NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

8D07 - Engineering, Manufacturing and Civil engineering
(Code and classification of the field of education)

8D072 - Manufacturing and processing
(Code and classification of the direction of training)

0720
(Code in the International Standard Classification of Education)

D100 - Automation and control
(Code and classification of the educational program group)

8D07102 - Automation and control
(Code and name of the educational program)

Doctor of philosophy (PhD)
(Level of preparation)

Semey

Educational program

8D07 -- Engineering, manufacturing and construction industries
(Code and classification of the field of education)

8D071 - Engineering and Engineering affairs
(Code and classification of the direction of training)

0710
(Code in the International Standard Classification of Education)

D100 - Automation and control
(Code and classification of the educational program group)

8D07102 - Automation and control
(Code and name of the educational program)

(Level of preparation)

Semey 2024

PREFACE

Developed

The educational program 8D07102 - Automation and control in the direction of preparation 8D071 - Engineering and Engineering affairs on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position
Head of the Academic Committee	Kozhakhmetova Dinara	Dean of the Higher School of Artificial Intelligence and Construction
Educational program manager	Zolotov Alexandr	Associate Professor of the Department of IT Technologies
Member of the AC	Bekbaeva Rosa	Head of the Department of IT Technologies
Member of the AC	Ospanov Erbol	Associate Professor of the Department of IT Technologies
Member of the AC	Kdirbayev Ayan	Director of RTS - montazh LLP
Member of the AC	Kagazbekov Daulet	Research Institute "Center of Nuclear Medicine and Oncology" of Semey city. Engineer
Member of the AC	Bidakhmetov Akylzhan	Doctoral student of the Department of IT Technologies
Member of the AC	Zhylkybayev Tursynkhan	Doctoral student of the Department of IT Technologies

Reviewing

Full name of the reviewer	Position, place of work
Shpuntov Evgeny	Director of LLP Reltex
Turagulov Rasul	OA Semey Engineering

Reviewed

at the meeting of the Commission on Academic Quality of the Faculty of Engineering and Technology
Protocol No. 3 January 15, 2024

at the meeting of the Commission on Academic Quality of the Higher School of Artificial Intelligence and Construction
Recommended for approval by the Academic Council of the University
Protocol No. 1, "6" June 2024

Approved

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

at a meeting of the University Academic Council by protocol No. 11 of June 28, 2024.

Content

1.Introduction

1.1.General data

Doctoral studies under the educational program 8D07102 "Automation and Control" are carried out at the Department of ""IT technologies" of the the Graduate School Artificial Intelligence and Constructiony . The EP was developed taking into account the needs of the regional labor market, the requirements of the normative documents of the Ministry of Science and Higher Education of the Republic of Kazakhstan and is a system of documents for organizing the educational process.

Having mastered this educational program, graduates acquire the skills and abilities of theoretical and experimental research in complex engineering activities in the field of automation and control and mechatronics; apply progressive methods of operating equipment of automation and control systems, apply modern methods to develop energy-saving and environmentally friendly automation and control systems that ensure the safety of people`s life and protect them from the possible consequences of accidents, catastrophes and natural disasters, gain knowledge and skills focused on creating robots and robotic systems with elements of artificial intelligence.

The novelty of this program is its informative uniqueness, which is the ability to combine design and programming in a single course as control systems built on a modern element base, and the study of mechatronics - applied science engaged in the development and operation of intelligent automated technical systems for their implementation in various spheres of human activity. Graduates of this educational program will master the latest tools and methods of design, such as artificial intelligence, digital information processing, simulation of complex dynamic systems and many others.

When implementing the educational program, it is planned to use artificial intelligence tools in the educational process, thereby developing digital competencies among students in a rapidly changing technological environment.

The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of PhD doctors is the student`s mastering of at least 45 credits of theoretical education, as well as at least 123 credits of doctoral student`s research work, including internship and doctoral dissertation, at least 12 credits for writing and defending a doctoral dissertation. A total of 180 credits.

1.3.Typical study duration: 3 years.

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Preparation of scientific and pedagogical personnel of the new formation, capable of solving the problems of automation and control in various industries, education, science and owning research methods in new directions of modern science
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	8D07 - Engineering, manufacturing and construction industries
Code and classification of the direction of training	8D071 - Engineering and Engineering affairs
Code in the International Standard Classification of Education	0710
Code and classification of the educational program group	D100 - Automation and control
Code and name of the educational program	8D07102 - Automation and control
2.3.Distinctive features of the OP (double degree/joint, OVPO-partner, Double major, innovative)	-
2.4.Qualification characteristics of the graduate	
Degree awarded / qualification	PhD in education program 8D07102 – Automation and Control
Name of professional standard	1. Creation and management of information technologies. 2. Technical design of innovative products/services. 3. Development of technical specifications for the creation of innovative products/services. 4. Organization of interaction between science and innovators. 5. Development and transformation of innovative ideas. 6. Teacher (faculty)organizations of higher and (or) postgraduate education.
Atlas of new professions	-
Regional standard	-
Name of the profession / list of positions of a specialist	Lecturer at the university, colleges, gymnasiums; engineer; employee of research institutes, researcher of research and production institutions; Head of the scientific group of research, production, administrative, expert institutions, etc.
OQF qualification level (industry qualification framework)	8
Area of professional activity	Graduates are prepared for work in the field of research, research and produc-tion, teaching, industrial and technological, organizational, managerial, design and engineering activities.
Object of professional activity	The objects of the graduate`s professional activity are: Universities, colleges, gymnasiums; research institutes and centers; research and production; pro-duction, administrative, expert institutions, etc.
Types of professional activity	Performs research; introduces the results of scientific research into production; organizes information retrieval work in a selected scientific area; carries out

	teaching of disciplines. Research activities, pedagogical activities, educational activities, innovative activities, industrial and technological activities, organizational and management activities, design and engineering activities.
2.5.Graduate Model	Graduate Model OP 8D07104 "Automation and control" According to the results of the training, the student receives: 1. Professional competencies: 1 Mastered competencies expressed in the achieved learning outcomes As a result of mastering this OP of doctoral studies , the graduate must have the following competencies: ▯ Uses the possibilities of written communication in the academic and scientific-technical field when writing research papers and conducting classes; Interprets the results of scientific research and the limits of their application; Possess knowledge, skills and abilities to improve the efficiency of managing complex processes and systems using modern research methods based on the development of methods of management theory and decision-making; ▯ Develop and improve existing structures, mechanisms and models of dynamic systems management by solving scientific research; ▯ Simulate mechatronic systems control systems. Implement algorithms for distributed embedded systems; ▯ Has knowledge of the implementation and configuration of a control system based on neural networks; Collection of the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidation of practical skills, application of modern methods of scientific research. 2 Personal qualities of the graduate The personal qualities of a graduate that must be possessed in order to be a competitively capable specialist in the field of automation and management: - Analytical skills: the ability to conduct a systematic analysis of information; systematize information; compare data; abstract information; design the result. - Diagnostic skills: the ability to structure the information received; to carry out innovative and combinational processes related to the ability to predict. - Verbal and non-verbal skills: the ability to build business relationships with colleagues; establish cooperation with partners; formulate professional

	tasks; master oral and written speech. - Predictive skills: confidence in one`s own actions in accordance with the assessment of everything that is happening; manifestation of extroversion and dominance as a condition of purposefulness, management, information modeling, energy mobilization, perseverance, activity, ability to withstand the load, perseverance when performing complex tasks. - Correctional skills: the ability to carry out self-analysis, self-correction; to determine the trajectories of self-development and self-education; to comprehend their own professional and personal capabilities.

3.Modules and content of the educational program

Research in scientific and pedagogical activities

Brief description of the module content

He has the skills to formulate research goals and objectives to solve the task, the main types of theoretical and applied research. He has the ability to prepare a report and write a scientific article based on research results, as well as rules and recommendations for presenting research results.

Module disciplines

Statistics and experimental design using R

Academic writing

Research methods

Pedagogical practice

Control of mechatronic, robotic and intellectual systems

Brief description of the module content

He knows the basic principles of controlling mechatronic and robotic systems using artificial intelligence. He knows the features of building multi- level and hybrid control systems for mechatronic and robotic complexes, algorithms for controlling robotic circuits and intelligent control systems.

Module disciplines

Servo systems

Research work of the doctoral student, including internship and doctoral dissertation I

Analysis of reliability of robotic systems

Embedded and distributed mechatronics systems

Artificial intelligence and neural network control

Research work of the doctoral student, including internship and doctoral dissertation II

Industrial and computer networks in robotics

Synthesis of optimal control systems

Managing complex objects based on neural network technologies

Research work of the doctoral student, including internship and doctoral dissertation III

Research work of the doctoral student, including internship and doctoral dissertation IV

Research practice

Research work of the doctoral student, including internship and doctoral dissertation V

Research work of the doctoral student, including internship and doctoral dissertation VI

Final assessment

Brief description of the module content

Writing and defending a doctoral dissertation

Module disciplines

Doctoral dissertation

4.Summary table on the scope of the educational program «8D07102 - Automation and control»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Research in scientific and pedagogical activities										
Statistics and experimental design using R	BS/US	1	3	90	15	15		20	40	Examination
Academic writing	BS/CC	1	5	150	15	30		35	70	Examination
Research methods	BS/US	1	5	150	15	30		35	70	Examination
Pedagogical practice	BS/US	3	10	300						Total mark on practice
Control of mechatronic, robotic and intellectual systems										
Servo systems	BS/US	1	5	150	15	30		35	70	Examination
Research work of the doctoral student, including internship and doctoral dissertation I	AS/US	1	15	450						Total mark on practice
Analysis of reliability of robotic systems	AS/CCh	2	5	150	15	30		35	70	Examination
Embedded and distributed mechatronics systems	AS/CCh	2	5	150	15	30		35	70	Examination
Artificial intelligence and neural network control	AS/CCh	2	5	150	15	30		35	70	Examination
Research work of the doctoral student, including internship and doctoral dissertation II	AS/US	2	20	600						Total mark on practice
Industrial and computer networks in robotics	AS/CCh	2	5	150	15	30		35	70	Examination
Synthesis of optimal control systems	AS/CCh	2	5	150	15	30		35	70	Examination
Managing complex objects based on neural network technologies	AS/CCh	2	5	150	15	30		35	70	Examination
Research work of the doctoral student, including internship and doctoral dissertation III	AS/US	3	20	600						Total mark on practice
Research work of the doctoral student, including internship and doctoral dissertation IV	AS/US	4	30	900						Total mark on practice
Research practice	AS/US	5	10	300						Total mark on practice
Research work of the doctoral student, including internship and doctoral dissertation V	AS/US	5	20	600						Total mark on practice
Research work of the doctoral student, including internship and doctoral dissertation VI	AS/US	6	18	540						Total mark on practice
Final assessment										
Doctoral dissertation		10	12	360						

NON -PROFIT LIMITED COMPANY «SHAKARIM UNIVERSITY OF SEMEY»

EDUCATIONAL PROGRAM DEVELOPMENT PLAN
8D07104 - «Automation and Control"
for the period 2024-2027

Semey 2024 y.

Content

1. Passport of the Development Plan of the PhD program 8D 07104 - "Automation and control"

1	The basis for the development	Development program of the Non -Profit Limited Company «Shakarim University of Semey» for 2023-2029 School work plan
2	Terms of implementation	2024-2027 yy.
3	Expected results of the implementation	Training of competitive specialists who possess the skills and abilities of organizational and managerial, scientific and design activities in the field of automation and control and mechatronics using theoretical, practice-oriented and scientific and educational approaches. Formation of researchers in the field of automated систем и IT- технологий.

2. Analytical justification of the OP

2.1 Information about the educational program

The educational program has been developed in accordance with the National Qualifications Framework and Professional Standards, according to the Dublin Descriptors and the European Qualifications Framework. The term of mastering the educational program of the doctoral program is 3 years.

The OP reflects the features of the objectives of the educational program for doctoral students, which allow them to develop innovative thinking, master advanced technologies in the field of automation and control, provide consulting services in complex engineering activities in the field of automation and control and mechatronics, apply progressive methods of operation of automation and control systems equipment, apply modern methods for the development of energy-saving and environmentally friendly systems automation and control, ensuring the safety of human life and their protection from the possible consequences of accidents, catastrophes and natural disasters, obtaining knowledge and skills aimed at creating robots and robotic systems with elements of artificial intelligence.

The content of the educational program is implemented through a curriculum developed in a modular format, which provides two cycles of disciplines: a cycle of basic disciplines and a cycle of core disciplines, as well as additional types of training (practice, research).2.2 Сведения об обучающихся

Academic year / The basis of learning	2024-2025 academic year	2025-2026 academic year	2026-2027 academic year
Grant	2	2	2

2.3 Internal and external conditions for the development of OP

For the development and implementation of the educational program 8D07104 - "Automation and control"
, the department has created favorable and optimal conditions such as:- highly qualified teaching staff (degree -100%);
- high material and technical equipment of the OP;
- training in 3 languages (state, Russian and English);
- modern educational and methodological base, with students' access to information and analytical resources;
-the use of modern and interactive learning tools;
- academic mobility (external and internal);
-high-quality professional infrastructure (educational resources);
-contracts have been signed with the Research Institute for internships and doctoral students' practices.

2.4 Information about teaching staff implementing the educational program

№	Indicators	Ed.ed.	2024-2025 academic year	2025-2026 academic year	2026-2027 academic year
1	Доля ППС с ученой степенью по ОП	%	**100**	**100**	**100**
2	The share of teaching staff with a degree in education Including the share of teaching staff with a degree in the OOD cycle	%	**100**	**100**	**100**

2.5 Characteristics of the achievements of the OP

According to the educational program 8D07104 - "Automation and control", there are achievements such as:

- defense of doctoral dissertations by PhD teachers of the department Ospanov E.A., Kozhakhmetova D.O.;
- participation of teaching staff in research on grant financing of the KN of the Ministry of Internal Affairs of the Republic of Kazakhstan:

1. "Selection of process parameters based on the production of wear-resistant coatings by cold gas-dynamic spraying of composite powders and computer modeling"
2. "Development of the Smart City digital service - a software product for transparent, high-quality and affordable provision of all services in the housing and communal services sector"
3. International project under the Erasmus+ program "Kaz Dual – the introduction of a dual system in Kazakhstan"
4. GeKaVOC project (Transfer of dual trainings on logistics, mechatronics and sustainable energy in Kazakhstan);

- high material and technical equipment of the OP;
- training in 3 languages (state, Russian and English);
- modern educational and methodological base, with students' access to information and analytical resources;

-the use of modern and interactive learning tools;
-high-quality professional infrastructure (educational resources);
-conclusion of an agreement with the Research Institute for internships and doctoral studies.

3. The main objectives of the OP development plan

The educational program 8D 07104 - "Automation and management" was developed based on the request of employers.

The main goal of the educational institution and its development is its improvement in accordance with the vision, mission and strategy of the university aimed at training highly qualified, competitive personnel, improving the quality of knowledge, forming a multi-level system of research activities in accordance with the urgent needs of modern education and science, transformation into an innovative world-class university.

The main objectives of the development plan are the following:

№	Name of the task	Terms of development	Stages of development
1	Providing conditions for obtaining a full-fledged, high-quality professional education	2024-2027	Development of measures to improve the quality of educational services for the development of professional skills of future specialists
2	Formation of the main professional competencies of future specialists	2024-2027	Updating the content of the OP. Acquisition of professional competencies in the field of Automation and management
3	The ability to work with scientific and technical information, use domestic and foreign experience in professional activities, systematize and summarize the information received	2024-2027	Development of measures for the analysis and processing of the results obtained
4	Consultation of scientists of the Research Institute in the selection of relevant and practically significant topics of doctoral dissertations	2024-2027	Consultations of interested parties

4. Risk analysis of OPERATIONS

№	Name of risks	Elimination measures
1	Insufficient knowledge of the language for the introduction of trilingual education	Plan English language courses for teaching staff
2	Insufficient development of external and internal academic mobility of doctoral students and teaching staff	Conclusion of contracts with universities for external and internal academic mobility of undergraduates and teaching staff
3	Insufficient provision of educational and methodological literature in professional disciplines in the state language	To plan the annual release of scientific and educational literature in the state language by scientists and teaching staff

5. Action plan for the development of the OP

№	Criteria	Expected results	Ed. ed.	2024-2025	2025-2026	2026-2027
Направление 1. Учебно-методическое обеспечение						
1.1	Updating the educational program based on professional standards, taking into account the recommendations of employers	Conducting an examination of the Educational program "8D07104 - "Automation and management" in order to increase the practice orientation and development of professional competencies of graduates	fact.		**1**	

1.2	Monitoring and updating catalogs of elective disciplines in accordance with the development of key and professional competencies, and the demands of the labor market	Improving the quality of the content of educational programs by including elective courses aimed at developing key and professional competencies of graduates in accordance with the demands of the labor market.	fact.	**1**	**1**	**1**
1.3	The introduction of modern learning technologies into the educational process that contribute to the development of cognitive activity and the communicative ability of students	Improving the quality of teaching academic disciplines, taking into account the novelty and variety of forms of work that contribute to the development of cognitive activity.	fact.	**1**	**1**	
1.3.1	Introduction of mass open online courses (MOOCs) in educational 8D07104 - "Automation and Management" into the educational process	The introduction of disciplines into the educational process is to improve the quality of teaching academic disciplines, taking into account the novelty and variety of forms of work that contribute to the development of cognitive activity.	units.	**-**	**-**	
1.4	Involvement of social partners and employers in the development and examination of the implementation of educational programs	Improving the quality of educational programs implemented, taking into account market demands and recommendations from employers	units.	**1**	**1**	
1.5	Development and implementation of elective courses in English	The introduction of disciplines in English into the educational process	units.	**-**	**-**	
1.6	Conducting seminars and round tables on the application of innovative technologies in the educational process	The introduction of innovative technologies in the educational process	units.	**-**	**-**	

1.7	Publication of educational, methodical and scientific literature on the implemented OP	Improvement of educational and methodological support in the disciplines of the implemented educational programs	units.	**1**		**1**
1.8	Conclusion of agreements with foreign and domestic partner universities in order to develop academic exchange of students of all levels and teaching staff	Creation of a database of foreign and domestic partner universities for the development of academic exchange of students of all levels and teaching staff	units.		**1**	**1**
1.9	Participation of teaching staff and students in international academic exchange programs	Development of international cooperation with foreign universities implementing educational programs in the field of 8D07104 - "Automation and management"	human.	**1**	**1**	**1**
1.10	Development of outgoing academic mobility of teaching staff and students in the direction 8D07104 - "Automation and management"	Improving the educational program based on the experience of implementing such programs in leading foreign universities	human.	**-**	**-**	**-**
Direction 2. Faculty						
2.1	Professional development and training of scientific and pedagogical personnel for the implementation of educational programs once every 3 years	The share of teaching staff who have completed advanced training at the national and international levels is at least 20%	human.	**1**	**1**	**1**
2.2	Advanced training, retraining, internships of teaching staff at the international level	Completion of at least 2 teachers of the advanced training program, retraining, internships of teaching staff at the international level	human.	**-**	**-**	**-**

2.3	Promotion of publications of the works of the Faculty in international publications indexed by the Web of Science and Scopus databases	An increase in the share of teaching staff who have published the results of scientific research in publications indexed by the Web of Science and Scopus databases – at least 30% of the total number of teaching staff	%	**30**	**30**	**30**
2.4	Involvement of practical specialists in teaching and scientific activities	Participation of practitioners in the implementation of educational programs (at least 20% of specialists)	%	**-**	**-**	
Direction 3. Internationalization of educational programs						
3.1	Conclusion of agreements on international cooperation with foreign universities	Implementation of joint projects, preparation of scientific publications with foreign partners, creation of bases for scientific internships of students	units.		**1**	
3.2	Attracting foreign students to study under the educational program "8D07104 - "Automation and management"	Increasing the number of foreign students	human.	**-**	**-**	**-**
3.3	Organization of joint scientific and practical events with international partners	Improving the effectiveness of scientific and methodological activities of teaching staff, exchange of experience with foreign partners	units.	**-**	**-**	**-**
3.4	Inviting foreign experts to give lectures and consultations on master's projects and dissertations	Improving the content component of educational programs based on the introduction of the experience of foreign specialists in the implementation of educational programs	units.	**1**	**1**	**1**

3.5	Expansion of cooperation with leading foreign scientific and educational organizations in order to attract the most qualified foreign specialists to the implementation of educational programs	Formation of key and professional competencies in accordance with the practice of leading universities	human.	**-**	**-**	**-**
Direction 4. Logistics and digitalization						
4.1	Step-by-step equipment of classrooms with technical means of teaching (projectors, panels, interactive and multimedia boards, multifunctional devices, webcam, projector screen, etc.)	Equipping classrooms assigned to the department with technical training tools (projectors, panels, interactive and multimedia whiteboards, multifunctional devices, webcam, projector screen, etc.)	units.	**1**		**1**
4.2	Automation of the educational process (testing, session management, student body movement, dean's office, department, teaching staff workload, schedule, library, syllabuses)	Information management based on automation of the educational process (testing, session management, student body movement, dean's office, department, teaching staff workload, schedule, library, syllabuses)	fact.	**1**	**1**	**1**
4.3	Replenishment of the full-text database of research results of teaching staff and students, teaching staff (articles, monographs, etc.)	An increase in the number of results of scientific works of scientists, research of teaching staff and students, teaching staff (articles, monographs, etc.)	units.	**5**	**5**	**5**
4.4	Expansion of the fund of scientific and educational literature, including on electronic media for ongoing educational programs	Ensuring the implementation of educational programs based on modern educational and information resources, including on electronic media	%	**1**	**1**	**1**

4.5	Monitoring the content and improvement of the school 's website	The formation of the school's website on various aspects of the implementation of educational programs.	%	1		1

Head of the Department _____ **Bekbayeva R.S.**

REVIEWED

at the meeting of the Commission on Academic Quality
Graduate School Artificial Intelligence and Construction
Minutes of the meeting № 1 «06» 06. 2024
Chairman CAQ _____ Adylkanova A.Zh.

AGREED

Dean _____ Kozhahmetova D.O.
«06» 06. 2024