / Muzipov Kh.N., Kuzyakov O.N. / Tutorial. TyumGNGU. 2011.209 p. 2. Handbook of the engineer for the process control system: Design and development [Text]: educational and practical manual / Yu. N. Fedorov. - M.: Infra-Engineering, 2008.926 p. 3. Design of automation systems for technological processes [Text]: reference manual / AS Klyuev [and others]; ed. A. S. Klyuev. 3rd ed., - M.: Alliance, 2008. - 464 s 4. Design of automated production systems: Textbook / V.L. The groom. - M .: KURS: NITs INFRA-M, 2014 .-- 312 p. Url:http://www.znanium.com/bookread.php?book=449810... 5. Design and design of the user interface.-SPb., 2000 6. Neural networks for information processing.- Moscow, 2002. 7. Goryunov A.G. Fundamentals of telecontrol and telecontrol [Electronic resource] - Course of lectures, 2009.. 8. Tutevich V.N. Telemechanics. Textbook for Universities. - 2nd ed. revised and add. - M .: Higher school, 1985. 9. Chancedal S. A. Algorithmization and programming: Textbook / S.A. Chancedal. - M .: ID FORUM: NITs Infra-M, 2013 .-- 352 p .: ill. - ISBN 978-5-8199-0355-1 - Access mode: http://znanium.com/bookread.php?book=391351. 10. Koldaev VD Fundamentals of algorithmization and programming [Electronic resource]: textbook / VD Koldaev; ed. L.G. Gagarina. - Moscow: FORUM, 2012 .-- 416 p. - (Professional education). - ISBN 978-5-8199-0279-0. - Access mode: http://znanium.com/go.php?id=336649. **additional literature** 1. Basics of computer-aided design for an engineer [Text]: tutorial / A. A. Silich; TyumGNGU. - Tyumen: TyumGNGU, 2009 .-- 89 p. 2. Intelligent design systems [Text]: tutorial / GB Evgenev. - M.: MSTU im. N.E. Bauman, 2009 - 335 p.	

	3. Loginov, VN Information management technologies / VN Loginov.? Moscow: KnoRus, 2008.-238 p. 4. Eminov, FI Automated control in technical systems: Textbook. allowance / F.I. Eminov, B.K. Kurbatov, A.V. Naumov.? Kazan: Unipress, 2002.-70 p. five. . Zlatopolsky D.M. Programming: typical tasks, algorithms, methods [Electronic resource] / DM Zlatopolsky. - Moscow: Publishing House 'Laboratory of Knowledge', 2015 .-- 226 p. - ISBN 978-5-9963-2932-8. - Access mode: https://e.lanbook.com/book/70753.		
A: INFORMATION FOR ADMINISTRATION			
1	**Module code**	**MAPP05**	
2	**Module name**	**Manufacturing process automation module** one) APNP 2309 Automation of petrochemical production processes / APB 1309 Automation of drilling processes (PD / KV, 5 credits)	
3	**Module developers**	D. N. Shabdirov	
4	**Module owner**	Faculty of Information Technology	
5	**Other faculties involved in the implementation of the module**	**Faculty**	**% participation**
		Faculty of Information Technology	100
6	**Duration of mastering the module** Semester and academic year	3	
7	**Language of teaching and assessment**	Kazakh, Russian	
8	**Number of academic credits**	five	
9	**Module prerequisites**	1.The program of higher education 2. Mathematical models and methods in engineering 3. Design of automation and control systems 4. Management of the development of automated systems 5. Control systems for technical processes 6. Computer technologies of automation and control 7. Telecontrol and telecontrol 8. Algorithmic and software for automation tools and systems	
B. DETAILED INFORMATION ABOUT LEARNING AND TEACHING			
10	**Module Description**		
Manufacturing process automation moduleis aimed at training and formation of knowledge about specific technologies of automatic control among undergraduates: about automation of petrochemical production processes; automation of drilling processes			
11	**Module objectives**		
Ts1.1	Formation of systematic knowledge about the main automation devices devices as control objects, the creation of automation systems that save material and energy resources, improve environmental safety, control systems using additional information signals.		
Ts1.2	Formation of knowledge on telecontrol in well drilling, automation of technological processes during well construction, general information about the drilling rig as an object of automation and regulation.		
12	**Learning outcomes**		
The code	*RO description*		Goal codes
PK15	Know: - the history of the formation of the main ideas in the field of creation and use		C1.1 Ts1.2

	of technological systems of petrochemical industries and their automation, methods of automated control and operational management of product quality, methods of rational use of raw materials and energy resources, methods of improving the environmental safety of production; - schematic diagrams of equipment, principles of operation of sensors, technical capabilities of equipment and automation means, algorithms for the operation of drilling regulators, rules for constructing structural diagrams, regulation criteria, prospects for the introduction of computers in the process of drilling wells, rules for the technically competent operation of equipment and automation equipment. Be able to: - to analyze the apparatuses of petrochemical industries as objects of management, to use modern methods of control and management of production; - to mount simple equipment, decipher and analyze the diagrams of the equipment recording, evaluate the information obtained, correct the drilling mode using the equipment. Have skills: - methods of creating rational systems for automating the processes of petrochemical industries, modern methods and means of automating technological processes. - carrying out a comparative analysis of control and automation equipment; learn about the difficulties in creating a BCIA and automation equipment and the prospects for their development	
13	**Literature** **Main literature** 1. Skhirtladze, A.G. Automation of technological processes and production. [Electronic resource] / A.G. Skhirtladze, A.V. Fedotov, V.B. Moiseev, V.G. Khomchenko. - Electron. Dan. - Penza: PenzGTU, 2015 .-- 442 p. - Access mode: http://e.lanbook.com/book/63096. 2. Selezneva, S.V. Introduction to the specialty "Automation of technological processes and production". [Electronic resource] / S.V. Selezneva, I.A. Proshin. - Electron. Dan. - Penza: PenzGTU, 2012 .-- 64 p. - Access mode: http://e.lanbook.com/book/62530. 3. Polyakov, S.I. Automation and automation of production processes: textbook / S.I. Polyakov. - Voronezh: Voronezh State Forestry Academy, 2007. - 372 p. - ISBN 978-5-7994-0273-0; The same [Electronic resource]. - URL: http://biblioclub.ru/index.php?page=book&id=142942 **additional literature** 1. Design of automation systems for technological processes / A. Klyuev [and others], - M.: Alliance, 2008. - 464 p .. 2. Andreev E.B. Technical means of control systems for technological processes of the oil and gas industry. - M. Education, 2005. 3. Verevkin AP, Kiryushin OV Automation of technological processes and production in oil refining and petrochemistry. - M .: Higher school, 2005 4.Khramenkov V.G. Automation of production processes [Electronic resource]: textbook / V.G. Khramenkov - Electron. text data.— Tomsk: Tomsk Polytechnic University, 2011.— 343 pp. — Access mode: http://www.iprbookshop.ru/34647.html.— ELS "IPRbooks"	

A: INFORMATION FOR ADMINISTRATION		
1	**Module code**	**MIA06**
2	**Module name**	**Module IA** Registration and defense of a master's thesis
3	**Module developers**	D. N. Shabdirov
4	**Module owner**	Faculty of Information Technology

5	**Other faculties involved in the implementation of the module**	**Faculty**	**% participation**
		Faculty of Information Technology	100
6	**Duration of mastering the module** Semester and academic year	four	
7	**Language of teaching and assessment**	Kazakh, Russian	
8	**Number of academic credits**	12	
9	**Module prerequisites**	1.The program of higher education 2. Mathematical models and methods in engineering	
B. DETAILED INFORMATION ABOUT LEARNING AND TEACHING			
10	**Module Description**		
IA modulecontains the design and defense of a master's thesis			
11	**Module objectives**		
Ts**1.1**	Establishing the degree of compliance of the level of quality of training of a graduate who has completed the development of an educational program in the direction of preparing a master's degree to the requirements of the state educational standard of higher education		
12	**The results of mastering the EP**		
The code	*RO description*		Goal codes
PK16	Design and engineering. The ability to develop technical specifications for the modernization and automation of existing production and technological processes and industries, technical means and systems of automation, control, monitoring, diagnostics and testing, new types of products, automated and automatic technologies for its production, automation tools and systems, process control, life product cycle and quality; ability: to compose a description of the principles of operation and design of devices, designed technical means of automation systems, control, monitoring, diagnostics and testing of technological processes and production of general industrial and special purposes for various sectors of the national economy, to design their architectural software systems; the ability to develop sketch, technical and working projects of automated and automatic productions for various technological and industrial purposes, technical means and systems for automation of management, control, diagnostics and testing, systems for managing the life cycle of products and their quality using modern design automation tools, domestic and foreign experience in the development of competitive products, carry out technical calculations for projects, technical-economic and functional-cost analysis of the effectiveness of projects, assess their innovative potential and risks; the ability to develop a functional, logical and technical organization of automated and automatic production, their elements, technical, algorithmic and software based on modern methods, General professional competencies: the ability to develop methodological and regulatory documents, technical documentation in the field of automation of technological processes and production, including the life cycle of products and their quality, to lead their creation. General cultural competencies: readiness for self-development, self-realization, use of creative potential.		Ts1.1

6 DISCIPLINE INFORMATION

No.	Name of the discipline	Brief description of the discipline (30-50 words)	Number of credits	Formed competencies (codes)
Cycle of basic disciplines University component				
1	IFN5201 History and Philosophy of Science	In the system of training undergraduates, the course "History and Philosophy of Science" occupies an important ideological, scientific and methodological place, the main core of which is history, philosophy and methodology of science. It is a necessary component of the content of education in the preparation of undergraduates for further raising the level of research work. Historical knowledge allows the future specialist to compose a holistic image of science, to consciously approach various aspects and contexts of the study of science itself. FN is a necessary condition for the development of links between science and various sections of philosophical knowledge, expansion and deepening of the philosophical problems of certain special scientific disciplines and acts as the self-consciousness of science in its socio-cultural manifestations, value guidelines for the development of scientific knowledge are formed,	5	KK1, KK2, KK3
2	IYa5202 Foreign language (professional)	English for professional purposes is designed for undergraduates who have completed a basic English course at an earlier stage of training, a professionally oriented foreign language, who have mastered English at the Intermediate - Upper-Intermediate level. After completing this material, undergraduates will be able to navigate in significant flows of information in their specialty.	5	KK4
3	PY5203 Management Psychology	Psychology is a science that has its own characteristics, as it develops the psychological mechanisms of teaching subjects. In the process of acquainting themselves with the course "Psychology", undergraduates acquire psychological knowledge, skills and abilities of work. Undergraduates through psychological knowledge learn the significance, characteristics, development and patterns in the branches of psychological sciences. They learn the basic concepts of psychological science, must be able to apply this knowledge in daily and professional activities.	5	KK5

4	PBS5204 High School Pedagogy	The pedagogy of higher education plays an essential role in determining the content of higher education, which is reflected in the state standards of higher education, as well as in the formation of a meaningful model for training a specialist. Taking into account the processes of development of higher education in modern conditions, the priority issues of scientific research in the field of PVS are: researching the problems of the systemic organization of the educational process, optimizing information support, conceptual-problematic activities, deepening the connection between educational and scientific work, increasing the effectiveness of education at the university.	3	KK6
5	PP5205 Teaching Practice	participation of a master student in the preparation of lectures and conducting practical classes on a topic determined by the head of the practice and corresponding to the direction of scientific interests of the master student; development of innovative methods of conducting classes with students inactive and interactive forms; participation in seminars ininteractive mode, business games, analysis of specific situations, psychological and other trainings, group discussions, discussion of resultsdesign workstudent teams; attending classes of leading teachers of departments, master classes of experts and specialists	2	KK7
		Cycle of basic disciplines **Component of choice**		
1	ITNP 1205 Information technology in science and industry.	Principles of information processing. Information and forms of its presentation. Information processes and technologies. Modern trends in the development of computer software and networks. Modern information technologies. Information Systems.	5	PK9, PK11
	PSAU 1205 Design of automation and control systems	Organization of the design of automation and control systems based on uniform standards. Stages and stages of design: technical assignment and technical proposal, draft, technical and working projects. Automated control systems for technological processes. Microprocessor control devices. Types and types of schemes. Structural diagrams of control systems. Functional schemes of automation. Implementation methodology based on state standards. Automation schemes for		

		thermal and mass transfer processes in petrochemical plants. Selection of measuring devices, converters, control devices, actuators. Basic electrical circuits. Rules for the execution of schemes. Schemes of technological signaling, position signaling. Pre-emergency protection systems. Control schemes for electric drives of production mechanisms. Basic electrical control circuits. External electrical and pipe wiring diagrams (connections)		
2	SNATP 1206 Modern directions of development of automation of continuous	Fundamental problems and mathematical methods of modern systems theory. New objects and problems of management in technology, economics, social and biological systems. System analysis. The essence of a systematic approach to the analysis of objects. The concept of "system". The main features and properties of systems. Decomposition of systems. Links in the system and their classification. Systems management. Features of organizational management. The structure of the control object. Non-linear control systems. Features of nonlinear systems. Principles of linearization of nonlinear systems. Methodological foundations of research and design of human-machine technical systems. A systematic approach to the analysis and synthesis of industrial facilities. Systemic paradigm. The main categories, definitions and signs. Conceptual model. Features of creation and development. Creation theory, functioning and death of technical entities (TOB). Structure and function. TOB sets, operations and relationships between them, models. Functional structure synthesis. Functional, technical and algorithmic models. Significance functional. Statement of the control problem. Analysis and synthesis methodology.	5	PK10, PK11
	IRATU 1206 History of the development of automation and control theory	Formation of control theory as an exact scientific discipline that has its own basic concepts and laws. Automata in the ancient world, the Renaissance and the Middle Ages. "Android" automation, the first robots, the industrial revolution. Mechanization of physical labor. The main stages in the history of the science of control: the theory of automatic control, cybernetics, general theory of systems, modern control theory. The integrative nature		

		of control theory, as a science of the generality of principles and control processes in objects of different physical nature. The problem of a holistic understanding of the surrounding world as a single evolutionary process. The role of computer technology and informatics in control theory and technology. Management as an organization of purposeful interaction of energy, matter and information. Physical control theory; synergistic approach to management problems. Automated technologies and production		
3	UPRAS 1207 Management of the process of development of automated systems.	Methodological and theoretical foundations of organization management; essence, content, goals, principles and functions of management and marketing; specifics of planning a product range and managing a portfolio of orders for products of modern organizations; principles, strategies and methods of formation of pricing policy; the basics of making marketing decisions in sales systems; specifics of establishing effective communications with market leaders and consumers; the basics of developing effective marketing programs for new products. Management functions to ensure the efficient functioning of the enterprise. Analysis and solution of specific management and marketing tasks arising in the course of the operation of the enterprise; conducting a marketing analysis of the behavior of target consumers of a new product that the company produces; evaluation of the effectiveness of projects for the production of new goods; analysis and formation of the product, assortment, sales, price and communication policy of the enterprise; control and audit of the enterprise.	5	PK12
	SUTP 1207 Technical process control systems.	The content of the concepts of control and technological process. Concept, composition and functions of the automated process control system. The main components of the automated process control system. Modern automation systems for the control of technological processes. SCADA systems. Controller programming languages. Reliability of the APCS.		

The cycle of profiling disciplines University component / Component of choice				
1	MMMI 5303 Mathematical Models and Methods in Engineering	Elements of linear and vector algebra, analytical geometry, introduction to mathematical analysis, differential calculus of a function of one variable, function of several variables, integral calculus, differential equations, theory of probability and mathematical statistics	5	PK1, PK2
	SUU 1301 Control Device Circuitry	Analog and digital signals, tasks of converting signals of various forms. ADC and DAC, additional functions for converting ADC and DAC signals. Current loop interface, current signal receivers and transmitters. Modulated signals with a high-frequency carrier, circuitry of amplitude, frequency and phase modulators / demodulators. Signals with frequency or time informative characteristics. Circuit design of the high-frequency converter, high-frequency converter Pulse-width modulation, circuit design of PWM units for the formation of analog signals. Power amplifiers of electronic automation devices, circuit design of amplifiers with push-pull and bridge output stages		
2	AP 1302 Academic writing.	Academic writing as a practical discipline. Scientific language and scientific text. Plagiarism. Rules of scientific citation. Text as a whole and as a structure. Synopsis, plan, plan-synopsis. Abstracting and scientific research. The style of the text. The main types of stylistic and speech errors. Scientific report as a genre. Abstract report and its features. Theses of the report. Basic principles of oral presentation. Principles of bibliographic description. Scientific libraries and electronic databases. Abstract as a genre of academic writing. Justification of the research topic / course work. Project proposal. Introduction to scientific work. Essays as an academic and literary genre. Review of the scientific literature on the topic.	3	PK2
The cycle of profiling disciplines Component of choice				
1	KTAU 1303 Computer automation and control technology.	Classification of models. Types of modeling. General information about physical modeling: concept, advantages and disadvantages. The concept of identification of a mathematical model. Stages of building a mathematical model. Types of mathematical models and their relationship with the theory of automatic control. Classification of	5	PK12, PK13

		mathematical models by the type of apparatus: ideal mixing, ideal displacement, cell and diffusion models. Methods for compiling mathematical models: An analytical method for compiling a mathematical description. Experimental and experimental analytical method for compiling a mathematical description. The concept of active and passive experiment. Methods for obtaining static and dynamic characteristics of an object through active experiment. Checking the adequacy of the mathematical model. Fisher's criterion.		
	TiT 1303 Telecontrol and telecontrol	Block diagrams of remote control with one-way and two-way message transmission. Messages and signals. Features of messages TU, TS, TI. Converting continuous messages to discrete signals. Signal spectra. Multichannel methods. Synchronization methods in systems with time division signals. Modulation and demodulation. Immunity when transmitting continuous signals. Transfer efficiency.Optimization of the network structure. Analytical optimization methods for underloaded communication lines. Information processes and systems. TUTS-TI devices. Statistical measurements and telemetry. Telecontrol and technical diagnostics. Telemechanics networks.		
2	APOSA 1304 Algorithmic and software for automation tools and systems.	Classification according to the mode of operation, functional development, information power, the nature of the flow of the controlled process in time. Functions of ACS TP and their content. Information-computing and control functions. Regulation of individual parameters, multi-connection and cascade control, logic control, program control, optimal process control in steady-state and transient modes with and without adaptation. Features of technological processes as control objects. Controlling, disturbing and output parameters. Automated control systems for technological processes, basic concepts of hierarchical automated control systems. Algorithms for analytical calibration of sensors, extra- and interpolation of discrete-measured values.		

2	APOAS 1304 Hardware and software for automated enterprise management systems.	Subsystems of the automated control system. The main tasks arising in the construction of information and control subsystems. software for control systems of technological processes. Implementation of automation and control systems in automated control systems. Information subsystem. The main tasks of the primary processing of information. Calculation of generalized indicators of the process. Determination of integral and averaged values of measured values. Calculation of unmeasured values and operational technical and economic indicators. Algorithms for accounting and compensation of dynamic connections between measured values. Methods for predicting the indicators of the technological process. Control subsystem of the automated control system. Quantifying the effectiveness of management.	5	PK13, PK14
3	ISPAP 2305 Integrated design and management systems for automated and automated production	The structure and functions of an integrated design and management system. Concepts about MES and ERP systems. The interrelation of design processes, production preparation and management. Industrial controllers, networks and interfaces. Current loop interface. RS-232, RS-485, HART-protocol interfaces. OSI Open Systems Model. The most common industrial networks: Modbus, Profibus, CAN. Network hardware. SCADA systems: basic concepts, functional characteristics. Technical and operational characteristics of SCADA systems. The concept of an automated workstation (AWP). SCADA-system TraceMode 6: basic capabilities and areas of application. Basic concepts about databases. Industrial databases. Microsoft SQL Server and Industrial SQL Server. Distributed Control Systems (DCS).	5	PK3, PK5, PK6
	ILPP 2305 Integrated logistics support for products in the life cycle stages	Product lifecycle management. Stages of the product life cycle. Assessment of product quality at the stages of the life cycle. Automation of product life cycle processes. PDM - systems. Methods for creating a single information space at enterprises.		
4	TA 2306 Automata Theory	Methods for specifying an automaton, canonical equations, Moore diagram. Isomorphism of automata, reduced automaton. The uniqueness theorem for a reduced automaton equivalent to a given one. Abstract automata.	5	PK2, PK4, PK6

		Corollary from Moore's theorem on the length of a word that distinguishes finite automata. Reachability of an estimate for the length of a word distinguishing finite automata. Experiments with automata. The problem of synthesizing a minimal recognizer automaton. Finite state machines as superaceptors. McNaughton's theorem. Finite state machines in labyrinths. Automatic machines with "stones", machines with "paint". Semigroup of an automaton, connection of operations on automata with operations on their semigroups. The concept of a sub-automaton and a homomorphic image of an automaton. Verbal operations on automata. Automation systems with a limited number of inputs. The completeness of the system of double automatic machines. Linear machines. Completeness problem for linear automata with respect to superposition. Algorithmic undecidability of the completeness problem for finite systems of automata with respect to superposition and feedback. Kudryavtsev's theorem on the continuum of precomplete classes of automata for superposition and feedback operations. Automata systems that explicitly contain Boolean functions. The solvability problem for the completeness problem for them.		
	TIOSU 2306 Technical and information support for control systems.	The main tasks arising in the construction of information and control subsystems. software for control systems of technological processes. Implementation of automation and control systems in automated control systems. Information subsystem. The main tasks of the primary processing of information. Calculation of generalized indicators of the process. Determination of integral and averaged values of measured values. Calculation of unmeasured values and operational technical and economic indicators. Algorithms for accounting and compensation of dynamic connections between measured values.		
5	ISKAP 2307 Information systems for quality management in automated and automated production.	Quality Management as a Factor of Enterprise Success in Competition. Approaches to product quality management. Quality management mechanism. Computer quality management system Main stages of the product life cycle. Functions of	5	PK5

		automated systems during the product life cycle. Integrated information environment. Information model of a product in automatic and automated systems. Computer quality management system Quality management system. Quality management system standards. Organization of the design of the quality management system. Quality management methods The structure of the computer quality management system. Information support of the QMS. Software tools used for quality management. Trends and prerequisites for the development of QMS. Design of quality management information systems. Information systems design technologies. Functional-oriented (structural) design. Object-oriented design. CASE systems. Methods and tools for building a computer quality management system		
	IKCU 2307 Information channels of control systems.	Scheme of data transmission in information channels (IC) of technological process control systems. Mathematical models and methods for analysis and research of processes in discrete-continuous IC. Description of the characteristics of signals and systems in the time domain. Signal model and its modifications in the tasks of information processing and control. Non-singular random process. Continuous signal time sampling and sampling function. Deterministic and stochastic selection model in the information channel and its properties. Linear discrete dynamic operation. Digital filter. Linear dynamic operations on random sequences. Basic characteristics of the output signal of a discrete filter (mathematical expectation, correlation function). Continuous signal recovery operation, a mathematical description of the various elements that implement it. Recovery of a random signal. Weighting function of the resulting linear operator. Ergodic properties of a signal in discrete-continuous IR. Characteristics of IR accuracy, various schemes for highlighting the error. Investigation of the accuracy of discrete transmission and processing of continuous data in a software-hardware channel, a scheme for isolating a random error. Methodology for calculating the accuracy of IR control systems for		

		random signals with an exponential-cosine correlation function. The method of accounting for the method of obtaining a digital equivalent in an ADC. Model for taking into account the error arising from the level quantization of signals. various schemes for highlighting the error. Investigation of the accuracy of discrete transmission and processing of continuous data in a software-hardware channel, a scheme for isolating a random error. Methodology for calculating the accuracy of IR control systems for random signals with an exponential-cosine correlation function. The method of accounting for the method of obtaining a digital equivalent in an ADC. Model for taking into account the error arising from the level quantization of signals. various schemes for highlighting the error. Investigation of the accuracy of discrete transmission and processing of continuous data in a software-hardware channel, a scheme for isolating a random error. Methodology for calculating the accuracy of IR control systems for random signals with an exponential-cosine correlation function. The method of accounting for the method of obtaining a digital equivalent in an ADC. Model for taking into account the error arising from the level quantization of signals.		
6	MUUAS 2308 Microprocessor control devices for automated systems	Architectural features and classification of microprocessor devices by purpose, bit capacity, control method, constructive and technological characteristics. The main tasks of the MPS design. Organization of processing, control, memory subsystems. The structure of the CPU, its software model and modes of operation, the typical core of the MPS. Organization of two-level management of the Ministry of Railways. Circuitry and features of the organization of buses for data and control addresses. Characteristics of machine cycles and machine cycles. Block diagram and timing diagrams of the system generator and system controller. Technique for organizing serial and parallel interfaces. Structure, operating modes, software model. Formats of commands for setting modes and control of reception / transmission. Programmable DMA controllers, their structure,	5	PK6

		functionality, software models, initialization routines, state diagrams, schemes for connecting to the system backbone. Interrupt service algorithms implemented in these controllers. Structure, programming models, initialization and maintenance instruction formats, programming features. Cascading multiple interrupt controllers.		
	IIIS 2308 Intelligent information and measurement systems	The place of expert systems in the theory of artificial intelligence. Components of ES: knowledge base, inference mechanism, mechanism for acquiring and explaining knowledge, intelligent interface. Stages of ES design: identification, conceptualization, formalization, implementation, testing, trial operation. Participants in the design process: experts, knowledge engineers, end users. Knowledge base organization. Knowledge representation models. Semantic networks. Frames. Production systems. Logical models. Logical and heuristic methods of reasoning in IS. Reasoning based on deduction, induction, analogy. Fuzzy conclusion of knowledge. Acquisition of knowledge. Extracting knowledge from data. Machine learning by example. Neural networks. Classification of NS models. Algorithms for training neural networks ..		
7	APNP 2309 Automation of petrochemical production processes	Regulation systems using additional information signals. Automation of drying processes and evaporators. Control systems, signaling and regulation of parameters. Features of automation of processes with a fluidized bed. Cascade and combined control systems. Automation of stabilization columns in hydrotreating and catalytic reforming processes. Quality control systems. Automation of the processes of absorption and desorption of gases, dehydration and desalination of oil and gas condensate. Introduction of complex control systems. Automation of separation and heating of oil products. Automation of tube furnaces. Automation of thermal power plants: steam and hot water boilers, atmospheric and vacuum deaerators. Decomposition of the control problem. Regulation of temperature and quality indicators of the combustion process of tube furnaces using additional information signals. Protection systems.	5	PK15

	APB 2309 Automation of drilling processes	A drilling rig as an object of control, regulation and automation. Appointment of drilling instrumentation (BKIA) and automation equipment. Control and measuring equipment as the first stage of production automation. Technological control during well construction. Drilling technological complex. Classification of the BCIA. Operating conditions and requirements for BCIA. Equipment for monitoring the parameters of the drilling process. Well drilling efficiency control equipment. Non-destructive testing of drilling equipment and tools. Equipment for special studies in wells. Equipment for determining the properties of materials, liquids and reagents used in technological processes. Equipment for monitoring indicators characterizing the state of health and safety during drilling operations. Automation of technological processes during well construction. General information about the drilling rig as an object of automation and regulation. Adjustable drive in well drilling. Criteria and algorithms for regulating the drilling process. General information about automatic bit feeding systems. Optimal automatic control of the well drilling process. Automation of round-trip operations. Maintenance of BCIA and automation equipment.		

7 CORRELATION MATRIX

learning outcomes for the educational program as a whole with formed competencies (learning outcomes of the constituent components)

	PO1	PO2	PO3	PO4	PO5	PO6
KK1	+					
KK2	+					
KK3	+					
KK4	+					
KK5		+				
KK6		+				
KK7		+				
PK 01		+	+	+		
PK 02			+	+		
PK 03			+			
PK 04		+	+		+	
PK 05		+	+	+	+	
PK06			+	+		+
PK07				+		+
PK08				+	+	+
PK09				+		
PK10				+		
PK11				+	+	
PK12				+		
PK13				+	+	
PK14					+	
PK15					+	+
PK16						+

8. SUMMARY TABLE

Semester	Number of academic credits								Duration (including session, but no vacation)
	DB VK	DB KB / Minor *	PD VK	PD KV	SP	NIRM	IA	Total	
1	17	10				3		30	
2	3	5	3	15		4		30	
3				25		5		30	
4				-	6	12	12	30	
Total	**20**	**15**	**3**	**40**	**6**	**24**	**12**	**120**	

9. ADMINISTRATION SHEET OF EP

EXPERTS:

Full name	Position	Signature and date
Shabdirov Daryn	c.s., professor	
Дробышевский	Директор ТОО "IQS Engineering"	
Касаков	Директор ТОО	

Educational program reviewed and recommended for approval at meetings of:

Council of the Faculty of "Information Technologies"
protocol № 9 " 24 " 04 2021 d.

Chairman of the Faculty Council _____ Iskakova S. Sh

Educational-methodical council of university

protocol № 5 " 29 " 04 2021 г.

Chairman of EMC of university _____ PhD Kumalakov B.A.