

MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN
KAZAKH AGROTECHNICAL UNIVERSITY S. SEYFULLINA

Reviewed at the meeting
academic council of the faculty
Protocol № 1 02.09.2019



APPROVED

Dean of the technical faculty

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2019y.

PLAN
EDUCATION PROGRAM DEVELOPMENT
on "Agricultural Engineering" and "Precision Farming"
direction of preparation - Agricultural Engineering for 2019-2025

Reviewed at an expanded meeting
Departments "Agricultural machinery and technology"
Protocol №1 dated 08/27/2019

Content

1	PASSPORT OF THE DEVELOPMENT PLAN OF THE EDUCATIONAL PROGRAM	3
2	ANALYTICAL SUBSTANTIATION OF THE EP	4
2.1	Information about the educational program	4
2.2	Information about students	4
2.3	Internal conditions for EP development	5
2.4	Characteristics of the society	5
2.5	Information about implementing the educational program by the academic staff	6
2.6	Characteristics of the EP achievements	6
3	CHARACTERISTICS OF THE PROBLEMS OF THE EDUCATIONAL PROGRAM DEVELOPMENT PLAN AND THE SUBSTANTIATION OF THEIR NECESSITY	7
4	MAIN GOALS AND OBJECTIVES OF THE EP DEVELOPMENT PLAN WITH INDICATION OF TIME AND STAGES OF ITS IMPLEMENTATION	7
5	ACTIVITIES FOR RISK INFLUENCE ON EP REDUCING	8
6	EP DEVELOPMENT PLAN	9
7	EP DEVELOPMENT PLAN IMPLEMENTATION MECHANISM	10
8	EVALUATION OF SOCIAL AND ECONOMIC EFFICIENCY OF EP PLAN DEVELOPMENT IMPLEMENTATION	10
9	MODEL OF THE EP GRADUATE	11

1. PASSPORT OF THE EDUCATIONAL PROGRAM DEVELOPMENT PLAN «Agro engineering and precision agriculture » FOR 2019 / 2025

1	Reasons for investigating of the EP development plan	<p>1) A new EP was developed according to SEP V081-Agro engineering and precision agriculture and M087/D087 – Motor vehicles, educational programs for bachelor's, master's and doctoral studies in the direction of « Agro engineering and precision agriculture»</p> <p>2) Great experience in the educational activities of Saken Seifullin Agrotechnical University in domestic and international practice, which is one of the traditional and innovative universities of Kazakhstan, the personnel and scientific potential of the department, faculty and university as a whole.</p> <p>3) The task of fulfilling the social order of the company for the development and formation of demanded personnel in the labor market, owning the theoretical and practical foundations of improving the technological processes of manufacturing and assembly of industrial products</p>
2	The main designers of the EP development plan	The staff of the department " Agro engineering and precision agriculture ", employers, partner universities and other interested parties (taking into account the requests of real and potential stakeholders of the EP)
3	Duration for implementation of EP development plan	Whole period of training 2019 - 2024. (a short-term forecast up to 5 years deep is established by the foresight method)
4	Amount and sources of financing	-
5	Expected final results of the EP development plan implementation	<p>Obtaining of the deep theoretical and practical knowledge and skills, assuming a clear orientation of students to successful professional activities, personal growth, satisfying the requirements of employers.</p> <p>To achieve a high level of quality of higher education that meets the needs of the labor market, the tasks of industrial and innovative development of the country, the individual and corresponds to the best world practices in the field of education</p>

2. ANALYTICAL SUBSTANTIATION OF THE EDUCATIONAL PROGRAM

2.1 Information about the educational program

The educational programs "Agro engineering and precision agriculture" at all levels of the bachelor-master-PhD of profile and scientific-pedagogical direction are aimed at training highly qualified, competitive personnel, improving the quality of knowledge, building multi-level system of research activities in accordance with the urgent needs of modern education and science, harmoniously developed personality hundred in improving manufacturing processes of parts, tools, machinery, technological equipment and other industrial products.

EPs were developed jointly with professors from the University of California, Davis (USA) and taking into account the recommendations of leading experts in 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 Higher Education Standard, 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 higher and postgraduate specialties of the Republic of Kazakhstan, educational program and methodical documentation, individual work plans of doctoral students and other documents approved by the established procedure.

To ensure the individuality of the learning trajectory, students are offered two areas of implementation of the Agro engineering and precision agriculture, developed on the basis of the requirements of partner universities and employers' requests.

The modular educational program, which is interdisciplinary and multidisciplinary in nature, which provides training at the junction of a number of areas of knowledge, is generally focused on training 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

The first set of a new EP "Agro engineering and precision agriculture" is planned for 2019-2020 academic year-89 people with a further increase in the number of applicants due to well-established career guidance and raising the level of prestige of specialties.

Information on the contingent of students in the specialty "agricultural machinery and technology "(old classifier) as of June 2019.

Specialty	2015-2016	2016-2017	2017-2018	2018-2019
5B080600	528	564	543	491
6M080600	19	7	6	15
6D080600	8	5	5	4
Total	560	576	554	510

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

2.3 Internal conditions for the EP development

For the development and implementation of the group of educational programs B087- Agro engineering and precision agriculture and M087/D087-Vehicles, educational programs for bachelor, master and PhD programs "Agro engineering and precision agriculture»

At the Department the following favorable and optimal conditions are created:

- highly qualified teaching staff (about 65%)
- high material and technical equipment;
- training in three languages (state, Russian and English);
- close cooperation with employers;
- modern educational and methodical base, with students' access to information and analytical resources of the world scientific sphere.
- application of modern and interactive methods
- introduction of dual training technology (part of the classes are held in the workplace);
- academic mobility (external and internal);
- high-quality professional infrastructure (educational resources);
- for laboratory and practical training there are training laboratories equipped with special equipment and materials.

The availability of high-quality professional infrastructure (educational resources) necessary for the implementation of EP is a guarantee of training of highly qualified specialists of modern times:

- Research and experimental campus of the University (1200 hectares)
- Kazakhstan-Belarus center for training and retraining of personnel;
- The Kazakh-Chinese center of agricultural mechanization;
- Kazakh-German center of precision agriculture "Glass"
- Kazakh-American precision agriculture center "John Deere"
- Laboratory of 3-D visualization and modeling;

- Pavilion of tractors, combines and agricultural machinery;
- Laboratories of mechanization of animal husbandry;
- GIS technology center;
- design Bureau;
- workshop with metal cutting and welding equipment;
- robotics laboratory;
- laboratory of fuel and lubricants;
- reading and computer laboratories;
- educational workshop.

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

2.4 Characteristics of the society

The base of practice is determined; agreements and contracts with enterprises for passing educational, industrial and undergraduate practice at the department are concluded. At present, there are 36 pcs of current agreements.

The main practice bases are:

Research and production center of grain economy named after A. I. Barayev

LLP "North Kazakhstan agricultural experimental station»

JSC "Atameken-agro”

LLP "Baiserke”

LLP "Agrocenter-Astana”

LLP “Agrofirm "Rodina”

Akkol branch of LLP "Kazniimosk”

LLP "Akmola Feniks”

PC "Izhevsk”

LLP"TNK”

LLP "Shakhterskoye”

LLP"ST AGRO”

LLP "Eurasia Group”

The practice of dual training is introduced into the learning process. For students of the 3rd course from the 2nd semester of 2012, field classes on the discipline "Reliability and repair of machines" are held on the basis of LLP «Kazakh research Institute of mechanization and electrification of agriculture».

Annually, representatives from partner enterprises, as well as foreign leading teachers of partner universities, are invited to deliver lectures. In order to develop academic mobility, close cooperation is underway with BSTU and the University of California at Davis (USA), and the search for new partner universities among foreign countries, countries of the customs union and the CIS is being continued.

2.5 Information about implementing the educational program by the academic staff

The academic degree of the department of «Agricultural machinery and technology» is 61.5%. The EP serves the highly qualified faculty of the university. The total number of faculty members on September 1, 2019 was – 28 people (full-time –

20), including with scientific degrees 3 doctors of technical sciences, 2 doctors PhD, 9 candidates of science, 2 associate professors and 1 senior teacher with extensive experience in teaching and experience in the workplace and 3 assistants (masters).

The faculty of the department "Agricultural machinery and technology" are constantly improving knowledge in this industry and undergoing further training, including passing 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 the EP achievements

The educational programs of the "Agricultural machinery and technology" specialty in 2015 successfully passed independent specialized accreditation in the accreditation body of the Independent Agency for Accreditation and Rating (hereinafter - IAAR). On April 17, 2015, by the decision of the Accreditation Council of the IAAR, the educational programs of the specialty were accredited and certificates for a full term of 5 years were awarded.

According to the results of the 2018 rating, educational programs of the specialty «Agricultural machinery and technology» in the national ranking of the IAAR are as follows:

5B080600 (bachelor) - 1 place, 6M080600 (masters) - 1 place, 6D080600 (PhD studies) – 1 place.

Throughout the entire period of the learning process, students of the specialty achieved results regarding residual knowledge in the corridor above the average. According to the results of Freight One over the years, there was no case of overcoming the threshold level of knowledge, and the overall result for the university was average.

3. CHARACTERISTICS OF THE PROBLEMS OF THE EDUCATIONAL PROGRAM DEVELOPMENT PLAN AND THE SUBSTANTIATION OF THEIR NECESSITY

Educational programs for Bachelor's degree "Agro engineering", for master's programs "Agro engineering and precision agriculture", for PhD programs "Agro engineering" at all levels, the bachelor-master-doctoral of profile and scientific-pedagogical direction was created to train staff for professional activities in the field of creation and improvement of creating and improving the Mechanization of the AIC.

Trained staff should have skills in studying the state of regulatory and technical support of the system; have skills in scientific-production, organizational, managerial and research work, capable of conducting experimental and theoretical studies on modern problems in the field of mechanical engineering.

Trained staff should increase the percentage of scientific articles publication in the field of creating and improving creating and improving the mmechanization of the AIC in domestic and foreign publications with a non-zero impact factor.

Information about scientific publications of the specialty "Agro engineering and precision agriculture", department, the analysis for the period of 3 years.

Publications	2016	2017	2018
In journals with impact factor above zero	3	3	1
In scientific journals that are part of CCSON and RSCI	6	18	22
In collections of international and republican scientific and practical conferences and other publications	14	20	13

Trained staff must be fluent in English at least C1 Advanced. Currently, the university has organized English courses such as DynEd and IELTS.

4. MAIN GOALS AND OBJECTIVES OF THE EP DEVELOPMENT PLAN WITH INDICATION OF TIME AND STAGES OF ITS IMPLEMENTATION

The educational programs “Agro engineering and precision agriculture” were created on the basis of the employers’ request. The main goal of the educational program and its development is to improve it 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 activity in accordance with the current needs of modern education and science, transforming it into an innovative university of world level.

The main objectives of the development plan are as follows:

№	Name of the task	Development period	Stages of development
1	Providing conditions for obtaining a full, high-quality professional education	The entire period of study 2020 - 2025	Development of measures to improve the quality of educational services for the development of professional skills of future specialists
2	Formation of basic professional competencies among future specialists	The entire period of study 2020 - 2025	Conducting an update of the content of the EP. Acquisition of professional competencies in the field of creation and improvement of creating and improving the mechanization of the AIC.
3	Ability to work with scientific and technical information, use domestic and foreign experience in professional activities,	The entire period of study 2020 - 2025	Development of measures for the analysis and processing of the results

	systematize and summarize the information received		
4	Consultations of employers and scientists of the research institute in the selection of relevant and practically significant topics of thesis and master's and doctoral dissertations	Final course of Bachelor's degree studies and initial course of Master's degree studies	Consultations of employers and stakeholders

5. ACTIVITIES FOR RISK INFLUENCE ON EP REDUCING

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

№	Name of possible risks	Actions to eliminate them
1	Lack of educational and methodological literature on professional disciplines in Kazakh and English languages	To plan the annual release by scientists and faculty of scientific and educational literature in Kazakh and English languages, according to the work curriculum of students
2	The traditional way of conducting studies	To improve and introduce innovative educational technologies and the provision of educational services at the level of international standards in the educational process
3	Outdated training and laboratory facilities	Creation of a modern educational, research and laboratory base on the basis of public-private partnership, the purchase of modern laboratory equipment
4	Shortage of scientific and pedagogical staff in connection with retirement	Preparation of highly qualified scientific personnel through master's and doctoral programs (PhD) at the level of modern requirements
5	Small academic groups of students in Russian	The formation of the students contingent of this profile through vocational guidance and information and advertising, the creation of multilingual education groups

6. EP DEVELOPMENT PLAN

№	Name of events	Time line	Person in	Expected results
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		of implementation	charge	
1	Formation of a working group to develop educational programs for 2020-2025	November 2019 - April 2020 (further annually until 2025)	Head of department	Formed team of authors
2	Development of the goals and objectives of the educational program for 2020 - 2025	November 2019 - April 2020 (further annually until 2025)	Head of department, team of authors of EP	Developed goals and objectives of the educational program
3	Determination of the competencies of the specialist and disciplines of the specialty 2020-2025.	November 2019 - April 2020 (further annually until 2024)	Head of department, team of authors of EP	Developed competency positions
4	Formation and coordination of specialist competencies and disciplines with Dublin descriptors	November 2019 - April 2020 (further annually until 2025)	Head of department, team of authors of EP	Formed and agreed competencies
5	EP formation in accordance with professional standards	November 2019 - April 2020 (further annually until 2024)	Head of department, team of authors of EP	Formed educational program
6	Preparation of academic calendar and working curriculum of the specialty in accordance	April 2020 (further annually until 2025)	Head of department	Academic calendar and working curriculum

	with the developed EP			
7	Consideration of the EP at the extended meeting of the Department with the employers participation	August-September 2020 (further annually until 2025)	Stakeholders (faculty members, employers, etc.)	Discussion of the educational program
8	Consideration and approval of the EP at the academic Council of the faculty	May 2020 (further annually until 2025)	Board members of the Technical Faculty, employers	Approval of the educational program

7. EP DEVELOPMENT PLAN IMPLEMENTATION MECHANISM

The implementation of the plan is carried out in accordance with the tasks:

- ensuring the conditions for obtaining high-quality professional education by introducing innovative educational technologies into the educational process at the level of world standards;
- based on the results of theoretical knowledge gained, the formation of basic professional competencies;
- the creation of prerequisites for independent search and research activities of the student in the framework of the experiment at all its stages;
- the formation of skills to work with scientific and technical information, systematize and summarize the information received;
- at the final stage, the selection of relevant and practically significant topics of diploma projects, master's and doctoral dissertations.

8. EVALUATION OF SOCIAL AND ECONOMIC EFFICIENCY OF EP PLAN DEVELOPMENT IMPLEMENTATION

When implementing the plan for the development of the educational program, it is effective:

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

9. EP GRADUATE MODEL

The educational programs "**Agro engineering and precision agriculture**" 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 in the design, creation and improvement of machines and technological equipment;
- development of ideas and critical argumentation (interpersonal competence);
- self-motivation and self-government (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, environmental protection measures.

be able to use effectively in various situations:

- one's intuition (instrumental competence);
- emotional understanding (interpersonal competence);
- the ability to think and work flexibly, adapting to new changing circumstances (instrumental and interpersonal competence);
- ability to improve and develop their intellectual and cultural level;
- knowledge of the culture of thinking, the ability to generalize, analyze, perceive information, set goals and choose ways to achieve it;
- the ability to control and, where possible, prevent the tension and stress associated with performing activities (interpersonal competencies);
- the ability to logically, reasonably and clearly build oral and written speech;
- organize the work of performers during scientific research, experiments, supervision of the use of requirements of regulatory and technical documents, as well as the correctness of their use.

be able to:

- plan acquired knowledge for solving specific scientific, practical, information retrieval and methodological problems;
- organize and conduct production, research and teaching work (for graduate and doctoral studies in the scientific and pedagogical direction);
- assess the status of regulatory and technical support for the production of parts, machines and technological equipment, processes;
- plan and carry out independently work on the organization of production, repair, installation;
- monitor progressive methods of machining parts, reinforcing methods to improve quality and performance;
- justify promising areas 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 technology;
 - use freely foreign language as a means of business communication;
 - the ability to use regulatory legal documents governing the organization and methodology of research in the industry

Competency model (portrait) of a graduate – bachelor student

The professional field of the bachelor:

- design and engineering organizations, machine-technological stations (MTS), equipment for maintenance and repair of technological machines, social and entrepreneurial complexes (SEC), processing and supplying enterprises and plants, organizations of technical service of agricultural machinery, fleets, district, regional and Republican bodies of management of agriculture (civil service).

General education competences

- providing social and humanitarian education based on knowledge of the laws of social and 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 international communication;
- understand the content of any information, Express thoughts, feelings, opinions in written and oral forms (listening, speaking, reading and writing);
- fluent multilingual oral, written and communication skills;
- ability to communicate fluently with a second language;
- ability to use communicative communication in different situations;
- basics of academic writing in the native language;
- basic mathematical thinking at the communication level-the ability to solve situational problems on the basis of the mathematical apparatus of algebra and the principles of mathematical analysis.
- know the traditions and culture of the peoples of Kazakhstan;
- be aware of the installation of tolerant behavior of the individual and the prevention of domestic racism, xenophobia, extremism;
- possess high spiritual qualities.

Core competencies

- providing in-depth knowledge of natural-scientific, general technical and economic nature as the Foundation of professional education;
 - in matters of labor legislation, norms and rules of labor protection and environmental safety, industrial sanitation and fire protection, the use of legislative and regulatory acts of the Republic of Kazakhstan acting in agriculture;
 - in the application of new energy and resource-saving technologies in the field of mechanization, electrification of agriculture and processing enterprises;
 - in management of agricultural machinery, adjustment of the technological equipment of the enterprises on production and processing of production of branch and Agrotechnical service;

- in the application of computer technology in the development of projects of agricultural enterprises and service centers;
- in the organization of complex mechanization in agriculture and processing enterprises

Professional competence

- providing in-depth theoretical knowledge and practical experience in the use of agricultural machinery in relation to existing technologies;
- work on the preparation of technical documentation and established reporting on approved forms;
- conducting training and instruction on safety, labor protection and environment;
- carry out maintenance and repair of machinery and equipment using the latest methods and means of diagnosis, technical and technological modernization of agricultural production;
- organize work in the complex mechanization of crop and livestock enterprises and the use of new energy and resource-saving technologies;
- assess the economic and social conditions of entrepreneurial activity and develop business plans for the creation and development of new organizations in the areas of activity;
- to design organizational structure, to carry out distribution of powers and responsibility on the basis of their delegation;
- participate in the development of human resources management strategy of organizations, plan and implement activities aimed at its implementation;
- analyze and calculate in the development of design and estimate documentation for the construction of agricultural service enterprises, in scientific research and design development of working bodies and machine components, drawing up technological maps for the production, storage and processing of agricultural products.

Competency model (portrait) of graduate – master’s degree student

Professional sphere of the master’s degree student (scientific-pedagogical and profile 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 managerial activities in design, consulting, engineering centers, public unions and associations, ministries and holding companies.

General educational competencies

The master of the profile direction after mastering the educational program should:

- 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 the problems of communication and correctly use the knowledge of psychology for successful management activities;
- know and be able to apply managerial theories to solve specific production situations;
- develop and apply independently 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, apply applied software to solve practical problems using personal computers using general and special purpose software, including remote access;
- apply automated methods for the design and manufacture of machinery and equipment for the agricultural sector;
- to apply in the process of production and restoration of machinery and equipment advanced methods of metalworking and welding, taking into account the requirements of quality, reliability, labor safety and environmental cleanliness of production.

Professional competence

- to know and understand the goals and objectives of production and technological, organizational and managerial activities in the field of engineering systems development in the agricultural sector.
- possess the skills of research activities and solutions of standard scientific problems, implementation of educational and pedagogical activities and willingness to apply engineering knowledge of modern research methods.
- ability and willingness to apply knowledge about modern research methods and willingness to organize independent and collective research work, to search for innovative solutions in the engineering and technical sphere of agriculture.
- development of research programs in the system of precision agriculture, search, collection, processing, analysis and systematization of information on the topic of research; development of methods and tools for research and analysis of their results; preparation of reviews, reports and scientific publications.

Competency model (portrait) of a PhD graduate

Professional area of PhD (scientific-pedagogical and specialized areas):

- research work;
- management activities;
- production and technological activities;
- information and design activities.
- organization and management of services of production enterprises;
- management activities in agricultural organizations of various forms of ownership, local and Republican bodies of education, agriculture.

General educational competencies

- own the methodology of a systematic approach to organization, modern approaches to management and analytical methods of management, methods of diagnosis, analysis and problem solving, as well as methods of decision making and their implementation in practice;
- to solve competently practical problems of management and bring these decisions to life, be prepared for the implementation of 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 to occupy an appropriate 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 of environmental problems, awareness of the social responsibility of business and adherence to civilized ethical standards of its conduct:
- be able to assess the current problems and prospects of socio-economic development of Kazakhstan, understand the current trends in the development of the world economy and globalization, and navigate the issues of international competition.

Basic competencies

- possess basic knowledge to conduct independent scientific research, characterized by academic integrity, on the basis of modern scientific theories and methods of analysis; strive for professional and personal growth;
- possess deep theoretical knowledge and practical experience, fundamentals of engineering knowledge in the field of development of Agro engineering systems, mechanization of agricultural production;
- to know and understand the goals and objectives of production and technological, organizational and managerial activities in the field of Agro engineering systems development and the basics of agro technological production, nanobiotechnology and molecular modeling.

Professional competencies

Organizational and technological activities:

- development of design, technological, design and estimate documentation, calculations to justify a system of machines and equipment for the production, storage and processing of crop and livestock products;
- organization of the work of the team of performers, taking into account various opinions and making managerial decisions;
- compromise solutions taking into account various requirements (cost, quality, deadlines and safety) for different types of planning and determining optimal solutions;
- accounting of various types of costs in order to ensure the release of high-quality products.

Production and management activities:

- willingness to conduct a scientific study characterized by academic integrity, based on modern scientific theories and methods of analysis;
- quality control of technological processes, materials and finished products;
- selection and effective use of materials, equipment and other means for the implementation of production processes;
- metrological verification of measuring instruments for product quality indicators;
- the ability to analyze critically and evaluate modern scientific achievements, generate new ideas in solving research and practical problems;
- Organization and management of services, enterprises related to the operation and repair of technological machinery and equipment.

Project Activities:

- determination of the goals and objectives of the project, taking into account various factors when building the structure of their relationships and identifying priority areas for solving problems;
- development and analysis of solutions to the problems of forecasting consequences, planning and implementation of projects;
- development of agricultural machinery and equipment projects taking into account technological, design, aesthetic, economic and other parameters.