SATBAYEV UNIVERSITY

Institute of «Automation and Information Technology»
Department «Robotics and Engineering Tools of Automation»

EDUCATIONAL PROGRAM
7M07107 «Robotics and Mechatronics»

Code and classification of the field of education:
7M07 «Engineering, manufacturing and construction industries»
Code and classification of training directions:
7M071 «Engineering and engineering trades»
Group of educational programs:
M102 «Robotics and mechatronics»
Level based on NQF: **7**
Level based on IQF: **7**
Study period: **2 year**
Amount of credits: **120**

Almaty 2025

Educational program 7M07107 «Robotics and Mechatronics» was approved at the meeting of K.I. Satbayev KazNRTU Academic Council

Minutes #10 dated 06.03.2025

was reviewed and recommended for approval at the meeting of K.I. Satbayev KazNRTU Educational and Methodological Council

Minutes #3 dated 20.12.2024

Educational program 7M07107 «Robotics and Mechatronics» was developed by Academic committee based on direction 7M071 Engineering and engineering trades

Full name	Academic degree/ academic title	Position	Workplace	Signature
Chairperson of Academic Committee:				
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List of abbreviations and designations

EP - Educational program
BD - basic disciplines
PD - profile disciplines
ECTS - European Credit Transfer and Accumulation System
USEC - Universal, social and ethical competencies
S&MC - Special and managerial competencies
PC - Professional competence
EO - educational outcomes
FA - Final attestation

1. Description of educational program

Master's degree in the field of training "Robotics and mechatronics" should be prepared to solve professional tasks in accordance with the profile of the master's program and the types of professional activities:

research activities:

- analysis of scientific and technical information, domestic and foreign experience in the development and research of robotic and mechatronic systems; study of new methods of control theory, artificial intelligence technologies and other scientific areas that make up the theoretical base of robotics and mechatronics, preparation and publication of reviews and abstracts;
- conducting theoretical and experimental research in the field of developing new samples and improving existing robotic and mechatronic systems, their modules and subsystems, searching for new ways of managing and processing information using artificial intelligence, fuzzy logic, multi-agent control methods, artificial neural and neuro-fuzzy networks;
- conducting patent research supporting the development of new robotic and mechatronic systems in order to protect intellectual property objects, research and development results obtained;
- conducting the development of experimental samples of robotic and mechatronic systems, their modules and subsystems in order to verify and substantiate the main theoretical and technical solutions to be included in the terms of reference for the performance of development work;
- organizing and conducting experiments on existing robotic and mechatronic systems, their subsystems and individual modules in order to determine their effectiveness and determine ways to improve, processing the results of experimental studies using modern information technologies;
- preparation of reports, scientific publications and reports at scientific conferences and seminars, participation in the implementation of research and development results in practice;

design and development activities:

- preparation of a feasibility study of projects for new robotic and mechatronic systems, their individual subsystems and modules;
- calculation and research of robotic and mechatronic systems, control, information-sensory and Executive subsystems using mathematical modeling methods, layout and testing of existing systems, processing of experimental data with the use of modern information technologies;
- development of special software for solving problems of designing robotic and mechatronic systems, development of technical specifications and direct participation in the design of mechanical, mechatronic and robotic modules, design of mechatronic and robotic devices, control and information processing systems;

organizational and managerial activities:

- development of organizational and technical documentation (work schedules, instructions, plans, estimates) and established reporting in accordance with approved forms;

- organization of work of small groups of performers involved in research, design and experimental research;

- monitoring the implementation of measures to prevent industrial injuries, occupational diseases, and prevent environmental violations during the research and operation of robotic and mechatronic systems;

installation and commissioning activities:

- participation in verification, adjustment, adjustment, equipment condition assessment and configuration of robotic and mechatronic systems for various purposes, including both technical means and software control systems;

- participation in the interfacing of software and hardware complexes with technical objects as part of robotic and mechatronic systems, in conducting tests and commissioning prototypes of such systems;

service and maintenance activities:

- participation in the verification, adjustment, adjustment and evaluation of the state of robotic and mechatronic systems for various purposes, as well as their individual subsystems, in the setting up of control hardware and software complexes;

- preventive maintenance of technical condition and functional diagnostics of robotic and mechatronic systems for various purposes, as well as their individual subsystems;

- preparation of operating instructions for robotic and mechatronic systems and their hardware and software, development of routine testing programs;

- preparation of applications for equipment and components, preparation of technical documentation for equipment repair;

scientific and pedagogical activity:

- participation in the development of programs of academic disciplines and courses based on the study of pedagogical, scientific, technical and scientific-methodical literature, as well as the results of their own professional activities;

- participation in setting up and modernizing individual laboratory works and workshops in professional disciplines;

- conducting training sessions with students, participating in the organization and management of their practical and research work;

- application and development of new educational technologies, including computer and distance learning systems.

The term of study in the master's program is determined by the volume of academic credits mastered. When the established amount of academic credits is mastered and the expected learning outcomes for obtaining a master's degree are achieved, the master's degree program is considered fully mastered. In the scientific and pedagogical master's program, at least 120 academic credits are awarded for the entire period of study, including all types of educational and scientific activities of the master's student.

Planning of the content of education, the way of organizing and conducting the educational process is carried out by the University and scientific organization independently on the basis of credit technology of training.

The master's program in scientific and pedagogical direction implements educational programs of postgraduate education for the training of scientific and

scientific and pedagogical personnel for Universities and scientific organizations with in-depth scientific and pedagogical and research training.

The content of the master's degree EP consists of:

1) theoretical training, including the study of cycles of basic and profile disciplines;

2) practical training of undergraduates: various types of internships, scientific or professional internships;

3) research work, including the execution of a master's thesis – - for the scientific and pedagogical master's program

4) final certification.

Final certification is carried out in the form of writing and defending a master's thesis.

2. Purpose and objectives of educational program

Purpose of EP: Training highly qualified specialists capable of developing scientifically grounded solutions in robotics and mechatronics, implementing intelligent control technologies, and applying sustainable design practices.

Tasks of EP:

- development of students through research activities, critical thinking, development of professionally oriented skills and abilities;
- using highly professional training of undergraduates in various educational environments;
- training a new competitive generation of technical specialists for the labor market;
- developing an environment that supports people of different cultures, and creating an atmosphere of striving for knowledge, academic integration and intellectual motivation;
- conducting research and educational activities based on the world's best practices, developing their own methods and style of training specialists;
- development of cooperation "University-industry" to meet the requirements of the labor market for technical specialists, to improve the quality of educational programs for training specialists;
- development of additional educational and training programs using multimedia, new teaching technologies for organizing learning based on the principle of lifelong learning;
- establishing partnerships with other universities and organizations to improve the quality of education, to support technical and cultural ties;
- incorporating energy-efficient and environmentally safe solutions into robotic and mechatronic systems.

Competencies for completing training

Universal, social and ethical competencies (USEC)	
U-1	Ability to communicate orally and in writing in the state, Russian and foreign languages to solve problems of interpersonal and intercultural interaction
U-2	The ability to assess the surrounding reality based on worldview positions formed by knowledge of the basics of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical knowledge
U-3	Develop an environment that welcomes and supports people from different cultures, and create an atmosphere of striving for knowledge, academic integration, and intellectual motivation
U-4	Have the skills of social design and methods of forming and maintaining the socio-psychological climate in the organization
U-5	Ability to critically use the methods of modern science in practice
U-6	Awareness of the need and ability to learn and improve their skills independently throughout their working life
Special and managerial competencies (S&MC)	

S-1	Independently manage and control the processes of work and training activities within the framework of the strategy, policy and goals of the organization, discuss problems, argue conclusions and correctly operate with information
S-2	Organize the activities of the production team, make organizational and managerial decisions in the context of different opinions and evaluate the consequences of decisions
S-3	Organize work in the division to improve, modernize, and unify the manufactured robotic and mechatronic systems
S-4	Readiness to lead and participate in the preparation of a feasibility study of projects for the creation of robotic and mechatronic systems, their subsystems and individual modules
S-5	Ability to critically analyze, present, defend, discuss and disseminate the results of their professional activities
Professional competencies (PC)	
PC-1	The ability to analyze literature data and, based on the analysis, be able to determine and experimentally implement possible ways to improve the quality of robotic systems
PC-2	Ability to conduct professional written and oral communication with all stakeholders in the field of robotics and mechatronics
PC-3	The ability to demonstrate a sustained interest in self-study and training of both wards and colleagues, to guide and advise them throughout the entire period of professional activity
PC-4	Ability to demonstrate a high level of professional activity while solving industrial and / or scientific tasks, observing all the principles of legal and ethical standards
PC-5	Ability to conduct independent research in the field of robotics and mechatronics and modernize existing robotic and mechatronic systems, introduce new methods of digital signal processing with elements of artificial intelligence
PC-6	Ability to design modern and reliable blocks and devices, intelligently controlled Executive, information-sensor and navigation modules of robotic and mechatronic systems
PC-7	Ability to apply modern software products and the latest technologies to solve and manage interdisciplinary engineering problems in various fields of science and technology
PC-8	Ability to create adaptive and robust control systems for multi-agent robotic systems and special-purpose object systems in an unknown environment, taking into account their dynamic characteristics
PC-9	Ability to implement scientific results in the production of robotic and mechatronic systems, their subsystems and individual modules

3. Requirements for evaluating the educational program learning outcomes

Learning outcomes include knowledge, skills, and competencies and are defined both for the educational program as a whole and for its individual modules, disciplines, or assignments. The main task at this stage is to select assessment methods and tools for all types of control, which can be used to most effectively assess the achievement of planned learning outcomes at the discipline level. The previous level of education of applicants is higher professional education (bachelor's degree). The applicant must have a diploma of the established standard and confirm the level of English language proficiency with a certificate or diplomas of the established standard. The procedure for admission of citizens to the magistracy is established in accordance with the "Standard rules for admission to study in educational organizations that implement educational programs of postgraduate education." The formation of a contingent of undergraduates is carried out through the placement of a state educational order for the training of scientific and pedagogical personnel, as well as tuition fees at the expense of citizens' own funds and other sources. The State provides citizens of the Republic of Kazakhstan with the right to receive free postgraduate education on a competitive basis in accordance with the state educational order, if they receive this level of education for the first time. At the entrance, a master's student must have all the prerequisites necessary to master the relevant Master's degree program. The list of necessary prerequisites is determined by the higher education institution independently. In the absence of the necessary prerequisites, the undergraduate is allowed to master them on a fee basis.

4. Passport of educational program

4.1. General information

№	Field name	Comments
1	Code and classification of the field of education	7M07 «Manufacturing and processing industries»
2	Code and classification of training directions	7M071 «Engineering and engineering trades»
3	Educational program group	M102 «Robotics and mechatronics»
4	Educational program name	7M07107 «Robotics and Mechatronics»
5	Short description of educational program	Training of highly qualified specialists in the field of development of new control methods, information processing and search for new design solutions for mechatronic and robotic systems of general purpose, their subsystems and individual modules, conducting research in the field of mechatronics, robotics, control theory and artificial intelligence methods.
6	Purpose of EP	The purpose of the educational program is training highly qualified specialists capable of developing scientifically grounded solutions in robotics and mechatronics, implementing intelligent control technologies, and applying sustainable design practices
7	Type of EP	New
8	The level based on NQF	7
9	The level based on IQF	7
10	Distinctive features of EP	no
11	List of competencies of educational program	In the field of research methodology; in the field of scientific and scientific-pedagogical activity in higher educational institutions; in matters of modern educational technologies; in the implementation of scientific projects and research in the professional field; in the field of information analysis.
12	Learning outcomes of educational program	EO1 - Organize and carry out work on the operation, installation and commissioning of robotic and mechatronic systems and complexes, including both technical means and software control complexes. EO2 – Apply modern software products and the latest technologies to solve and manage interdisciplinary engineering problems in various fields of science and technology. EO3 – Demonstrate a high level of professional activity while solving production and/or scientific tasks, observing all the principles of legal and ethical standards. EO4 – Design modern and reliable blocks and devices, intelligently controlled executive and information-sensor and navigation modules of robotic and mechatronic systems and complexes. EO5 – Demonstrate a steady interest in self-study and training of both wards and colleagues, guide and advise them throughout the entire period of professional activity.

		EO6 – To conduct research in the field of developing new samples and improving existing mechatronic and robotic systems, to look for new ways of processing information with elements of artificial intelligence. EO7 – Implement energy-efficient technologies in robotic and mechatronic systems, analyze their impact on sustainable development and integration with intelligent control algorithms based on the study of scientific and technical achievements of domestic and foreign scientists. EO8 – Demonstrate teaching and mentoring skills in secondary and higher education institutions using modern technologies and teaching methods
13	Education form	full-time
14	Period of training	2 year
15	Amount of credits	120
16	Languages of instruction	russian, kazakh, english
17	Academic degree awarded	Master of Technical Sciences
18	Developer and author	Ozhikenov K.A.

4.2. Relationship between the achievability of the formed learning outcomes based on educational program and academic disciplines

№	Discipline name	Short description of discipline	Amount of credits	Generated learning outcomes (codes)							
				EO1	EO2	EO3	EO4	EO5	EO6	EO7	EO8
Cycle of basic disciplines University component											
1.	Foreign language (professional)	The course is aimed at studying the main problems of scientific knowledge in the context of its historical development and philosophical understanding, the evolution of scientific theories, principles and methods of scientific research in the historical construction of scientific paintings of the world. The discipline will help to master the skills of developing critical and constructive scientific thinking based on research on the history and philosophy of science. At the end of the course, undergraduates will learn to analyze the ideological and methodological problems of science and engineering and technical activities in building Kazakhstan's science and the prospects for its development.	5			v					
2.	Psychology of management	The course is aimed at mastering the tools for effective employee management, based on knowledge of the psychological mechanisms of the manager's activity. Discipline will help you master the skills of making decisions, creating a favorable psychological climate, motivating employees, setting goals, building a team and communicating with employees. At the end of the course, undergraduates will learn how to resolve managerial conflicts, create their own image, analyze situations in the field of managerial activity, as well as negotiate, be stress-resistant and effective leaders.	3					v			
3.	History and philosophy of science	Purpose: to explore the history and philosophy of science as a system of concepts of global and Kazakh science. Content: the subject of philosophy of science, dynamics of science, the main stages of the historical development of science, features of classical science, non-classical and post-non-classical science, philosophy of mathematics, physics, engineering and technology, specifics of engineering sciences, ethics of science, social and moral responsibility of a scientist and engineer.	3			v					
4.	Higher school pedagogy	The course is aimed at mastering the methodological and theoretical foundations of higher education pedagogy. The discipline will help to master the skills of modern pedagogical technologies, technologies of pedagogical design, organization and control in higher education, skills of communicative competence. At the end of the course, undergraduates learn how to organize and conduct various forms of organizing training, apply active teaching methods, and select the content of training sessions. Organize the educational process on the basis of credit technology of education.	3		v						v
5.	Pedagogical practice	To know the history of the development of general psychological concepts of cognitive processes, modern theories and problems of the systematic organization of cognitive processes. Be able to analyze, compare and generalize the results of theoretical and applied research in the field of general psychology; apply modern methods and techniques of teaching technical disciplines; use the acquired knowledge for independent									

		development and application of ideas in the context of scientific research; critically analyze existing concepts, theories and approaches to the analysis of processes and phenomena. Acquisition of research skills, solving standard scientific tasks; implementation of educational and pedagogical activities on credit technology of education; methods of teaching professional disciplines									
Cycle of basic disciplines Component of choice											
6.	Dynamics of robotic systems	The purpose of the discipline is to study the issues of modeling the dynamics of robotic systems. To understand the dynamics of robots and basic concepts and definitions, fundamental principles and the most common and effective modeling methods Contents: concepts of a dynamic model and equations of motion. Problems of dynamics Fundamental principles of mechanics. The movement of the point mass. The movement of an absolutely rigid body. Assignment forms and methods for deriving equations of motion. Equations of motion in configuration space.	5				v			v	v
7.	Intelligent control and information processing systems	The discipline is aimed at studying the theoretical foundations and practical mastering of working with neural networks, genetic algorithms and expert systems. Formation of practical skills in the use of intelligent systems for management. Understanding the place of intelligent methods among all information technologies. The concept of basic intelligent technologies, their use in computer control systems and application for solving applied problems	5						v	v	
8.	Intellectual property and scientific research	The purpose of this course is to provide undergraduates with the knowledge and skills necessary to understand, protect and manage intellectual property (IP) in the context of scientific research and innovation. The course is aimed at training specialists who can effectively work with IP, protect the results of scientific research and apply them in practice.	5				v				
9.	Methods for solving inventive tasks	Purpose: the development of the discipline is the development of skills to use tools and methods for solving inventive tasks in the search for solutions to practical and professional problems. Content: introduction to the phenomenon of inventive problem solving and its modern architectonics. Characterization of the levels of creative tasks and the development of key concepts. The concept of the functional nature of problem situations (how they are "split" into inventive and non-inventive tasks). Description of a technical object based on a systematic approach.	5						v		
10	Application of methods of technical creativity in innovative activities	The purpose of studying the discipline is to master the basics of practical application of methods of technical creativity in innovation. The basic knowledge and skills of applying the methods of technical creativity in innovation are offered. After studying the course, a master's student must demonstrate the ability to analyze, synthesize and design methods of technical creativity in innovation.	5						v		
11	Mathematical modeling and optimization of motion of multi-tier systems	The purpose of studying the discipline is to study the principles of modeling the movement of multi-link systems, which are the majority of mechatronic systems that are multi-link, such as manipulators of industrial robots, etc., at the design stage. The study of the main elements of the SimMechanics library and the principles of forming models of spatial mechanisms and machines in the SimMechanics environment, visualization of the	5		v						

		movements of spatial mechanisms and machines using the built-in SimMechanics tools.									
12	Biotechnical control systems	The objectives of the development of the discipline: the formation of knowledge, skills, abilities and competences on the management systems of biotechnical systems; forming a belief about the need for the development of automatic biotechnical systems for human life support; use of information tools necessary for future professional activities	5								
13	Sustainable development strategies	Purpose: To train graduate students in sustainable development strategies to achieve a balance between economic growth, social responsibility, and environmental protection. Content: Graduate students will study the concepts and principles of sustainable development, the development and implementation of sustainable development strategies, the evaluation of their effectiveness, and international standards and best practices. Cases and examples of successful sustainable development strategies are included.	5					v		v	
Cycle of profile disciplines University component											
14	Intelligent control technology	The purpose of the discipline is to study the theoretical foundations of artificial intelligence, neural network technologies of intelligent systems, technologies for building control systems with fuzzy logic, rules of fuzzy logic, technologies for creating a knowledge base, expert control systems, adaptive control systems, problems of theory and technology of intelligent systems, etc. This knowledge is necessary for further understanding of the principles of building robotic systems.	5		v					v	
15	Research practice	Formation of professional skills necessary for the successful implementation of research activities, mastering research technology; introducing undergraduates to direct practical activities in order to acquire the professional qualities of a future specialist; organization of interaction and communication of undergraduates with specialists of their future specialty for professional adaptation, the development of a creative and research approach to future professional activities among undergraduates, the acquisition of skills in analyzing the results of their work, the formation of the need for self-education.									
Cycle of profile disciplines Component of choice											
16	Control of mobile robots in an unknown environment	The purpose of teaching the discipline is to form masters' knowledge about automatic and automated control of mobile robots, methods and methods of designing, debugging and operating mobile robots using computer–aided design and production systems, taking into account unknown, random, non-deterministic influences. The issues of mathematical description of static and dynamic objects, development and design of mechanical and electrical components of robotic and mechatronic systems with their subsequent automated control are considered.	5						v		
17	Intellectual management in conditions of uncertainty	The discipline "Intellectual management in conditions of uncertainty" is aimed at studying the problems of managing continuous dynamic objects under uncertainty. The tools of sensitivity theory, interval model representations, generalized modal control, Lyapunov function method and adaptive control are studied. Designing control laws that deliver robustness to systems in the sense of the main indicators of the quality of their functioning. Non-adaptive and adaptive management methods.	5				v				

18	Robot Navigation Systems	The purpose of the discipline is to study the types, purpose, general principles of operation of robot navigation systems, as well as the mathematical apparatus of modern navigation. To teach to understand the purpose of robot navigation systems and to apply modern robot navigation systems and tools. Inertial orientation and navigation system (IONS) for manipulative and mobile robots. Structure and purpose and sleep. Orientation and navigation algorithms for determining the kinematic parameters of a moving object using IONS.	5						v		
19	Technical means of information-measuring systems	The purpose of studying the discipline is the formation of students' knowledge in the field of information and measurement systems: components, algorithms, structures, characteristics, varieties and purposes of modern information and measurement systems and their parts; features of the use of computers and computer technology in information and measurement systems; organization of human interaction and technology in information and measurement systems; metrological providing systems; sources, types and performance indicators of information and measurement systems	5			v				V	
20	Project management	Goal: Gaining knowledge about the components and methods of project management based on modern models and standards. Objectives: study of behavioral models of project-oriented management of business development; mastering international standards PMI PMBOK, IPMA ICB and national standards of the Republic of Kazakhstan in the field of project management; analysis of the features of organizational management of business development through the integration of strategic, project and operational management.	5			v					
21	Multi-agent robotic systems	The purpose of studying the discipline is the study of multi-agent systems, which are one of the new promising areas of artificial intelligence, which was formed on the basis of research results in the field of distributed computer systems, network technologies for solving problems in parallel computing, in which the principle of autonomy of individual parts of the program, jointly functioning in a distributed system, where many interconnected computing processes are simultaneously taking place programs called multiagents.	5				v				
22	Reliability of technical systems	The purpose of teaching the discipline is to study a wide range of issues: basic concepts and definitions of the theory of reliability of technical systems. Quantitative and qualitative characteristics of reliability. Mathematical models of reliability of devices and systems. Methods and main stages of determining the reliability indicators of the designed devices and systems. Improving reliability by redundancy. Calculation of reliability of devices and systems with information redundancy and temporary redundancy	5				v				
23	Diagnosis and reliability of technical systems and devices	The purpose of studying the discipline is to study methods for assessing the reliability of technical systems at the design stage, to study methods for assessing the reliability of technical systems in operation, to apply probability theory to predict and prevent equipment failures, to study methods for diagnosing existing equipment. Accordingly, the teaching of the discipline "Diagnostics and reliability of technical systems and devices" is aimed at arming future specialists with knowledge of the basic provisions of the theory of reliability and survivability of technical systems.	5	v							
24	Evaluation of reliability and survivability of technical systems	The discipline is aimed at studying methods for assessing the reliability of technical systems at the design stage, studying methods for assessing the reliability of technical systems in operation, applying probability theory to predict and prevent equipment failures. The basic	5	v							

		concepts of reliability theory, such as the quality and reliability of the object, the causes and types of failures. Methods for assessing the reliability of recoverable systems without limitation and with a limited recovery time									
25	Digital processing of measurement information	The purpose of the discipline is to study the role and significance of digital signal processing in the reception and transmission of information, the features and advantages of digital representation of signals, the study of digital transformation algorithms, the implementation of digital processing in telecommunications, information-measuring and radiophysical systems and its application in various fields of science, technology and production.	5						v		
26	Neuro fuzzy and hybrid control	The purpose of studying the discipline is to familiarize with the principles and methods of building systems of neural fuzzy and hybrid control of a technical object based on the methods of the theory of artificial intelligence and modern software and hardware. Study of the structure, characteristics and functionality of the NeuralNetworksToolbox module of the MatLab software package for modeling neural networks; study of the structure, characteristics and functionality of the FuzzyLogicToolbox module of the MatLab software package for modeling fuzzy and hybrid control systems	5						v		
27	Designing special purpose robotic systems	The purpose of teaching the discipline is to systematize and integrate previously acquired knowledge in the disciplines of bachelor's and master's training in the field of study. Definition and formalization of tasks facing robotics; drawing up requirements for components of robotic systems; the concept of problems of designing highly efficient mechatronic modules and systems of special-purpose objects; obtaining methodological foundations of system design of multicomponent integrated systems, taking into account the specifics of automated production.	5					v		v	
28	Designing microprocessor and microcontroller systems	The discipline is aimed at forming students' knowledge of the general methodology and specific design methods of the main varieties of modern microprocessor tools, as well as knowledge and skills in the field of architecture, principles of functioning and programming of microprocessor systems. Studies the architecture and functionality of modern microprocessors and microcontrollers; methods and technical means of debugging, diagnostics, modeling and design of microprocessor systems and microcontrollers	5				v				
29	Organization and planning of production of mechatronic equipment	The purpose of studying the discipline is to study the methods of planning and production of medical equipment and the principles of the organization of the production process in the production of medical equipment. Scientific foundations of the organization of the production of medical equipment. Organization of auxiliary workshops and service farms of the enterprise for the production of medical equipment. Organization of research, design and technological preparation of medical equipment production. Organization and planning of management of the enterprise for the production of medical equipment. Organization of mastering the production of new equipment.	5	v						v	
30	Information topologies and networks	The purpose of studying the discipline is to provide undergraduates with systematized knowledge about information topologies and networks in computer control systems of robotic systems. Formation of in-depth knowledge in the field of modern information and communication technologies, information culture. Mastering the skills of designing and practical implementation of various automated control systems for robotic systems.	5				v				

31	Deep learning for robots	The discipline focuses on studying deep learning methods and their applications in robotic systems. It includes reinforcement learning for autonomous robots, self-supervised learning, generative AI, and interpretability of neural network models. Tasks of computer vision, natural language processing for robot control, integration of neural networks into adaptive control systems, and fault diagnosis are considered. Special attention is given to energy efficiency and optimization of computations in real-time deep neural network operation.	5		v				v		
32	Robust systems and adaptive control	The purpose of studying the discipline is to familiarize undergraduates with the technical characteristics of adaptive, robust and robust–suboptimal control systems for single-connected, multi-connected and network linear and nonlinear objects. To study mathematical methods used in the synthesis of adaptive and robust control systems for dynamic objects. To teach how to use the studied methods to solve specific adaptation problems in stochastic dynamical systems	5						v		
33	Planning an experiment	Purpose: to prepare future specialists for research and organizational and managerial activities and processing of their results. Contents: general questions of the theory of experiment planning. An experiment as an object of research. Methods of the theory of experiment planning. The logical foundations. Statistical processing of measurement results. Analysis of measurement results. Fundamentals of experiment planning. A complete and fractional factorial experiment. Verification of the adequacy of the model obtained from experimental data. Computer methods of statistical processing of the results of an engineering experiment.	4						v	v	
34	Statistical methods in research	Purpose: formation of logical and algorithmic thinking of students, which allows them to apply statistical methods in research. Content: The discipline is aimed at studying the basic methods of modeling processes and systems in solving problems of processing and interpretation of experimental data and problems of system engineering and circuit design, the formation of logical and algorithmic thinking of students, allowing the use of statistical methods in engineering research.	4						v	v	

5. Curriculum of educational program

KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I.SATPAYEV

APPROVED

Chairman of the Management Board-
Rector of KazNRTU named after K.Satpayev
_____ M.M. Begentaev
«___» _____ 2025 y.

CURRICULUM
of Educational Program on enrollment for 2025-2026 academic year
Educational program 7M07107 - Robotics and mechatronics
Group of educational programs M102 - "Robotics and mechatronics"

Form of study: full-time **Duration of study: 2 year** **Academic degree: Master of Technical Sciences**

Discipline code	Name of disciplines	Cycle	Total amount in credits	Total hours	Classroom amount lec/lab/pr	SIS (including TSIS) in hours	Form of control	Allocation of face-to-face training based on courses and semesters			
								I course		2 course	
								1 semester	2 semester	3 semester	4 semester
M-1. Module of basic training (university component)											
LNG213	Foreign language (professional)	BD UC	3	90	0/0/2	60	E	3			
HUM214	Management Psychology	BD UC	3	90	1/0/1	60	E	3			
HUM212	History and philosophy of science	BD UC	3	90	1/0/1	60	E		3		
HUM213	Higher school pedagogy	BD UC	3	90	1/0/1	60	E		3		
component of choice											
ROB701	Dynamics of robotic systems	BD CCH	5	150	2/0/1	105	Э	5			
ROB204	Intelligent information management and processing systems				2/1/0						
MNG781	Intellectual property and scientific research				2/0/1						
ROB292	Methods for solving inventive tasks	BD CCH	5	150	2/0/1	105	Э	5			
ROB262	Application of methods of technical creativity in innovation										
ROB275	Mathematical modeling and optimization of the movement of multi-link systems	BD CCH	5	150	2/0/1	105	Э		5		
ROB257	Biotechnical control systems										
MNG782	Sustainable development strategies										
M-2. Module of theoretical foundations of management (optional component)											
ROB284	Intelligent control technology	PD UC	5	150	2/0/1	105	Э	5			
ROB555	Managing mobile robots in an unknown environment	PD CCH	5	150	2/0/1	105	Э		5		
ROB203	Intelligent management in conditions of uncertainty										
ROB283	Robot navigation systems	PD CCH	5	150	2/0/1	105	Э			5	
ROB224	Technical means of information and measuring systems										
MNG705	Project management										
M-3. Control system design module (optional component)											
ROB265	Multi-agent robotic systems	PD CCH	5	150	2/0/1	105	Э	5			
ROB231	Reliability of technical systems										

ROB277	Diagnostics and reliability of technical systems and devices	PD CCH	5	150	2/0/1	105	Э		5		
ROB216	Assessment of reliability and survivability of technical systems										
ROB279	Digital processing of measurement information	PD CCH	5	150	2/0/1	105	Э		5		
ROB285	Neuro fuzzy and hybrid control										
ROB281	Design of special purpose robotic systems	PD CCH	5	150	2/0/1	105	Э			5	
ROB239	Design of microprocessor and microcontroller systems				2/1/0						
ROB280	Organization and planning of mechatronic equipment production	PD CCH	5	150	2/0/1	105	Э			5	
ROB288	Information topologies and networks										
ROB274	Deep learning of robots	PD CCH	5	150	2/0/1	105	Э			5	
ROB286	Robust systems and adaptive control										
ROB710	Planning an experiment	PD CCH	4	120	0/0/3	75	course project				4
ROB711	Statistical methods in research										
M-4. Practice-oriented module											
AAP273	Pedagogical practice	BD UC	8							8	
AAP256	Research practice	PD CCH	4								4
M-5. Experimental research module											
AAP268	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	4					4			
AAP268	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	4						4		
AAP251	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	2							2	
AAP255	Research work of a master's student, including internship and completion of a master's thesis	RWMS UC	14								14
M-6. Module of final attestation											
ECA212	Preparation and defense of a master's thesis	FA	8								8
	Total based on UNIVERSITY:							30	30	30	30
								60		**60**	

Number of credits for the entire period of study					
Cycle code	**Cycles of disciplines**	**Credits**			
			university component (UC)	**component of choice (CCH)**	**Total**
BD	Cycle of basic disciplines		20	15	35
PD	Cycle of profile disciplines		4	35	53

	Total for theoretical training:	***0***	***24***	***50***	***88***
	RWMS				***24***
FA	Final attestation	8			8
	TOTAL:	**8**	**24**	**50**	**120**

Decision of the Academic Council of Kazntu named after K.Satpayev. Protocol № " " y.
Decision of the Educational and Methodological Council of Kazntu named after K. Satpayev. Protocol № " " y.
Decision of the Academic Council of the Institute Automation and Information Technology. Protocol № from " " y.

Vice-Rector for Academic Affairs	_____	**R.K. Uskenbayeva**
Acting Directors of the Institute of Automation and Information Technology	_____	**E.G. Chinibayev**
Head of the Department of Robotics and Automation Equipment	_____	**K.A. Ozhikenov**
Specialty Council representative from employers	_____	**A.K. Dzhumagulov**