

Ministry of Agriculture of the Republic of Kazakhstan
S.Seifullin Kazakh Agrotechnical University

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at the meeting of the
University Academic Council
Protocol number 19
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Chairman of the Board
NJSC S.Seifullin Kazakh
agrotechnical University
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EDUCATIONAL PROGRAM

8D07105 Mechanical engineering

Code and classification of the field of education: 8D07- Engineering, Machining and Construction branches
Code and classification of training areas: 8D071- Engineering and Engineering affair
Code in International Standard Classification of Education: 0710
Qualification: PhD / Educational Program 8D07105- Engineering and Engineering affair
Duration of study: 3 years (scientific and pedagogical direction)

Nur-Sultan 2022

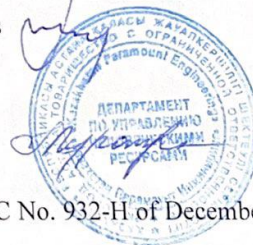
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Educational program **8D07105 "Mechanical Engineering"**
reviewed at the meeting of the department Technological machines and equipment
protocol number 20 from 27 June 2022,

approved by the Faculty's Academic Council for Quality
protocol № 10 (E) "29" June 2022 .

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1 Educational program passport

EP purpose:

The main objective of the educational program "Mechanical Engineering" (OP) is to prepare competitive PhD doctors of scientific and pedagogical direction, possessing modern competencies and skills, techniques and technologies that contribute to the solution of issues arising in industrial enterprises, specialized research and educational organizations by providing deep theoretical knowledge and practical experience in the field of technological machines and equipments.

To achieve the above objectives of the OP formulated the following tasks:

1. Fulfillment of the social order of a society for the development and formation of demanded personnel in the labor market;
2. Focusing attention on various groups of PhD doctors and their professional needs on the basis of providing them with flexible individual educational trajectories and forming students' motivation for professional improvement and self-realization;
3. Formation of readiness of doctors PhD for the organization and implementation of practice-oriented innovation and research activities;
4. Formation of current professional skills and competencies at PhDs, which contribute to solving theoretical and practical aspects of promising trends in industry and related sectors: technology for manufacturing parts, mechanisms and machines; technology of machining parts using advanced processing methods; technology assembly components and machines; technologies for repair and restoration of parts, as well as technology for hardening parts, mechanisms and machines; automation and robotization of industrial production;
5. Formation of the image of KATU, as a key educational and expert organization in the field of production of parts, mechanisms, machines and industrial products among scientific and educational institutions of the republic and Central Asia.

1.2 Educational outcome

EO 1. Show professional communication, scientific, discursive and writing skills.

EO 2. Reveal the ability to critically analyze and evaluate the received theoretical and experimental data, draw conclusions and synthesize new ideas for the creation of new technological machines and equipment in the field of agricultural engineering.

EO 3. To summarize the scientific aspects of theoretical research and experimental results in the development of new models of mechatronic and robotic systems, their modules and subsystems.

EO 4. To form the ability of scientific thinking, to design and implement the results of theoretical and experimental research on the creation of new technological machines and equipment in the field of agricultural engineering.

EO 5. Gain knowledge in the field of theoretical methods of analysis and construction of a dynamic model of processes in mechanical systems when creating agrotechnological machines and processing equipment.

EO 6. Determine the methodology for posing the problem, justifying the choice of the goal and objectives of scientific research.

EO 7. Substantiate and propose the stages of scientific research on the theoretical justification of the design and technological parameters of the working bodies of the developed agricultural machine, the methodology and equipment used for experimental research, as well as describe the test conditions.

EO 8. Synchronize the knowledge of theoretical and experimental research at the stages of preparation, planning, conducting and analyzing an

engineering experiment, interpret the results obtained and solve problems of optimizing the parameters of technological machines for agricultural and processing industries.

EO 9. Own scientific methods for constructing a mathematical model of technological machines and its analysis when exposed to dynamic processes of various nature.

EO 10. Develop skills to identify the physical essence of the phenomenon occurring in materials in the conditions of production and operation of products from them under the influence of external factors.

EO 11. Describe the functions and tasks of automated control systems at the upper and lower levels. Understand and determine the modes of operation of automated process control systems, quantitative assessment of the effectiveness of control systems, describe the tasks and stages of designing control systems.

2 General description of the educational program (relevance, features, competitive advantages, uniqueness, stakeholders).

The study program was developed jointly with professors of the University of California, Davis (USA) and taking into account the recommendations of leading experts of advanced industrial enterprises, in accordance with the NFC and professional standards, agreed with the Dublin descriptors and the European Qualifications Framework, on the basis of the State Compulsory Higher Education Standard, doctoral studies approved by order of the Minister of Education and Science of the Republic Kazakhstan dated October 31, 2018 (No. 604), the classifier of specialties of higher and postgraduate education the formation of the Republic Kazakhstan, educational, program and methodological documentation, individual work plans for doctoral students and other documents approved in the prescribed manner.

A feature of the EP is to consolidate the theoretical knowledge of classrooms during the experimental research on the basis of its own workshops within the university. To implement the "Mechanical Engineering", the department "Technological Machines and Equipment" has a modern material and technical base and scientific and experimental platform in the field of mechanical processing of parts, automation and production robotization (further platform), created within the framework of the State program of industrial and innovative development Kazakhstan for 2015-2019, as well as a highly qualified faculty.

The **competitive advantages** of this OP are the following:

- highly qualified faculty;
- high material and technical equipment of the OP;
- training is conducted in three languages (state, Russian and English);
- a close relationship with employers and graduates of educational programs;
- 100% provision of a hostel for living during the course of study;
- availability of a medical center, social pharmacy and store for students.

The uniqueness of the EP lies in combining all the theoretical and practical aspects of the manufacture of competitive products through the application in the manufacture of innovative and advanced technologies for processing and manufacturing parts, mechanisms, assemblies, components and machines for agricultural purposes, in order to implement the program of import substitution and national security of the country in the field of

industrial independence i.e. the transition from the mining cluster to the processing and production, and increasing the share of the percentage of Kazakhstan goods, as well as increasing the export potential.

The main **stakeholders of the EP** are:

- PTC
- Leading experts of industrial enterprises and associations of the agroindustry complex;
- Department of Technical and Innovative Development of the Ministry of Industrial-Innovative Development of the Republic of Kazakhstan;
- Machine-building enterprises of any profile;
- Design organizations of machine building;
- Research institutes and research and production centers.

3 Competency model (portrait) of the graduate

3.1 Professional activities

The field of professional activity of the Doctor of Philosophy (Phd) of the educational program "Mechanical Engineering" includes:

- all types of organizations of education and science;
 - research and design organizations;
 - production and psychological-pedagogical activity in organizations of secondary, higher and additional professional education of technical and agricultural areas, research, design organizations and production;
 - research activities in the field of education and workplace in the field of advanced training of workers in accordance with the specialization;
 - educational, management and planning activities in accordance with the qualifications of the doctor PhD.
- The doctor of this profile is prepared for activities in the field of material production, which includes a set of tools, methods and methods of human activity aimed at solving complex problems associated with the design, operation and repair of process equipment.

3.2 Types of professional activity

The objects of professional activity are:

- secondary and higher vocational schools;
- enterprises and organizations that train and retrain specialists;
- research, design organizations of the educational sector and research institutes;
- engineering plants producing technological equipment; enterprises and organizations that operate technological equipment: design, design and technological organizations; machine repair enterprises of technological equipment; branded and dealer centers of machine-building and repair plants of technological equipment; marketing services; logistics systems, technological equipment management services, various technological equipment testing centers.

3.3 General educational competencies

- possess the methodology of a systematic approach to the organization, modern approaches to management and analytical management methods, methods of diagnostics, analysis and problem solving, as well as methods of decision making and their implementation in practice;

- competently solve practical management problems and implement these solutions, be prepared to perform management functions and be able to solve professional problems in the interests of the organization as a whole;
- possess the knowledge, skills and abilities necessary for taking up a relevant managerial position and based on a deep understanding of the characteristics of a market economy and its capabilities, functions and economic role of the state, understanding environmental problems, awareness of the social responsibility of business and adherence to civilized ethical norms of its conduct:
 - to be able assess modern problems and prospects for the socio-economic development of Kazakhstan, to understand modern trends in the development of the world economy and globalization, to navigate in matters of international competition.

3.4 Basic competencies

- demonstrate a systematic understanding of the field of study, mastering the skills and research methods used in this field;
- demonstrate the ability to think, design, implement and adapt the essential research process with a scientific approach;
- to contribute by own original research to the expansion of the boundaries of the scientific field, which deserves publication at the national or international level;
- critically analyze, evaluate and synthesize new and complex ideas;
- communicate their knowledge and achievements to colleagues, the scientific community and the general public;
- to promote the advancement of the technological, social or cultural development of a society based on knowledge in the academic and professional context.

3.5 Professional competencies

Organizational and technological activities:

- development of design, technological, design-estimate documentation for the creation and repair of technological machines and equipment;
- organization of the team work of performers, consideration of different opinions and management decisions;
- trade-off decisions taking into account various requirements (cost, quality, deadlines and safety) for different types of planning and determining the optimal solutions;
- accounting for various types of costs in order to ensure the production of quality products.

Production and management activities:

- optimization of manufacturing technology of technological machines and equipment;
- quality control of technological processes, materials and finished products;
- the choice and effective use of materials, equipment and other means for the implementation of production processes;
- Metrological verification of measuring the indicators of product quality;
- carrying out measures for the standardization and certification of technological machines and equipment, the technology of their manufacture and repair;
- organization and management of services, enterprises related to the operation and maintenance of technological machines and equipment.

Project activities:

- defining the goals and objectives of the project, taking into account various factors when building the structure of their interrelations and identifying priority areas for solving problems;

- development and analysis of solutions to the problems of forecasting the consequences, planning and implementation of projects;
- development of projects of technological machines and equipment taking into account technological, design, aesthetic, economic and other parameters;

- use of information technology in the selection of materials, technological machines and equipment.

Typical tasks of professional activity are aimed at solving:

- tasks related to the improvement and improvement of their qualification level;
- technical and detailed design of units and parts of technological machines and equipment;
- testing of technological machines and equipment and its elements for reliability according to standard procedures;
- development of standard technological processes for the manufacture of blanks, parts, assembly units of technological machines and equipment;
- production management at the level of production sites of enterprises of technological machines and equipment;
- technological support of existing production;
- technical design of automatic control means of technological machines and equipment based on standard solutions;
- tests of automation equipment according to standard procedures;
- development of vibration isolation systems for technological machines and equipment and noise protection;
- analysis of the reliability and durability of technological machines and equipment.

4 Base professional practice (all types of practices)

The practice is carried out in order to develop practical skills of scientific, scientific, pedagogical and professional activities.

The educational program of scientific and pedagogical doctoral studies includes: pedagogical and research practice.

In the period of teaching practice, doctoral students, if necessary, are invited to conduct classes in undergraduate and graduate programs.

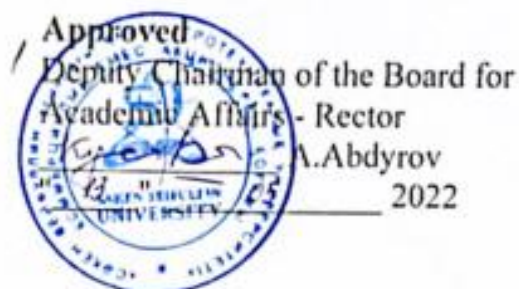
The research practice of the doctoral candidate is carried out with the purpose of studying the latest theoretical, methodological and technological achievements of domestic and foreign science, as well as consolidating practical skills, applying modern methods of scientific research, processing and interpreting experimental data in the dissertation research.

The content of research practice is determined by the theme of the doctoral dissertation.

5 Structure of the educational program

№	Naming cycles of disciplines and types of activity	General workload	
		in academic times	in academic credits
1	2	3	4
1.	Theoretical training	1350	45
1.1	Cycle of basic disciplines (BD)	870	29
	University component	600	20
1)	Academic writing	150	5
2)	Methods of scientific researches	150	5
3)	Pedagogical practice	300	10
	Option component	270	9
1)	Engineering Experimentation & Uncertainty Analysis	90	3
2)	Methods of empirical and theoretical research		
3)	Mechanical Performance of Materials	90	3
4)	Mechanical characteristics of new structural materials		
5)	Theory and Design of Control Systems	90	3
6)	Theoretical foundations for the design of control systems		
1.2	Cycle of professional subjects	480	16
	University component	480	16
1)	Mechatronics and robotics	90	3
2)	Dynamics of processes in mechanical systems	90	3
3)	Research practice	300	10
2	Scientific research work	3690	123
1)	Scientific research work of a doctoral student, including the completion of an internship and the completion of a doctoral dissertation	3690	123
3	Additional types of training		
4	Final attestation	360	12
1)	Writing and defense of a doctoral dissertation	360	12
	Total	5400	180

Annex 1. Academic calendar



ACADEMIC CALENDAR for 2022-2023 academic year in areas of Doctoral training

Beginning of 1st trimester		1 September
1	Presentation week	from 1 September to September 2 (from August 29 to September 2 for 1 course)
2	<i>Constitution day</i>	<i>30 August</i>
3	<i>The day of knowledge</i>	<i>1 September</i>
4	Examination session	from 14 to 25 November
5	<i>The day of the First President</i>	<i>of 1 December</i>
6	FX delivery	from 14 November to 9 December
7	<i>Independence day</i>	<i>16 December</i>
8	Holidays	from 28 November to 31 December
9	<i>The New year's holiday</i>	<i>January 1,2,3</i>
Beginning of 2nd trimester		1 January
10	<i>Christmas</i>	<i>7 January</i>
11	<i>International Women's Day</i>	<i>on 8 March</i>
12	<i>Nauryz holiday</i>	<i>21,22,23 March</i>
13	Examination session	from March 13 to 24 March
14	FX delivery	from March 13 to 31 March
15	Holidays	from March 27 to March 31
Beginning of 3rd trimester		1 April
16	<i>Holiday of Unity of Nations of Kazakhstan</i>	<i>1 May</i>
17	<i>Defender is day</i>	<i>7 may</i>
18	<i>Victory Day</i>	<i>9 may</i>
19	Examination session	from 12 June to 23 June
20	Holidays	from 26 June to 31 August
21	FX delivery	from 12 June to 30 June
22	Enrollment for a trimester	from 26 June to 30 June
23	Final examination	until June 30
24	Summer trimester	from 3 June to 11 August
25	<i>Capital Day</i>	<i>6 July</i>

☑ **Note:** If it concurs with a weekend or a holiday, study begins on the next working day.

Deputy Director of the Department
of Academic Affairs _____ A.Sh.Imasheva

Annex 2. Working curriculum.

