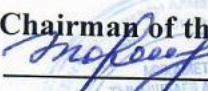


JSC "ALT University named after Mukhamedzhana Tynyshpaeva"

I APPROVE

Chairman of the «ALT University» JSC

M.S. Zharmagambetova

Decision of the Academic Council of
«ALT University» JSC
from "30" April 2026 year (Protocol №8)

PROGRAM
THE ENTRANCE EXAM TO THE DOCTORAL PROGRAM
scientific and pedagogical direction

"D100 - Automation and control"

"8D07158 - Automation and control"

Almaty 2026

The program of the entrance exam was discussed and received a positive decision at the meeting of the Department of Automation and Control, Protocol No. 6d on March 18, 2026

Head of the department



Karymsakova N.T.

The program for the entrance examination was reviewed and recommended to the meeting of the Council Institute "Energy and Digital Technologies", Protocol No. 8 "March 19, 2026".

Chairman of the Council Institute



Togozhinova A.Zh

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1. PURPOSE OF ENTRANCE EXAMINATION

The purpose of the entrance exam is to determine the level of theoretical and practical preparation of the applicant for doctoral studies and to assess the compliance of his knowledge, skills and abilities with the requirements of training in the field of preparation.

The entrance exam for doctoral studies in the Doctor of Philosophy (PhD) program consists of the following blocks:

- 1) interview with the applicant, conducted by the examination committee;
- 2) essay writing;
- 3) answers to exam questions on the profile group of the educational program.

2. FORMAT AND REGULATION PROCEDURE ENTRANCE EXAMINATION

The duration of the entrance exam is 3 hours and 30 minutes, during which the applicant passes an interview, writes an essay, and answers an electronic exam ticket consisting of 3 questions. The list of questions and essay topics are formed in random order. The maximum score for the entrance exam is 100 points, of which the essay is 20 points, the GOP profile exam is 50 points, and the interview is 30 points.

3. TYPES AND EVALUATION CRITERIA

3.1 Type and criteria evaluation essay

Types of essays	Description	Volume essay
Motivational	Argumentation of the applicant about motivational motives for research activity (research statement)	At least 250 words
Scientific and analytical	Justification of the relevance and methodology of the proposed research (research proposal)	
Problem-thematic	Presentation of the author's position on actual aspects of subject knowledge	

Criteria	Descriptor	Ball
The topic of depth disclosure	The problem is explained at the theoretical level, with the correct use of scientific terms and concepts	4
		4
Argumentation, evidence base	Presents own point of view (position, attitude) when solving a problem	4
Compositional The integrity and logic of the presentation	the presence of arguments from scientific literature and sources corresponding to the essay topic	4
Speech culture	the presence of compositional integrity, the structural components of the essay are logically connected	4
	Maximum number of points	20

3.2 Criteria for evaluating answers to questions on the electronic examination ticket

The profile exam of the group of educational programs includes 3 blocks of questions, from which: the 1st question determines the level and system of theoretical knowledge; Question 2 reveals the degree of formation of functional competencies; The 3rd question is aimed at defining system competencies. The maximum number of points is 50.

The electronic examination ticket consists of 3 questions:

Blocks	Character question	Number of points
1st question	theoretical - determines the level and system of theoretical knowledge	10
2nd question	practical - reveals the degree of formation of functional competences (the ability to apply methods, technologies and techniques in the subject area)	20
3rd question	reveals a systematic understanding of the subject area under study, specialized knowledge in the field of research methodology (system competences)	20
Total		50

Criteria for evaluating answers to questions on the electronic examination ticket:

Question	Criterion assessment	Number of points
1st question	demonstrates knowledge of the main processes of the studied subject area; depth and full coverage of the issue	5
	logically and consistently expresses his own opinion on the discussed problem	3
	knows conceptual and categorical apparatus, scientific terminology	2
	Total	10
2nd question	applies methods, techniques, technologies to solve problems in the subject area	7
	argues, compares, classifies events, events, processes; makes conclusions and generalizations based on practical skills	7
	analyzes information from various sources	6
	Total	20
3rd question	critically analyzes and evaluates theoretical and practical developments, scientific concepts and modern trends in the development of science	7
	synthesizes methodological approaches in the interpretation of the main problems of subject knowledge	7
	reveals causal relationships when analyzing processes, phenomena, events	6
	Total	20
	TOTAL	50 Ball

3.3 Interview assessment criteria

№	Criteria	Descriptor	Ball
1.	Motivation	Argumentation of motives for studying in a doctoral program in the chosen field of study and admission to a certain university. Vision of professional and personal growth prospects upon completion of training.	5
2	Research competence	Possession of research skills and experience necessary for research activity in a specific subject area.	10
3.	Creativity	Non-standard thinking, creative and alternative approaches to solving problems, situational tasks.	10
4.	Communicativeness	The ability to briefly, representatively, logically, argumentatively express one's point of view, make generalizations and conclusions. Possession of languages.	5
Maximum number of points			30

4. CONTENTS OF EXAMINATION MATERIALS

4.1 Content thematic Essay

№	Topic essay
1	Modern scientific trends in the development of automation and control of transport systems.
2	Digital transformation of the railway transport of the Republic of Kazakhstan: problems and prospects.
3	Artificial intelligence in automated control systems of technological processes.
4	Intelligent transport systems (ITS) as a basis for sustainable development of the transport industry.
5	Application of digital twins (Digital Twin) in transport infrastructure management.
6	Modern methods of modeling and optimization of automatic control systems.
7	Development of Industrial Internet of Things (IIoT) in the automation of transport processes.
8	Intelligent decision support systems in the management of complex technical objects.
9	The role of robotic complexes in the automation of transport and logistics processes.
10	Modern methods of diagnostics and forecasting of the technical condition of automated control systems.
11	Ensuring reliability, functional safety and fault tolerance of automated control systems.

12	Cybersecurity of automated systems for managing objects of transport infrastructure.
13	Digital technologies in the management of the transportation process in railway transport.
14	Optimal management of complex dynamic systems under uncertainty.
15	Energy efficiency of automated control systems in transport and industry.
16	Application of machine learning methods for intellectual control of technological processes.
17	Modern software and technical automation systems (PLC, SCADA, DCS, MES): state and prospects of development.
18	Scientific research in the field of automation and digital control: modern trends and promising directions.
19	Training of scientific personnel in the field of automation and management in the conditions of the digital economy.
20	Prospects for the development of automation and digital management of transport systems of the Republic of Kazakhstan in the context of the implementation of the concept "Industry 4.0" and the strategy of digital transformation.

4.2 The content of sections by blocks, which are submitted to the entrance exam

Examination materials for doctoral entrance examinations for groups of educational programs, including thematic essays, examination questions for the profile are made in three languages: Kazakh, Russian and English.

The topics of the examination questions correspond to selected sections from the educational programs of the cycles provided by groups of educational programs "D100 - Automation and control"

№	Name of discipline
1	Computer systems DC
2	System of interval regulation of train movement
3	Optimization of the operation of automated systems
4	Methods of modeling and identification of control systems
5	SCADA system
6	Digital automated systems in railway transport

4.3 The content of sections by blocks, which are submitted to the entrance exam

Block 1

1.1. Microprocessor systems of dispatching centralization.

Introduction, history of development of computer systems of dispatch centralization, issues of software. The operation of central post devices during the formation and transmission of telecontrol signals. Basic technical characteristics of the computer system. Structural scheme of the equipment of the central post and controlled points. Construction of telecontrol signals and telesignaling in DC system "Neman"

1.1. Perspectives of the development of dispatching centralization systems.

Dispatching centralization systems existing in the CIS countries. Prospective computer systems on a new element base. Prospects of creating a production base and solving software issues of computer systems of DC.

Block 2

2.1. Automatic blocking system.

Purpose and features of the system of interval regulation of the movement of trains. Purpose, specifics and basic concepts of systems of interval regulation of train movement. Area of application of automatic blocking of constant current, principle of operation, advantages and disadvantages of the system. Designation of the circuit, simplified two-wire and four-wire circuit of change of direction, operation of the circuit in normal mode. Organizational and technical measures for the transition to two-way movement of trains on one two-track route, the principle of operation of the main scheme decisions

2.2. Perspectives on the development of systems of interval regulation of train traffic.

Microprocessor automatic blocking systems. General characteristics, structural diagrams, basic equipment and its characteristics, principle of operation of the system. The system of regulating the movement of trains on the basis of axle counters and other perspective elements. Prospective systems of traffic signaling and dispatch control.

Block 3

3.1. Management object in technical systems.

Classification of control objects in technical systems and their types, especially technical systems as control objects, linear and non-linear models. Analytical and experimental methods of determining static and dynamic characteristics of control objects. General provisions on information provision of the management process. The principle of obtaining and transforming technological information.

3.2. Optimal controls in technical systems.

Basic methods of solving tasks of modeling technical systems, presentation of application packages of application programs for modeling. Algorithm of optimization of static modes by immediate search for the extremum of the object control using a mathematical model. Comparative analysis of algorithms for optimization of static modes with direct search for the extremum of the control object.

4.4 Interview questions

1. Why did you choose doctoral studies in the group of educational programs "Automation and control"?
2. What is the intended topic of your dissertation research?
3. What is the scientific novelty of your proposed research?
4. What scientific problems in the field of automation do you consider to be the most relevant?
5. What scientific publications on the subject of research have you studied in recent years?
6. What methods of scientific research do you plan to use?
7. What is meant by a scientific hypothesis?
8. What stages does scientific research involve?
9. What methods of mathematical modeling do you know?
10. How do you plan to confirm the validity of the obtained results? What modern methods of managing complex technical systems do you know?
11. What is adaptive control and where is it applied?
12. What are the features of intellectual control systems?
13. What criteria do you know about the quality of automatic control systems?

14. What modern methods of optimization are used in the design of control systems?
16. How is artificial intelligence used in the automation of technological processes?
17. What is Digital Twin and what are its advantages?
18. How is the Industrial Internet of Things (IIoT) used in automation systems?
19. What functions do SCADA, PLC and DCS systems perform in modern enterprises?
20. What are the problems of information security characteristic of automated control systems?
21. Why did you choose the scientific and pedagogical direction of training?
22. What competencies should a modern teacher of a technical university possess?
23. What modern educational technologies do you consider to be the most effective in training engineers?
24. How can the results of your research be implemented in the educational process and industry?
25. What are the scientific results you plan to get as a result of your doctoral studies and what are their practical implications?

5. RECOMMENDED LITERATURE

5.1 Basic literature

1. Glazunov L.P., Grabotsevskiy V.P., Fundamentals of the theory of reliability of automatic control systems: Moscow, Route, 2005 – 255 p.
2. Krylov E. G., Makarov A.M. Reliability of technical systems. Calculation methods. Moscow: Infra-Engineering, 2026.
3. Kozhevnikov A.V., Nguyen O. I., Reliability and predictive analytics in technical systems. Moscow: Infra-Engineering, 2026.
4. Rachkov M. Yu., Optimal control in technical systems. Textbook for universities. 2nd ed., ispr. and add. — Moscow: Yurait, 2026. Optimal control methods, mathematical models, optimization criteria and synthesis of control systems are considered.
5. Trotsenko V. V., Fedorov V. K., Zabudskiy A. I., Komendantov V. V., Process control systems and information technologies. Textbook for universities. 2nd ed. — Moscow: Yurait, 2026.
6. Olson G., Piani D., Digital automation and control systems, St. Petersburg: Nevsky dialect, 2001- 557 p.
7. Kochetkov A.A. Remote control systems in railway transport, Moscow, Route, 2005 – 304 p.
8. Satyrev F.E., Golik V.K., Dispatch centralization "Neman", Republic of Belarus, Gomel, 2003 – 106 p
9. Dolgiy I.D., Kulkin A.G., Dispatch control system and train traffic control DC – South from the Russian Communist Party, Rostov-on-Don, RGUPS, 2010 - 468 p.
10. Vinogradova V.Yu., Voronin V.A., Kazakov E.A., Shvalov D.V., Shukhina E.E. Distillation automation systems. Moscow, Route, 2005. – 292 p.

5.2. Additional literature

1. Korolev P. S., Polessky S. N., Tsvetkov V. E., Belyaev K. A., Fundamentals of reliability of computing systems. — Moscow: KnoRus, 2023.
2. Shultz V.A., Methodological guidelines for the implementation of practical exercises. Almaty, KazATK 2010- 32s.
3. Shultz V.A., Textbook "Dispatch centralization". Almaty, KazATK 2010- 86c.
4. Murtazin T. M., Verevkin A. P., Advanced process control systems at fuel and energy complex enterprises. The training manual. Moscow: Infra-Engineering, 2026.
5. Mankwein V.T., Frolov S.V., Shekhtman M.B., Application of Scada systems for automation of technological processes. Moscow: Tambov: Mashinostroenie, 2000.- 176 p
6. Aristova N.I., Korneva A.A., Industrial software and hardware in the market of automated process control systems, Moscow: Nauchtekhizdat 2001. - 400 p .

7. Denisov A.A., Kolesnikov D.N., Theory of large control systems, L.: Energoizdat 2000- 228 p.
8. Vedernikov B.M. Automation and telemechanics on the tracks. The training manual. KazATK, Almaty, 2009. 109 p.
9. Vedernikov B.M. Automatic and semi-automatic locking. The training manual. KazATK, Almaty, 2009. 132 p.
10. Vedernikov B.M. Track sensors. The training manual. KazATK, Almaty, 2011. 122 p.