

NJSC "S. Seifullin Kazakh Agrotechnical Research University"

Considered  
at the meeting  
faculty council

Protocol № 10

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Approved

Dean of the Technical Faculty

Y.S. Akhmetov



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DEVELOPMENT OF EDUCATIONAL PROGRAMS  
PLAN

7M07106-Mechanical engineering,  
by group of educational programs  
M103 - Mechanics and metalworking (metal processing)  
for 2024-2029

Considered at an extended meeting of the department  
Technological machines and equipment  
Protocol № 01 of 28.08.2023

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**1 Passport of the educational program development plan 6B07104-  
Technological machines and equipment, 6B07105-Mechanical engineering for  
2024-2029**

1	Basis for developing an educational program development plan	<p>1) The development plan of the educational program 7M07106-Mechanical Engineering is necessary for the formation of students' general pedagogical, research and professional competencies in the field of design, production and technical operation of machines and apparatus of agricultural production with the training of qualified specialists who are able to analyze the work and examine these technical objects, to develop their promising designs with the choice of the optimal solution, with high technological reliability, comparable to the performance indicators of foreign models.</p> <p>2) Many years of experience in the educational activities of KATRU in domestic and international practice, which is one of the traditional and innovative universities in Kazakhstan, the personnel and scientific potential of the department, faculty and the university as a whole.</p> <p>3) The task of fulfilling the social order of society for the development and formation of in-demand personnel in the labor market who possess the theoretical and practical foundations for improving the technological processes of manufacturing and assembling industrial products</p>
2	Key Plan Developers educational program development	The staff of the Department of Technological Machines and Equipment, employers, partner universities and other interested parties (taking into account the requests of real and potential stakeholders of the educational program)
3	Time frame for implementing the educational program development plan	The entire training period is 2024 - 2029. (the foresight method established a short-term forecast with a depth of up to 5 years)
4	Volume and sources of funding	-
5	Expected final results of the plan implementation educational program development	Obtaining deep theoretical and practical knowledge and skills, which presupposes a clear orientation of students towards successful professional activities, personal growth that meets the requirements of employers. Formation of the image of KATRU 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.

## **2. Analytical justification of the educational program**

### **2.1 Information about the educational program**

The educational program 7M07106-Mechanical Engineering is aimed at training highly qualified, competitive personnel, improving the quality of knowledge, forming a multi-level system of research activities in accordance with the current needs of modern education and science, a harmoniously developed personality of a specialist in the field of improving technological processes for manufacturing parts, mechanisms, machines, technological equipment and other types of industrial products.

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

An educational program of an interdisciplinary and multidisciplinary nature, which provides training at the intersection of a number of areas of knowledge, is generally focused on preparing qualified competitive personnel for professional activities in all sectors and provides for broad basic professional training, which should be aimed at achieving fundamental knowledge of future specialists.

### **2.2 Information about students**

Information on the number of students in the educational program 7M07106-Mechanical Engineering:

Educational program	Academic years			
	2020-2021	2021-2022	2022-2023	2023-2024
7M07106-Mechanical engineering	52	27	13	10

### **2.3 Internal conditions for the development of the educational program**

For the development and implementation of the educational program 7M07106-Mechanical Engineering, the department has created favorable and optimal conditions such as:

- highly qualified teaching staff;
- high material and technical equipment of the educational program;
- training in three languages (multilingual training);
- close cooperation with employers;
- modern educational and methodological base, with students' access to information and analytical resources of the world scientific world;
- use of modern and interactive TSO;
- educational laboratories, centers, workshops and platforms (educational resources) are equipped with special equipment and materials for conducting laboratory and practical classes, the functioning of which guarantees the training of highly qualified specialists of modern times:

Scientific and experimental platform of agroengineering:

- Laboratory of mechatronics and applied robotics;
- 3D visualization laboratory;
- Production and experimental metalworking and welding workshop;
- Design department.

Scientific and experimental platform for processing agricultural products:

- Experimental production workshop of vegetable oil;
- Experimental production workshop for milk processing;
- Experimental production workshop for the production of bread and bakery products;

- Experimental production workshop for meat processing;

- Laboratory of deep processing of plant raw materials.

International scientific and educational centers:

- Kazakh-Belarusian center for training and retraining of personnel;
- Kazakh-Chinese center for agricultural mechanization;
- Kazakh-German Center for Precision Agriculture.

There are also:

- Laboratory of Materials Science and TCM;
- Laboratory “Installation and operation of technological machines”;
- Training workshops.

All classrooms are equipped with digitalization systems for the educational process.

## **2.4 Characteristics of the surrounding society**

Pedagogical and research practices are carried out on the basis of the departments of “Technological machines and equipment”, “Agricultural technology and technology” and “Technology of food and processing industries” of the Technical Faculty. For research practice there is a scientific and experimental platform for agricultural engineering, a scientific and experimental platform for processing agricultural products and a laboratory for deep processing of plant raw materials

Every year, representatives from partner production facilities, as well as foreign leading teachers from partner universities, are invited to give lectures. In

order to develop academic mobility, close cooperation is being carried out with the Belarusian State Agrarian Technical University, the Russian State Agrarian University - Temiryazev Moscow Agricultural University and AGH University in Krakow (Poland), and the search for new partner universities among foreign countries, customs union countries and the CIS continues.

## **2.5 Information about the teaching staff implementing the educational program**

The degree level of the department “Technological machines and equipment” is 70%. The educational program is served by highly qualified teaching staff of the university. The total number of teaching staff as of September 1, 2023 was 28 people (full-time - 25), including 2 doctors of technical sciences, 5 doctors of philosophy (PhD), 13 candidates of science and 8 teachers (masters) with academic degrees.

The teaching staff of the Department of “Technological Machines and Equipment” constantly improves their knowledge in this industry and undergoes advanced training, including short-term advanced training courses, attending various kinds of seminars, internships at leading universities in Kazakhstan, near and far abroad, as well as in relevant industry organizations.

## **2.6 Characteristics of educational program achievements**

In 2019, the educational program 7M07106-Mechanical Engineering successfully passed independent specialized accreditation by the Independent Agency for Accreditation and Rating (hereinafter referred to as IAAR), as a result of which, by decision of the IAAR Accreditation Council, the educational program was accredited and awarded a certificate for a full period of 7 years.

According to the results of the annual national ranking of the IAAR for higher educational institutions, the educational program 7M07106-Mechanical Engineering takes a leading place: for example, 2021 - 1st place, 2022 - 1st place, 2023 - 5th place\* (\*the Ministry of Education and Science of the Republic of Kazakhstan has not allocated an educational grant for master's students of S. Seifullin KATRU).

## **3.Characteristics of the problems that the educational program development plan is aimed at solving and justification for the need to solve them**

The educational program 7M07106-Mechanical Engineering was created to train personnel to carry out professional activities in the field of creating and improving technological machines and equipment, to increase the efficiency and effectiveness of scientific research, to more fully use the scientific potential of the university to improve the quality of training of specialists, to implement the

principle of learning through conducting scientific research at all stages of specialist training.

Trained personnel must have the skills to study the state of the regulatory and technical support of the system, possess the skills of scientific-production, organizational-managerial and research work, capable of conducting experimental and theoretical research on modern problems in the field of mechanical engineering.

Trained personnel should increase the percentage of publication of scientific articles of their research in the field of creating and improving technological machines and equipment in domestic and foreign publications with a non-zero impact factor.

Information about teaching staff publications of the department “Technological machines and equipment” the depth of analysis is 3 years.

<b>Publications</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>
in the database ISI Web of Knowledge (Q1-Q4)	-	-	4
in the database Scopus	3	10	23
other foreign databases, RSCI	4	8	11
publications recommended by CQASHE MSHE RK	6	9	3
other publications	29	22	9
Patenting of intellectual property objects	5	5	2
<b>All publications</b>	<b>45</b>	<b>54</b>	<b>52</b>

Trained personnel must speak English at least at the C1 Advance level. Currently, the university offers English language courses such as DynEd and IELTS.

#### **4. The main goals and objectives of the educational program development plan, indicating the timing and stages of its implementation**

The educational program 7M07106-Mechanical Engineering was created based on the request of employers. The main goal of the educational program and its development is the formation in students of general cultural (general scientific, social-personal, instrumental) and professional competencies in the field of design, production and technical operation of machines and apparatus for food production of the agro-industrial complex with the training of qualified specialists who are able to analyze work and examine technical data objects, develop their promising designs with the selection of the optimal solution, with high technological reliability, comparable to the performance of foreign models.

The main objectives of the development plan are the following:

<b>№</b>	<b>Task name</b>	<b>Development timeframe</b>	<b>Stages of development</b>
1	Providing conditions for obtaining full-fledged, high-	The entire period of	Development of measures to improve the quality of

	quality professional education	study, 2024-2029	educational services to develop professional skills of future specialists
2	Formation of basic professional competencies among future specialists	The entire period of study, 2024-2029	Updating the content of the educational program. Acquisition of professional competencies in the field of creation and improvement of technological machines and equipment.
3	Ability to work with scientific and technical information, use domestic and foreign experience in professional activities, systematize and summarize the information received	The entire period of study, 2024-2029	Development of measures for analyzing and processing the results obtained
4	Consultations for employers and research institute scientists when choosing relevant and practically significant topics for diploma theses and master's theses	End of bachelor's degree and beginning of master's degree	Consultations for employers and stakeholders

## 5. Measures to reduce the impact of risks for the educational program

When implementing educational programs to reduce risks, the following measures are applied:

№	Name of possible risks	Measures to eliminate them
1	Insufficient provision of educational and methodological literature on professional disciplines in the state and English languages	Plan the annual publication by scientists and teaching staff of scientific and educational literature in the state and English languages, according to the students' working curriculum
2	Traditional way of conducting classes	Improve and introduce innovative technologies of teaching and provision of educational services into the educational process at the level of world standards
3	Outdated training and laboratory facilities	Creation of a modern educational, research and laboratory base based on public-private partnership, purchase of modern laboratory equipment
4	Lack of scientific and teaching	Training of highly qualified scientific



	personnel due to retirement	personnel through doctoral studies (PhD) at the level of modern requirements
5	Small academic groups of students studying in Russian	Formation of a contingent of students in this profile through career guidance and information and advertising work, creation of multilingual training groups

## 6. Action plan for the development of the educational program

№	Name of events	Implementation deadlines	Responsible	Expected results
1	Formation of a working group to develop an educational program	November 2023	head of department	Formed team of authors
2	Development of the goals and objectives of the educational program	As the educational program is updated	Head of the department, author's team of the educational program	Developed goals and objectives of the educational program
3	Determination of specialist competencies and specialty disciplines	November 2024 - April 2025 (further annually until 2029)	Head of the department, author's team of the educational program	Developed positions on competencies
4	Formation and coordination of specialist competencies and specialty disciplines with Dublin descriptors	November 2024 - April 2025 (further annually until 2029)	Head of the department, author's team of the educational program	Formed and agreed competencies
5	Formation of an educational program in accordance with professional standards	November 2024 - April 2025 (further annually until 2029)	Head of the department, author's team of the educational program	Formed educational program
6	Drawing up an academic calendar and working curriculum for the specialty in accordance with the developed	April 2024 (further annually until 2029)	head of department	Academic calendar and working curriculum

	educational program			
7	Consideration of the educational program at an extended meeting of the department with the participation of employers	May-June 2024 (further annually until 2029)	Stakeholders (faculty and teaching staff of the department, employers, etc.)	Discussion of the educational program
8	Review and approval of the educational program by the Faculty Academic Council	May 2024 (further annually until 2029)	Members of the Council of the Technical Faculty, employers	Approval of the educational program

### **7. Mechanism for implementing the educational program development plan**

The plan is implemented in accordance with the assigned tasks:

- providing conditions for obtaining high-quality vocational education by introducing innovative teaching technologies into the educational process at the level of world standards;
- based on the results of the obtained theoretical knowledge, the formation of basic professional competencies;
- creation of prerequisites for independent research activities of the student as part of the experiment at all its stages;
- developing skills in the ability to work with scientific and technical information, systematize and summarize the information received;
- at the final stage, selection of relevant and practically significant topics for master's theses.

### **8. Assessment of the socio-economic efficiency of the implementation of the educational program development plan**

When implementing an educational program development plan, it is effective to:

- the possibility of concluding agreements with universities near and far abroad;
- formation of a contingent of students;
- creation of a modern laboratory research base;
- the possibility of organizing professional practices on the basis of leading enterprises in foreign countries;
- training of highly qualified scientific personnel through doctoral studies (PhD) at the level of modern requirements.

## **9. Educational program graduate model**

### **Competency model (portrait) of a graduate – master**

*Professional field of the master degree (scientific, pedagogical and specialized areas):*

- research activities in experimental research and design organizations, centers, institutes;
- production activities in agricultural and processing enterprises and organizations, complexes, corporations;
- engineering, technical and management activities in design, consulting, engineering centers, public unions and associations, ministries and holding companies.

General educational competencies

After completing the educational program, a master's degree student in a specialized field must:

- be fluent in a foreign language as a means of business and professional communication;
- apply the necessary psychological theories and techniques to the study of man as a subject of activity and cognition, solve communication problems and correctly use knowledge of psychology for successful management activities;
- know and be able to apply management theories to solve specific production situations;
- independently develop and apply methods and means of cognition, training and self-control to acquire new knowledge and skills;

#### *Basic competencies*

- choose analytical and numerical methods when designing machinery and equipment for agricultural and processing industries;
- receive and process information using modern information technologies use applied software when solving practical issues using personal computers using general and special-purpose software, including in remote access mode;
- apply automated methods for the design and production of machinery and equipment for the agro-industrial complex;
- apply progressive methods of metalworking and welding in the process of production and restoration of machinery and equipment, taking into account the requirements of quality, reliability, labor safety and environmental friendliness of production.

#### *Professional competencies*

1) know:

- theoretical foundations of the design and construction of machines and equipment;

- automation processes for the design and production of machines;
  - advanced methods of metal processing and restoration of machine and equipment parts;
- 2) be able to:
- use automated machine design programs;
  - apply advanced methods of processing and restoration of parts in practice;
  - integrate knowledge acquired within different disciplines use it to solve complex engineering and management problems in the context of the development of scientific and technical progress;
  - apply in practice new approaches to organizing the management of engineering and technical departments of enterprises and the enterprise itself;
  - make independent engineering decisions in complex and non-standard production situations;
  - summarize the results of experimental research and analytical work in the form of a master's project, article, report, analytical note, etc.
- 3) acquired skills and abilities:
- solving engineering problems in production conditions;
  - conducting statistical analysis and solving practical problems in the design and production of machinery and equipment;
  - expansion and deepening of knowledge necessary for everyday professional activities and professional growth in production and scientific activities
  - use of modern information and computer technologies in the field of professional activity;