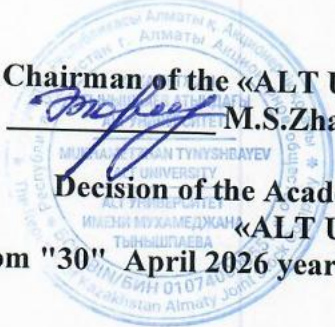


JSC "ALT University named after Mukhamedzhana Tynyshpaeva"

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 (PROFILE) PROGRAM

D100 – Automation and control

«8D07167 – Automation and control (profile)»

Almaty, 2026

The program of the entrance exam was discussed and received a positive decision at the meeting of the department of automation and management, protocol No. 6d "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 2 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 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
	Итого	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
	Итого	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 баллов

3.2 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

3.3 Recommendation letter from the company and organization

For admission to a doctoral program, a letter of recommendation from an enterprise or organization must be drawn up on an official form, contain specifics and confirm the company's interest in training.

4. CONTENTS OF EXAMINATION MATERIALS

4.1 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	Automation technical systems

4.2 Содержание разделов по блокам, выносимых на вступительный экзамен

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 tele-signaling in DC system "Neman"

1.2. 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.

4.3 List of questions

1. Why did you choose to study in a professional doctorate in the group of educational programs D100 "Automation and control"?
2. What is your professional experience in automation and control?
3. What do you consider to be the most relevant modern automation problems for the transport industry and industry?
4. What professional achievements do you consider to be the most significant?
5. What skills do you plan to develop during your doctoral studies?
6. What is a modern automated system for controlling technological processes?
7. What methods of synthesis and analysis of automatic control systems do you know?
8. What is adaptive and intellectual management?
9. What quality criteria are used in the design of control systems?
10. What modern optimization methods are used in automatic control systems?
11. How does digital transformation affect the development of automated control systems?
12. What functions do SCADA, PLC and DCS systems perform?
13. What is Digital Twin and where is it used?
14. How is artificial intelligence used in automation systems?
15. What advantages does the Industrial Internet of Things (IIoT) provide when managing technological processes?
16. What tasks are solved by intelligent transport systems (ITS)?
17. How is the reliability of automated systems for managing objects of the transport infrastructure ensured?
18. What modern methods of diagnostics of the technical condition of the equipment do you know?
19. What directions of digitization of transport and logistics processes are considered the most promising?
21. What software tools do you use when designing and modeling control systems (MATLAB/Simulink, TIA Portal, WinCC, LabVIEW, AutoCAD Electrical, etc.)?
22. What industrial controllers and automation systems did you have to use in practice?
23. What modern standards and regulatory documents are used in the design of automated control systems?
24. How do you assess the prospect of introducing intelligent management systems in the transport industry of the Republic of Kazakhstan?
25. How will the results of doctoral studies be used in your professional activity?

5. RECOMMENDED LITERATURE

5.1 Basic literature

1. Glazunov L.P., Grabotsevtzkiy 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.