Non-profit Joint Stock Company "KAZAKH NATIONAL RESEARCH TECHNICAL UNIVERSITY named after K.I. SATPAYEV"

GRADUATE MODEL
of the educational program
«8D07111 - Digitalization of machine-building production»

1 Educational Program Objectives

Training of competitive and qualified personnel with high spiritual and moral qualities, capable of solving research and design tasks, as well as developing high-quality and inclusive education in the context of sustainable development of the engineering industry.

2 Objectives of the educational program

- training of a scientific and pedagogical specialist for the activities of constant self-improvement and self-development, mastering new knowledge, skills and abilities in innovative areas of development of digitalization of machine-building production;
- preparation of doctoral students for a successful career in the field of digitalization of machine-building production, private, public and state organizations, educational institutions, through teaching disciplines that will provide the profiling knowledge, tools, skills and abilities necessary in a competitive environment;
- preparation of scientific and pedagogical personnel, based on the diversity and dynamism of the catalog of elective disciplines of the curriculum, with a predominance of practical skills in competencies, capable of performing professional functions within one or more types of activities based on the final results of training, taking into account the specifics of these types of activities, market requirements for organizational management, professional competencies;
- training of scientific and pedagogical staff as a competitive specialist in the field of digitalization of machine-building production, meeting international standards and allowing Kazakhstan to integrate into the world educational space.

3 Doctoral student in the field of 8D07111 preparation "Digitalization of machine-building production" should be prepared to solve professional problems in accordance with the profile direction of the doctoral program and types of professional activities:

design and engineering activities:

- analysis of the state of the scientific and technical problem and determination of goals and objectives for the design of instrument systems based on the study of world experience;
- making decisions on the results of calculations for projects and the results of technical, economic and functional-cost analysis of the effectiveness of the designed machine-building systems;

production and technological activities:

- development of methods for conducting theoretical and experimental studies on the analysis, synthesis and optimization of the characteristics of materials used in mechanical engineering;
- solving economic and organizational tasks of technological preparation of machine systems production and selection of systems for ensuring environmental safety of production;

research activities:

- construction of mathematical models for analysis and optimization of research objects, selection of a numerical method for their modeling or development of a new algorithm for solving the problem;
- development and optimization of full-scale experimental studies of machine systems taking into account their reliability criteria;
- preparation of scientific and technical reports, reviews, publications on the results of the studies performed;

- application of research results and use of intellectual property rights;

organizational and management activities:

- finding optimal solutions when creating high-tech products, taking into account the requirements of quality, cost, deadlines, competitiveness, life safety, as well as environmental safety;
- support of a single information space for planning and management of the enterprise at all stages of the product life cycle;
- development of plans and programs for organization of innovation activity at the enterprise.
- deep knowledge and understanding of fundamental phenomena in their field of science.

scientific and pedagogical activity:

- participation in the development of curricula and courses based on the study of pedagogical, scientific, technical and scientific and methodological literature, as well as the results of their own professional activities;
- participation in the formulation and modernization of individual laboratory works and workshops in professional disciplines;
- conducting training sessions with students, participation in the organization and management of their practical and research work;
- application and development of new educational technologies, including computer and distance learning systems.

organizational and management activities:

- finding optimal solutions when creating high-tech products, taking into account the requirements of quality, cost, deadlines, competitiveness, life safety, as well as environmental safety;
- support of a single information space for planning and management of the enterprise at all stages of the product life cycle;
- development of plans and programs for organization of innovation activity at the enterprise.
- deep knowledge and understanding of fundamental phenomena in their field of science.

4 Requirements for the key competencies of doctoral student OP 8D07111 "Digitalization of machine-building production"

Educational programs in the specialty of doctoral studies meet the requirements of section 2 of the State compulsory standard of postgraduate education, approved by Decree of the Government of the Republic of Kazakhstan No. 1080 of August 23, 2012.

The content of the educational disciplines of the mandatory component is strictly regulated by the State Educational Institution of the Republic of Kazakhstan in 2009. And it is reflected in the standard curricula of the specialty disciplines. The working curriculum displays the logical sequence of mastering modules and sections of the program (disciplines, practices) that ensure the formation of competencies. The curriculum model combines required components and elective components, the relationship between these two components varies from course to course. To supplement, expand and deepen the training along the selected learning path, elective disciplines are introduced into the curriculum of the specialty in accordance with the State Educational Institution. The educational program of a given direction in the preparation of doctoral students in the specialty is built through the choice of elective disciplines. Doctoral students are provided with the opportunity for an alternative choice of elective educational disciplines.

The educational programme is designed according to the National Qualification Framework for the industry and according to the Dublin Descriptors for Level Three (PhD). When developing educational programs, special attention is paid to the formation of goals to ensure the continuity of

their content, taking into account the logic of the academic interconnection of disciplines, their sequence and continuity.

The content of the PhD doctoral program is aimed at achieving the competencies that are spelled out in the program when mastering each module separately and received a review of the modular program of OP 8D07111 "Digitalization of Machine-Building Production."

General competencies of higher education are formed on the basis of requirements for general education, socio-ethical competencies, economic and organizational and managerial competencies, special competencies.

5 Competency model of the specialist based on the results of the educational program

List of competencies of the educational program:

- Ability to analyze physico-chemical phenomena occurring in additive manufacturing, features of applied methods of additive technologies in the field of mechanical engineering;
- The ability to apply modeling and experimental research methods for the development and improvement of additive manufacturing;
- The ability to design optimal methods for improving the productivity, accuracy, quality and reliability of automated process equipment and tooling;
- Ability to participate in international and domestic research projects and works on the application of additive technologies in the production of blanks and machine parts;
- The ability to build mathematical models using modern applied software tools in solving practical problems of organizing the selection of technologies, technological equipment, diagnostics and software testing of technological processes;
- Readiness for scientific and teaching activities in the field of professional disciplines of additive manufacturing.

Head of the Department of Mechanical Engineering _____ **Nugman E.Z.**

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Protocol No. 3 dated October 10, 2025.