

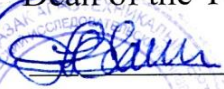
NJSC "S. Seifullin Kazakh Agrotechnical Research University"

Considered  
at the meeting  
faculty council

Protocol № 10  
from « 26 » 12 2023.

Approved

Dean of the Technical Faculty

  
Y.S. Akhmetov  
ГЕХНИКАЛЫҚ «26» 12 2023  
ФАКУЛЬТЕТ

DEVELOPMENT OF EDUCATIONAL PROGRAMS  
PLAN

6B07104-Technological machines and equipment,  
6B07105-Mechanical engineering  
by group of educational programs  
B064 - 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

## Content

1	Passport of the educational program development plan	3
2	Analytical justification of the educational program	4
2.1	Information about the educational program	4
2.2	Information about students	5
2.3	Internal conditions for the development of the educational program	5
2.4	Characteristics of the surrounding society	6
2.5	Information about the teaching staff implementing the educational program	7
2.6	Characteristics of educational program achievements	7
3	Characteristics of the problems that the educational program development plan is aimed at solving and justification for the need to solve them	8
4	The main goals and objectives of the educational program development plan, indicating the timing and stages of its implementation	8
5	Measures to reduce the impact of risks for the educational program	10
6	Action plan for the development of the educational program	11
7	Mechanism for implementing the educational program development plan	12
8	Assessment of the socio-economic efficiency of the implementation of the educational program development plan	12
9	Educational program graduate model	13

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

1	Basis for developing an educational program development plan	<p>1) A development plan for the educational program 6B07104-Technological machines and equipment, 6B07105-Mechanical engineering is required to train highly qualified, competitive personnel, to improve the quality of knowledge, to form a multi-level system of research activities in accordance with the current needs of modern education and science, for a harmonious development of the personality of a specialist in the field of improving technological processes for manufacturing parts, mechanisms, machines, technological equipment and other types of industrial products.</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**

Educational programs 6B07104-Technological machines and equipment and 6B07105-Mechanical engineering are 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.

Educational programs were developed taking into account the recommendations of foreign scientists leading specialists from leading industrial enterprises, in accordance with the NQF and professional standards, agreed with the Dublin descriptors and the European Qualifications Framework, based on the State Compulsory Standard of Higher Education, doctoral studies, approved by 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 students and other documents approved in the prescribed manner.

In order to ensure the individuality of the learning path, students are offered two directions for the implementation of educational programs 6B07104-Technological machines and equipment, 6B07105-Mechanical engineering, developed based on the requirements of partner universities and requests from employers.

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

## 2.2 Information about students

Training in new educational programs 6B07104-Technological machines and equipment, 6B07105-Mechanical engineering has been conducted since the 2019-2020 academic year.

Information on the number of students admitted by year to the 1st year of educational programs from 2020 to 2023:

Educational programs	Years of admission			
	2020	2021	2022	2023
6B07104-Technological machines and equipment	55	78	115	86
6B07105-Mechanical engineering	73	42	-	-
Total	128	120	115	86

The analysis shows the demand in the labor market for specialists in this profile and the prestige of the university as a whole

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

For the development and implementation of educational programs 6B07104-Technological machines and equipment, 6B07105-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 (state, Russian and English);
- close cooperation with employers;
- modern educational and methodological base, with students' access to information and analytical resources of the scientific world;
- use of modern and interactive TSO;
- training laboratories are equipped with special equipment and materials (platform) for conducting laboratory and practical classes;
- 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 agro engineering:

- 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 staff members;
- 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**

One of the mandatory components of the higher education curriculum is professional practice. It is divided into educational, industrial and pre-diploma. As a basis for conducting professional practice, the department chooses organizations, regardless of their form of ownership, whose statutory activities correspond to the profile of training specialists and the requirements of the educational program, which have qualified personnel to manage professional practice and the material and technical base.

An agreement on professional practice is concluded with the organization designated as the base for professional practice no later than one month before the start of the practice.

The main bases of practice are:

- Zapchast ZhD LLP;
- Galam LLP;
- Kazakhstan Paramount Engineering LLP;
- LLP “Unified Consolidating Center”;
- MVTU LLP;
- Eurasia Group LLP;
- ZMKA LLP;
- Agropromzapchastservis LLP;
- Vector Combine Plant LLP;
- MK-Metalworks LLP;
- PIK Astana Yutaria LTD LLP;

The practice of dual learning is being introduced into the learning process. For 2nd year students, from the 2nd semester of the 2017-2018 academic year, laboratory work is carried out in the discipline “Metal-cutting machines” on the basis of Zapchast ZhD LLP.

Currently, memorandums of cooperation have been concluded with the enterprises Zapchast ZhD LLP, Galam LLP, Kazakhstan Paramount Engineering LLP and Unified Consolidating Center LLP, on the basis of which 3rd and 4th year students undergo dual training in the disciplines Modeling of Metalworking,

Failure analysis and machine repair, CNC system (Fundamentals of mechatronics), Metalworking machines and welding equipment.

Every year, representatives from partner industries, such as Galam LLP, Zapchast-ZhD LLP, Kazakhstan Paramount Engineering LLP, as well as foreign leading teachers of partner universities, are invited to give lectures. In order to develop academic mobility, close cooperation is being carried out with AGH University in Krakow (Poland), BGATU (Belarus) and the University of California at Davis (USA), and the search for new partner universities among foreign countries, customs union countries and the CIS continues.

#### Academic mobility of students:

University name	Academic years			
	2019-2020	2020-2021	2021-2022	2022-2023
BGATU (Belarus)	34	-	-	-
ATU	2	-	1	-
Valladolid, Spain	-	-	1	-
AgrarKontakte, Germany	-	-	3	1
LOGO e.V., Germany	-	-	6	4
«DEULA-Nienburg», Germany	-	-	-	10
Total	36	0	11	15

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

The degree level of the department “Technological machines and equipment” is 70%. Educational programs are 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, educational programs 6B07105-Mechanical Engineering and 6B07104-Technological Machinery and Equipment 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, educational programs were accredited and awarded certificates for a full term - 5 and 7 years respectively.

According to the results of the annual national ranking of the IAAR for higher educational institutions, the educational program 6B07104-Technological machines and equipment takes a leading place: for example, 2021 - 2nd place, 2022 - 1st place, 2023 - 2nd place.

According to the ranking of educational programs of the NCE RK “Atameken” in 2021, 3rd place among 17 educational programs, in 2022, 6th place among 15 educational programs of universities of the Republic of Kazakhstan.

Throughout the entire period of the learning process, students of the specialty achieved results regarding residual knowledge in the corridor above the average value. According to the results of the State Examination, for all the years there was no case of failure to overcome the threshold level of knowledge, and the overall result for the university was average.

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

Bachelor degree programs 6B07104-Technological machines and equipment, 6B07105-Mechanical engineering were created to train personnel to carry out professional activities in the field of creating and improving technological machines and equipment.

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.

Publications	2020	2021	2022
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
All publications	45	54	52



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**

Educational programs 6B07104-Technological machines and equipment, 6B07105-Mechanical engineering were created based on the request of employers. The main goal of the educational program and its development is its improvement in accordance with the vision, mission and strategy of the university 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, transformation into world-class innovative university.

The main objectives of the development plan are the following:

№	Task name	Development timeframe	Stages of development
1	Providing conditions for obtaining full-fledged, high-quality professional education	The entire Study period 2024 – 2029.	Development of measures to improve the quality of educational services to develop professional skills of future specialists
2	Formation of basic professional competencies among future specialists	The entire Study period 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 training period is 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 dissertations	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 personnel due to retirement	Training of highly qualified scientific personnel through master's and 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 update the educational program for 2024-2029.	October 2023	Head of the department	Formed team of authors (academic committee)
2	Development of goals and objectives of the	January 2024 - December 2029 (further annually)	Head of the department, author's team	Developed goals and objectives of the educational

	educational program for 2024 - 2029.	until 2029)	of the educational program	program
3	Determination of specialist competencies and specialty disciplines for 2020-2025.	January 2024 - December 2029 (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	January 2024 - December 2029 (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	January 2024 - December 2029 (further annually until 2029)	Head of the department, author's team of the educational program	Сформированная образовательная программа
6	Drawing up an academic calendar and working curriculum for the specialty in accordance with the developed educational program	January 2024 - December 2029 (further annually until 2029)	Head of the department	Academic calendar and working curriculum
7	Consideration of the educational program at an extended meeting of the department with the participation of employers	January 2024 - December 2029 (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	January 2024 - December 2029 (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 diploma projects, master's and doctoral dissertations.

## **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 educational, research and laboratory base;
- the possibility of organizing professional practices on the basis of leading enterprises in foreign countries;
- training of highly qualified scientific personnel through master's and doctoral studies (PhD) at the level of modern requirements.

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

The educational programs “Mechanical Engineering” and “Technological Machinery and Equipment” are focused on the following learning outcomes:

be able to resolve independently issues regarding:

- collection, analysis and interpretation of information (instrumental competence);
- problems in new situations when designing, creating and improving machines and technological equipment;
- development of ideas and critical argumentation (interpersonal competence);
- self-motivation and self-management (system competence);
- implementation of methods and technologies for the production and processing of parts, machines and technological equipment;

- development of plans for the rational use of energy and labor resources in production and environmental protection measures.

be capable of effective use in a variety of situations:

- your intuition (instrumental competence);
- your emotional understanding (interpersonal competence);
- ability to think and work flexibly, adapting to new changing circumstances (instrumental and interpersonal competence);
- the ability to improve and develop one's intellectual and general cultural level;
- possession of a culture of thinking, the ability to generalize, analyze, perceive information, set a goal and choose ways to achieve it;
- ability to control and, where possible, prevent tension and stress associated with performance activities (interpersonal competencies);
- the ability to construct oral and written speech in a logical, reasoned and clear manner;
- organize the work of performers when conducting research observations, experiments, supervision for application of the requirements of regulatory and technical documents, as well as the correctness of their use.

be able to speak in Kazakh, Russian and English:

- plan the acquired knowledge to solve specific scientific, practical, information retrieval and methodological problems;
- organize and conduct production, research and teaching work (for master's and doctoral studies in scientific and pedagogical areas);
- assess the state of regulatory and technical support for the production of parts, machines and technological equipment, processes;
- independently plan and carry out work on organizing production, repair, installation;
- monitor progressive methods of processing parts, strengthening methods to improve quality and performance indicators;
- substantiate promising directions in the field of creation, processing, production of parts, machines and technological equipment;
- have effective communication and social skills, including the ability to:
  - on the preparation of feasibility studies and the development of plans and programs for innovative projects;
- carry out design and survey work using modern equipment and information technologies;
- use a foreign language fluently as a means of business communication;
- ability to use regulatory legal documents regulating the organization and methodology of research work in the industry

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

***Professional field of bachelor's degree:***

- technological machines and equipment; power equipment; running equipment; work equipment; machine drive systems;
- traffic control systems; operator life support systems; a common housing to accommodate all parts of the machine;
- structural and operational materials;
- equipment for the manufacture, testing and disposal of technological machines;
- equipment for maintenance and repair of technological machines;
- control and measuring instruments for the manufacture and operation of machines;
- equipment for automating machine workflows;
- equipment for machine design.

### ***General educational competencies***

- providing social and humanitarian education based on knowledge of the laws of socio-economic development of society, the history of Kazakhstan, modern information technologies with the introduction of elements of Industry 4.0, the state language, foreign and Russian languages as means of interethnic communication;
- fluent multilingual oral, written and communication skills;
- the ability to communicate fluently with a second language;
- ability to use communicative communication in various situations;
- fundamentals of academic writing in the native language;
- fundamental mathematical thinking at the communication level - the ability to solve situational problems based on the mathematical apparatus of algebra and the principles of mathematical analysis.

### ***Basic competencies***

- providing in-depth knowledge of natural science, general technical and economic nature, as the foundation of vocational education;
- basic understanding of the scientific picture of the world with an understanding of the essence of the fundamental laws of science;
- understanding fundamental hypotheses, laws, methods, formulating conclusions and assessing errors.

### ***Professional competencies***

- providing deep theoretical knowledge and practical experience in the field of technological machines and equipment;
- carrying out work on the preparation of technical documentation and established reporting according to approved forms;
- conducting training and instruction on safety, labor protection and environmental protection;
- monitoring the fulfillment of requirements for the preparation of documentation on quality management of technological processes at production sites;
- improving the design of technological machines and equipment using breakthrough technologies and capabilities;

- comprehensive mechanization and automation of technological processes;
- establishing and ensuring optimal operating modes of technological machines and equipment.