

**JSC «KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY
named after K.I.SATPAYEV»**

**GRADUATE MODEL (Doctoral Studies)
Educational programs
8D07115 – Land transport, transport equipment and technologies**

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Introduction

In the international educational space, the leading conceptual model for the preparation of PhD doctors is result-oriented education, which involves the introduction of a competence-based approach to learning.

One of the main results of the doctoral student's training in the educational program 8D07115 – "Land transport, transport equipment and technologies" is to make decisions in the field of management of production processes of operation and repair of transport equipment based on their financial performance and principles, resource and energy conservation, as well as synthesize new knowledge and technologies based on analysis, planning and evaluation know-how and scientific achievements in the field of transport equipment and technologies.

One of the key competencies directly related to the professional activity of a graduate of a doctoral degree is the skills of personal and professional responsibility, ethics and communication, and others.

A PhD should be prepared for independent professional activity in the field of geospatial digital engineering, work in research institutions, etc. He must combine deep theoretical training with practical skills.

The uniqueness of the EP "Land transport, transport equipment and technologies" is determined by the competencies possessed by a doctoral student who has been educated under this program.

The planning of the content of education, the way of organizing and conducting the educational process is carried out by the university and the scientific organization independently on the basis of credit technology of education.

The content of the doctoral program consists of:

- 1) theoretical education, including the study of cycles of basic and core disciplines;
- 2) practical training of doctoral students: various types of practices, scientific or professional internships;
- 3) research work, including the execution of a doctoral dissertation,
- 4) final certification.

The content of the EP "Land transport, transport equipment and technologies" based on the development of a multi-level training system, the fundamental nature and quality of education, continuity and continuity of education and science, unity of training, education, research and innovation activities aimed at maximum satisfaction of consumer needs should ensure:

- solving theoretical, experimental and applied problems using modern research methods;
- synthesis of new knowledge and technologies based on the analysis, planning and evaluation of know-how and scientific achievements in the field of transport equipment and technologies;

- the ability to apply knowledge of mathematics, fundamental and technical sciences;

- using methods of analysis and evaluation of experimental results.

The specialist model provides for: competencies due to the development of modern science and technology; competencies dictated by the requirements of the profession, specialty; competencies due to the socio-political system of the country, its spiritual and moral system.

To acquire a set of professional, intercultural, and communicative competencies, a graduate must master the knowledge of a set of general education (GED), basic (BD) and specialized (SD) disciplines, both their mandatory component and a component of choice in accordance with the chosen trajectory of education in full, established by the state standard.

The ability to navigate the information flow is important in the modern world: the ability to find and systematize various sources of information according to a certain criterion; use rational ways to obtain, transform, systematize and store information, update it in necessary situations of intellectual and cognitive activity, possession of modern technologies in the field of design, manufacture, operation and repair of transport equipment.

1 The goals and objectives of the educational program 8D07115 – "Land transport, transport equipment and technologies"

The purpose of the EP is: to train scientific, pedagogical and managerial personnel for the transport complex capable of managing complex industrial and scientific processes and generating innovative ideas based on research methods, forecasting and evaluation in the field of transport equipment and technologies.

Tasks of the EP:

1. Assistance in the formation of the graduate's ability:

1) demonstrate the developing knowledge and understanding gained at the level of higher and postgraduate education, which are the basis or opportunity for the original development or application of ideas, often in the context of scientific research;

2) apply knowledge, understanding and the ability to solve problems in new or unfamiliar situations in contexts and within broader or interdisciplinary fields related to the field under study;

3) integrate knowledge, cope with difficulties and make judgments based on incomplete or limited information, taking into account the ethical and social responsibility for the application of these judgments and knowledge;

4) clearly and clearly communicate their conclusions and knowledge and their justification to specialists and non-specialists;

5) continue to study independently.

6) plan, develop, implement and adjust a comprehensive research process;

7) demonstrate a systematic understanding of the field of study, mastery of the skills and research methods used in this field;

8) critically analyze, evaluate and synthesize new and complex ideas;
9) conducting independent scientific research, the ability to communicate their knowledge and achievements to colleagues, the scientific community and the general public.

2. Assistance in the formation of graduate readiness:

1) independently form professional and research competencies;
2) independently perform research and professional tasks in accordance with the requirements of the professional standard and the educational program.

2 List of qualifications and positions

A graduate of the specialty 8D07115 – "Land transport, transport equipment and technologies" is awarded the degree of Doctor of Philosophy (PhD) after defending his doctoral dissertation.

Qualifications and positions are determined in accordance with the National Qualifications Framework (NQF), approved by the protocol of March 16, 2016 by the Republican tripartite Commission on social partnership and regulation of social and labor relations.

Graduates of the specialty 8D07115 – "Land transport, transport equipment and technologies" can work in the following positions regardless of the training trajectory:

- research associate;
- professor, associate professor, associate professor, senior lecturer;
- manager in education;
- researcher;
- designer, head of various sections of factories, manufacturing enterprises for the manufacture, repair and operation of transport and transport equipment.

Types of professional activity

A special feature of this program is the training of graduates who are able to conduct the following types of professional activities:

- research;
- scientific and pedagogical;
- production and technological;
- organizational and managerial;
- design and technological.

Objects of professional activity

The objects of professional activity of students under the educational program "Land transport, transport equipment and technologies" are state and educational institutions, national and branch academies of sciences, scientific organizations, research institutes, research universities, scientific laboratories of higher educational institutions, experimental design bureaus, laboratories for collective use, research units of organizations for whom scientific and (or) scientific and technical activities are not the main type of activity; transport, transport equipment and enterprises of the transport and communication

complex.

3. Descriptors

The requirements for the level of training of a doctoral student are determined on the basis of the Dublin descriptors of the second level of higher education (Master's degree) and reflect the acquired competencies expressed in the achieved learning outcomes.

Learning outcomes are formulated both at the level of the entire educational program of the doctoral program, and at the level of individual modules or academic discipline.

Descriptors reflect learning outcomes that characterize the student's abilities:

1. demonstrate a systematic understanding of the field of study, mastering the skills and research methods used in this field;
2. Demonstrate the ability to think, design, implement and adapt an essential research process with a scientific approach;
3. to contribute with their own original research to the expansion of the boundaries of the scientific field, which deserves publication at the national or international level;
4. Critically analyze, evaluate and synthesize new and complex ideas;
5. Communicate your knowledge and achievements to colleagues, the scientific community and the general public;
6. To promote knowledge-based technological, social or cultural development in the academic and professional context of society.

4. Competencies upon completion of training

4.1 Requirements for the key competencies of doctoral graduates, must:

- 1) *have an idea of:*
 - the main stages of development and paradigm shift in the evolution of science;
 - on the subject, ideological and methodological specifics of the natural (social, humanitarian, economic) sciences;
 - about scientific schools of the relevant branch of knowledge, their theoretical and practical developments;
 - about scientific concepts of world and Kazakh science in the relevant field;
 - on the mechanism of implementation of scientific developments in practical activities;
 - on the norms of interaction in the scientific community;

- on the pedagogical and scientific ethics of a research scientist;
- 2) *to know and understand:*
 - current trends, trends and patterns of development of Russian science in the context of globalization and internationalization;
 - methodology of scientific knowledge;
 - achievements of world and Kazakh science in the relevant field;
 - (to realize and accept) the social responsibility of science and education;
 - perfect foreign language for scientific communication and international cooperation;
- 3) *be able to:*
 - to organize, plan and implement the process of scientific research;
 - analyze, evaluate and compare various theoretical concepts in the field of research and draw conclusions;
 - analyze and process information from various sources;
 - to conduct independent scientific research, characterized by academic integrity, based on modern theories and methods of analysis;
 - generate your own new scientific ideas, communicate your knowledge and ideas to the scientific community, expanding the boundaries of scientific knowledge;
 - to choose and effectively use modern research methodology;
 - plan and predict your further professional development;
- 4) *have the skills:*
 - critical analysis, evaluation and comparison of various scientific theories and ideas;
 - analytical and experimental scientific activities;
 - planning and forecasting of research results;
 - public speaking and public speaking at international scientific forums, conferences and seminars;
 - scientific writing and scientific communication;
 - planning, coordination and implementation of scientific research processes;
 - a systematic understanding of the field of study and demonstrate the quality and effectiveness of the selected scientific methods;
 - participation in scientific events, fundamental scientific domestic and international projects;
 - leadership management and team management;
 - responsible and creative attitude to scientific and scientific-pedagogical activities;
 - conducting patent search and experience in the transfer of scientific information using modern information and innovative technologies;
 - protection of intellectual property rights to scientific discoveries and developments;
 - free communication in a foreign language;

5) be competent:

- in the field of scientific and scientific-pedagogical activity in the context of rapid updating and growth of information flows;
- in conducting theoretical and experimental scientific research;
- in setting and solving theoretical and applied problems in scientific research;
- to conduct a professional and comprehensive analysis of problems in the relevant field;
- in matters of interpersonal communication and human resource management;
- in matters of university training of specialists;
- in carrying out the expertise of scientific projects and research;
- to ensure continuous professional growth.

B - Basic knowledge, skills, and abilities

B1 - Analyze trends in modern science, identify promising directions for research in the subject area of professional activity, and determine the composition of research work along with their determining factors.

B2 - Apply in-depth knowledge in the subject area of professional activity that reflects the current level of development.

P - professional competencies

P1 - Apply methods of mathematical, numerical, and computer modeling in the analysis and solution of applied and engineering problems, demonstrating the ability to expand knowledge based on information and educational technologies.

P2 - Apply a mathematical-statistical approach to spatial problems, including methods from geographic information systems and packages for statistical data processing.

P3 - Navigate modern approaches, methods, and tools for studying the figure and external gravitational field of the Earth and other planets, as well as trends and developments in solving this problem.

P4 - Analyze scientific publications and communicate research results in writing in accordance with accepted norms in a foreign language.

P5 - Understand the trends in the development of digitization technologies for geospatial data, readiness to transform processes in the dynamic market conditions, apply modern technologies for visualization and optimization of production processes, and manage big data in the field of automation technologies.

P6 - Possess knowledge of legislative fundamentals in the design, production, operation, and repair of transport equipment.

P7 - Possess skills in organizing research activities.

P8 - Be prepared to develop, coordinate, and approve, in the established order, technical, methodological, and other documents regulating the

procedures, quality, and safety of design, production, operation, and repair of transport equipment.

P9 - Ability to analyze and apply laws on geodesy, cartography, and spatial data in work and regularly monitor changes and additions to these laws.

0 - General, social-ethical competencies

01 - Ability for abstract thinking, analysis, synthesis;

02 - Ability to use the fundamentals of philosophical knowledge to form a worldview position;

03 - Ability to analyze the main stages and regularities of historical development of society to form a civic position;

04 - Ability to use the fundamentals of economic knowledge in various spheres of life;

05 - Ability to use the basics of legal knowledge in various spheres of life;

06 - Readiness to act in non-standard situations, take social and ethical responsibility for decisions made;

07 - Readiness for self-development, self-realization, and utilization of creative potential;

08 - Ability to use methods and means of physical culture to ensure full-fledged social and professional activities;

09 - Ability to use first aid techniques, methods of protection in emergency situations.

C - Special and managerial competencies:

C2 - Readiness for communication in oral and written forms in the state, Russian, and foreign languages for solving tasks of professional activity;

C3 - Readiness to lead a team in the field of one's professional activity, tolerantly perceive social, ethnic, confessional, and cultural differences;

C4 - Ability to use software for processing information arrays;

C5 - Proficiency in methods of digital modeling of spatial systems in the implementation of interdisciplinary educational and research projects;

C7 - Ability to apply information technologies to solve national applied problems in cartography, monitoring the development of regional spatial systems.

4. 2 Requirements for the research work of a doctoral student in a scientific and pedagogical doctoral program

Requirements for the previous level of education: master's degree in scientific and pedagogical direction.

The educational program of the scientific and pedagogical doctoral program includes two types of practical work:

- pedagogical practice – in the organization of education;

- research practice – at the place of completion of the dissertation.

Research internship.

A research internship is a type of scientific research activity aimed at deepening and systematizing the theoretical and methodological preparation of a doctoral candidate. It involves the practical mastery of research technology, the acquisition, and improvement of practical skills in conducting scientific experiments in accordance with the requirements for the level of preparation of a PhD.

Research internships for students are conducted with the goal of familiarizing them with the latest theoretical, methodological, and technological achievements of domestic and foreign science, as well as modern methods of scientific research, data processing, and interpretation. The content of the research internship is determined by the topic of the dissertation research.

The research internship for doctoral candidates is carried out at the place of study or in research organizations that can be considered experimental platforms for research related to the topic of the doctoral dissertation. During the internship, doctoral candidates are given the opportunity to conduct experimental research according to a pre-developed program that takes into account the tasks of the doctoral dissertation.

Pedagogical practice.

The pedagogical practice of doctoral candidates is a practical preparation for future educators and is conducted in conditions that are as close as possible to the professional activities of a teacher. Pedagogical practice aims to develop functional competencies and enhance abilities to perform tasks in professional and educational spheres. The process of pedagogical practice activates the professional and personal development of future educators. During the practice, doctoral candidates create and implement an educational activity plan with a group of students, design and conduct a series of sessions reflecting a completed segment of the learning process based on the content of specialized disciplines, and demonstrate proficiency in modern teaching technologies and methodologies.

The goal of pedagogical practice is to:

- Consolidate and deepen knowledge in general scientific, psycho-pedagogical, methodological, basic, and specialized disciplines.
- Form pedagogical skills, abilities, and competencies based on theoretical knowledge.

The pedagogical practice program is developed by the department and approved by the Vice-Rector for Academic Affairs.

The pedagogical practice program should be aimed at developing professionally significant skills and forming key competencies in students:

- Planning, forecasting, and analyzing the main components of the teaching and educational process.
- Using various forms and methods to organize and implement educational,

labor, social, environmental, health-improving, play, and other types of activities for students.

- Implementing an individual approach to students in the course of educational and educational work, taking into account the features of their development.

- Conducting pedagogical diagnostics of the state of the educational process.

The bases for pedagogical practice are educational organizations providing secondary vocational education and higher education.

The duration of pedagogical practice is determined by the Educational Plan of the educational program in the field of training 8D071 – Engineering and Engineering Affairs.

Doctoral Research and Development (DRD).

The planning of DRD in weeks is determined based on the normative time of a doctoral candidate's work within a week. The number of credits allocated for the execution of DRD in a specific academic period is determined by the working educational plan of the professional educational program in the field of training 8D071 – Engineering and Engineering Affairs.

The Doctoral Research and Development (DRD) should:

- 1) Align with the main issues of the doctoral program for which the doctoral dissertation is defended.

- 2) Be current and include scientific novelty and practical significance.

- 3) Be based on contemporary theoretical, methodological, and technological achievements in science and practice.

- 4) Rely on modern methods of data processing and interpretation using computer technologies.

- 5) Be conducted using contemporary methods of scientific research.

- 6) Include research (methodological, practical) sections addressing the main defended positions.

The completion of a doctoral dissertation is carried out during the period of Postgraduate Research and Development (PR&D).

Within the framework of PR&D, the individual work plan of the doctoral candidate includes mandatory participation in international scientific internships in research organizations and/or entities relevant to the respective industries or fields of activity, aimed at familiarizing them with innovative technologies and new types of production.

The objective of the research and development work is to prepare the doctoral candidate who possesses the methodology of scientific understanding of processes and is capable of applying scientific methods to investigate issues in modern production. The ultimate outcome of the research and development activities is the composition and successful defense of the doctoral dissertation.

Tasks of research work:

- to prepare highly qualified specialists of modern education with broad fundamental knowledge;

- to develop the abilities and abilities of doctoral students to critically analyze and master theoretical concepts in order to implement them into practice and with subsequent testing at the international level;

- to form doctoral students' abilities for professional growth and self-development, skills for independent creative acquisition of new knowledge throughout their active life.

As a result of mastering the doctoral program, graduates should be prepared to perform the following types and tasks of professional research work:

- demonstrate a systematic understanding of the field of study, mastery of the skills and research methods used in this field;

- plan, develop, implement and adjust a comprehensive research process;

- to contribute with their own original research to the expansion of the boundaries of the scientific field, which may deserve publication at the national or international level;

- critically analyze, evaluate and synthesize new and complex ideas;

- communicate your knowledge and achievements to colleagues, the scientific community and the general public;

- to promote the development of a knowledge-based society.

International scientific internships are conducted with the following objectives:

- Fulfillment of tasks related to the doctoral dissertation.

- Familiarization with innovative technologies and new types of production.

- Exposure to the latest theoretical, methodological, and technological achievements in domestic and foreign science.

- Familiarization with modern methods of scientific research, processing, and interpretation of experimental data.

- Consolidation of theoretical knowledge acquired during the educational process, gaining practical skills, competencies, and professional experience in the taught specialty, as well as assimilation of advanced international practices.

Requirements for Postgraduate Research and Development (PR&D):

- 1) Alignment with the main issues of the doctoral program, for which the doctoral dissertation is defended.

- 2) Relevance and inclusion of scientific novelty and practical significance.

- 3) Grounding in contemporary theoretical, methodological, and technological achievements in science and practice.

- 4) Utilization of modern data processing and interpretation methods using computer technologies.

- 5) Execution using contemporary scientific research methods.

- 6) Inclusion of research (methodological, practical) sections addressing the

main defended positions.

The Academy establishes specific requirements for the preparation of a doctoral candidate in the research and development part of the program. Among these specific requirements are:

- Knowledge in the field of scientific and managerial activities in conditions of constant knowledge renewal and societal modernization.
- Conducting independent scientific research on problems and disciplines.
- Ability to practically process and convey information using modern technical means.
- Ability to forecast directions of technical and scientific development in the country.
- Mastery of modern specialized skills and methods necessary for making effective decisions in the field of engineering and technology.

The primary content of PR&D is reflected in the individual work plan of the doctoral candidate.

Contents of Postgraduate Research and Development (PR&D).

The research work of a doctoral candidate can be conducted in the following forms:

- Execution of tasks assigned by the academic advisor in accordance with the approved plan of research and development work.
- Participation in the research activities of the department.
- Attendance of scientific and methodological seminars conducted by the Academy or the department.
- Utilization of modern data processing and interpretation methods using computer technologies.
- Involvement in the development of project documents and other provisions related to the subject area of scientific research.
- Participation in research projects and programs, including collaborative scientific projects.
- Preparation and defense of the doctoral dissertation.

The forms of conducting research and development work by doctoral candidates may be specified and supplemented depending on the specifics of the doctoral program and the topics of doctoral dissertations.

The research and development work of doctoral candidates encompasses:

- Scientific research activities.
- Participation in field research trips (including attendance at scientific conferences and seminars, internships at the base university of the foreign academic advisor).
- Publication of scientific works.
- Writing the doctoral dissertation.

Organization of international scientific internships within the framework of postgraduate research and development.

International scientific internship is one of the most crucial components in the preparation of PhD doctors and is implemented in accordance with the Postgraduate Research and Development Individual Study Plan, within the timeframes determined by the academic calendar and the individual work plan of the doctoral candidate.

The duration of the international scientific internship is determined independently by the Academy. Typically, the international scientific internship is planned for the second year of doctoral studies.

The international scientific internship of a doctoral candidate is conducted based on agreements concluded with enterprises/organizations/institutions, universities, and research organizations, as well as with leading scientists from foreign countries, within the framework of Agreements and Memoranda of Cooperation in the field of education and science. It is also based on personal invitations from educational and scientific organizations.

Participation in exchange programs, including double degree programs, joint educational programs with foreign universities and organizations, is considered equivalent to undergoing an international scientific internship.

The international internship for doctoral candidates is carried out within the framework of dissertation research at a university and/or a major research center in the near or distant abroad, in coordination with the foreign consultant's work location and within agreed-upon timeframes.

In the event of not completing the international scientific internship, the doctoral candidate is not eligible for the final certification.

The final certification of a doctoral student is carried out in the form of writing and defending a doctoral dissertation.

The goal of the final certification of a doctoral student is to assess the scientific-theoretical and research-analytical level of the doctoral candidate, the formation of professional and managerial competencies, readiness for independent completion of professional tasks, and compliance of their training with the requirements of the doctoral program.

Students who have completed the educational process in accordance with the requirements of the educational program, the working curriculum, and the working educational programs, and have also undergone a preliminary defense (extended session) based on the results of the dissertation research, are eligible for the final certification.

5 Requirements for completion and obtaining a diploma

The primary criterion for the completion of the educational process in the preparation of doctoral candidates is the fulfillment of the doctoral program requirements and the successful defense of the doctoral dissertation.

Individuals who have fully met the aforementioned requirements are awarded a university diploma conferring the degree of Doctor of Philosophy and

a transcript.

Educational Program Results 8D07115 – "Ground Transportation, Transport Equipment, and Technologies":

1) Analyze trends in modern science, identify prospective directions for scientific research in the subject area of professional activity, and formulate research works, determining their influencing factors.

2) Apply methods of mathematical, numerical, and computer modeling in the analysis and solution of applied and engineering problems, demonstrating the ability to expand knowledge based on information and educational technologies.

3) Acquire in-depth knowledge in the subject area of professional activity reflecting the contemporary level of development.

4) Formulate a conceptual worldview for the future scholar, particularly in the study of spatial aspects of the surrounding world when making professional and/or managerial decisions.

5) Apply a mathematical-statistical approach to spatial problems, including methods from geographic information systems and packages for statistical data processing.

6) Navigate in modern approaches, methods, and tools for studying the shape and external gravitational field of the Earth and other planets, as well as trends and developments in methods for solving this problem.

7) Analyze scientific publications and present in writing the results of one's own research in accordance with accepted norms in a foreign language.

Change log for _____

Sequence number	Section, item	Type of change (replace, annul, add)	Number and date of notification	Change entered	
				DATE	FULL NAME SIGNATURE, POSITION