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"Kazakh University of Technology and Business" named after K.Kulazhanova" JSC

EDUCATIONAL PROGRAM

6B07119 Technological Machines and Equipment (by industry)

Level: *bachelor's*

Approved
by the Board of Directors of JSC «K.Kulazhanov KazUTB»
"17" 02 2026 protocol No. 4

Recommended
by the Academic Council of JSC «K.Kulazhanov KazUTB»
"17" 02 2026 protocol No. 7

Astana, 2026

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CONTENT

Preface	3
Approval sheet	4
1 Passport of the educational program	5
2 Qualification characteristics of a graduate of an educational program	5
3 Requirements for the content of the educational program	6
4 Additional educational programs (minor)	7
5 Competency map of the educational program	7
6 Learning outcomes of the educational program and modules	9
7 The relationship between the attainability of the formed learning outcomes according to the educational program and academic disciplines	16
8 Alignment of planned learning outcomes with assessment technologies and teaching methods within the module	44
9 Correlation of learning outcomes of the educational program with the labor functions of professional standards (if any)	46
10 Graduate model	48
11 Typical curriculum (appendix to the OP)	49
12 Expert opinion	53

Preface

The educational program "6B07119 Technological Machines and Equipment (by industry)" has been developed in accordance with the State Compulsory Standard of Higher Education / Postgraduate Education, approved by Order No. 2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022. It is also based on the Career Enbek professional standards "Operation and Repair of Technological Equipment," as well as the sector-specific and regional Atlas (2023–2025) of professions and competencies for "Mechanical Engineer," "Predictive Diagnostics Specialist," and "Predictive Maintenance Specialist" of the Republic of Kazakhstan (https://enbek.kz/ru/atlases-professions/regions) dated April 17, 2026.

The educational program "6B07119 Technological Machines and Equipment (by industry)" was approved at the meeting of the Council on Academic Quality on "22" 01 2026 protocol No. 3
Chairman _____ Askarbekov E.B.

The educational program "6B07119 Technological Machines and Equipment (by industry)" was approved at the meeting of the Commission on Academic Quality of the Faculty on "19" 12 2025 protocol No. 3
Chairman _____ Safuani Zh. Y.

The educational program "6B07119 Technological Machines and Equipment (by industry)" was developed and discussed at the meeting of the department "Technology and standardization" dated "18" 12 2025 protocol No. 5
Head of the department _____ Baitukenova S.B.

Approval sheet

Educational program "6B07119 Technological Machines and Equipment (by industry)"

AGREED:

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1 Passport of the educational program

International Standard Classification of Education (ISCED) level	6
National Qualification Framework (NQF) level	6
Sectoral Qualifications Framework (SQF) level	6
Code and name of the field of education	6B07 Engineering, Manufacturing and Construction industries
Direction of training	6B071 Engineering and Engineering Affairs
Number and name of the group of educational programs	B064 Mechanics and Metal Working
Code and name of the educational program (EP	"6B07119 Technological Machines and Equipment (by industry)"
Educational program profile	Higher engineering education
goal of the educational program	Training of competitive specialists skilled in managing the installation, repair, and service processes of technological machinery and equipment through the implementation of innovations and digital transformation to solve production tasks in various industrial sectors
completion criterion of an educational program	240 academic credits
language of instruction of the educational program	Russian, kazakh
Distinctive features of the educational program	No
Partner University	No

2 Qualification characteristics of a graduate of an educational program

Degree awarded	Bachelor of engineering and technology in the educational program "6B07119 Technological Machines and Equipment (by industry)"
Field of professional activity	Production, management, research, education
Types of professional activities	- design and calculation; - production and technological; - experimental and research; - organizational and managerial; - installation and adjustment; - service and operational in the field of food and processing industries.
Object of professional activity	Enterprises of dairy, meat, canning, bakery, confectionery, brewing, sugar refining, pasta, flour milling and other branches of public catering. Design organizations, research institutes, companies and firms of various forms of ownership

Functions of professional activity	– Operation and maintenance of machines and equipment; – control and supervision of the quality of repair work; – ensuring the uninterrupted operation of machines and equipment, calculating their main characteristics and operational parameters in connection with the design of new or reconstruction of existing equipment; – preparation and formation of current and long-term scheduled preventive maintenance of production lines, technical maintenance and repair of machines, equipment, modernization programs and technical equipment; – research of food and processing equipment for various technological purposes in order to assess its reliability and performance; – development and approval of a technical project for the creation of an innovative development related to equipment testing and its implementation into operation, as well as preparation of technical documentation; – analysis of technical specifications and preparation for technical design and systematization of necessary information, technical data, indicators and work results. Carrying out necessary calculations using modern computer tools; – conducting conformity assessment, monitoring the compliance of developed projects and technical documentation with standards and technical conditions.

3 Requirements for the content of the educational program

Name of cycles and disciplines	Workload in academic credits
Cycle of general education disciplines (GED)	**56**
Required component	51
University component	5
Cycle of basic disciplines (BD)	**89**
University component	32
Component of choice	57
Cycle of major disciplines (MD)	**87**
University component	15
Component of choice	55
Professional practice	17
Final assessment	**8**
Total	**240**

4 Additional educational programs (minor)

4.1 Minor "Modern Aspects of the Application of Artificial Intelligence"

Name of disciplines	Workload in academic credits
Introduction to Artificial Intelligence	5
Artificial Neural Network Development	5
Artificial Intelligence in Control Systems	5
Total	**15**

5 Competency map of the educational program "6B07119 Technological Machines and Equipment (by industry)"

Competence map of the educational program	Learning outcome code	Learning Outcome (according to Bloom's Taxonomy)
Behavioral skills and personality traits (Softskills)	LO_{OOK1}	Forms a system of general competencies that ensure the socio-cultural development of the future specialist's personality, based on the formation of their worldview, civic, and moral stance, oriented towards a healthy lifestyle.
	LO_{OOK2}	Capable of communication in both oral and written forms in Kazakh, Russian, and foreign languages to solve tasks related to interpersonal, intercultural, and professional communication.
	LO1	Forms competencies in the field of economics, law, the basics of anti-corruption culture, entrepreneurship skills and financial literacy for effective energy and waste management in making management and technical decisions.
Digital competencies (Digital skills)	LO_{OOK3}	Promotes the development of information literacy through the mastery and use of modern information and communication technologies in all areas of activity.
	LO2	Applies fundamental natural science and engineering knowledge in professional activities, providing calculation, design and optimization of technical solutions.
	LO3	Analyzes the principle of operation, design features and technical characteristics of technological equipment for the correct selection, operation and maintenance in accordance with the requirements of the production process.
	LO4	Defines the relationship between equipment design and functionality in different processes to optimize operation and improve the efficiency of production systems.
	LO5	Models intelligent systems and digital twins of equipment, applying artificial intelligence algorithms to optimize

		machine parameters and implement predictive maintenance technologies into production.
Professional skills (Hardskills)	LO6	Predicts the technical condition of equipment based on predictive analytics for the organization of maintenance work, development and implementation of new technologies to increase reliability and minimize downtime.
	LO7	Organizes technical operation and repair of equipment on the basis of quality standards and industrial safety standards using instrumentation to prevent emergencies and ensure uninterrupted operation of production systems.
	LO8	Develops maintenance plans, preventive maintenance schedules and equipment modernization programs based on tribotechnical calculations, logistics schemes and energy efficiency indicators to ensure uninterrupted operation of automated systems and air conditioning units.
	LO9	Justifies the strategies of technical re-equipment and modernization of equipment on the basis of analysis of the causes of wear, examination of rationalization proposals and monitoring data of hydraulic and pneumatic systems to improve the efficiency of the operation of production assets.

6 Learning outcomes of the educational program and modules

Key competitions	Learning Outcomes (LO) of the Educational Program	Module name	LO by module	Names of disciplines forming learning outcomes
Behavioral skills and personal qualities (Soft skills)	LO ООК1 Forms a system of general competencies that ensure the socio-cultural development of the future specialist's personality, based on the formation of their worldview, civic, and moral stance, oriented towards a healthy lifestyle.	Man and Society – the foundation of worldview and socio-political knowledge.	Applies the fundamental laws of Kazakhstan's history, philosophy, and socio-political knowledge for effective socialization and adaptation in changing socio-cultural conditions, shaping a personality capable of mobility in the modern world, critical thinking, and physical self-improvement.	History of Kazakhstan Philosophy Physical Culture Module of Socio-Political Knowledge (Political Science, Sociology, Cultural Studies, Psychology)
	LOООК2 Capable of communication in both oral and written forms in Kazakh, Russian, and foreign languages to solve tasks related to interpersonal, intercultural, and professional communication.	Information and Communication Module	Capable of interpersonal social and professional communication in Kazakh, Russian, and foreign languages.	Foreign Language Kazakh Language Russian Language
	LOООК3 Promotes the development of information literacy through the mastery and use of modern information and communication technologies in all areas of activity.		Possesses various types of information and communication technologies for searching, storing, processing, protecting, and disseminating information.	Information and Communication Technologies
	LO 1 Forms competencies in the field of economics, law, the basics of	Module of Economic, Legal, Scientific and	Applies in professional activity knowledge of economics and law, as well as entrepreneurial skills and financial literacy, using key economic and legal principles, financial awareness	Module of Economics, Entrepreneurship, Law and Financial Literacy

	anti-corruption culture, entrepreneurship skills and financial literacy for effective energy and waste management in making management and technical decisions.	Environmental Knowledge	and demonstrating civic responsibility in behavior.	(Fundamentals of Economics and Entrepreneurship, Fundamentals of Law and Anti-corruption Culture, Fundamentals of Financial Literacy)
			Assesses environmental risks and safety conditions during operation of equipment to reduce environmental impact.	Sustainable Development, Ecology and Life Safety
Цифровые компетенции (Digital skills)	LO2 Applies fundamental natural science and engineering knowledge in professional activities, ensuring calculation, design, and optimization of technical solutions	Basic Engineering and Mathematical Training	He is proficient in basic mathematical concepts and formulas, uses the acquired knowledge in solving problems of an applied nature and mathematical methods in constructing models.	Higher Mathematics
			Applies fundamental physical laws and mathematical tools to solve physical and engineering problems.	Physics
			Determines the fundamental principles of chemical processes, analyzes the properties of substances and chemical reactions, and performs calculations based on chemical equations. Determines the structure and properties of organic and inorganic substances, analyzes their reactivity, and selects reagents for chemical transformations.	General Chemistry/ Organic and Inorganic Chemistry
			Selects materials according to mechanical properties and operating conditions to ensure the strength and durability of products. Selects modes of thermal treatment of structural materials according to the specified requirements for hardness and strength to ensure wear resistance and durability of parts.	Materials Science/ Structural Materials and Heat Treatment
			Calculates heat flows and temperature conditions of heat exchange equipment according to specified heat exchange conditions to determine heat load. Evaluates measurement accuracy and applies artificial	Heat Engineering/ Metrological Support of Production

			intelligence algorithms for processing calibration data to ensure the reliability of metrological control in production.	
			Calculates electrical parameters from specified voltages and resistances to determine currents and power. Adjusts the control parameters of the automatic system according to the set values of temperature, pressure or flow.	Electrical Engineering/ Automation
			Calculates the kinematic parameters of mechanisms according to the specified scheme and input data to determine the speeds and movements of links. Calculates the kinematic and dynamic parameters of robotic systems to determine loads and trajectories.	Theory of Mechanisms and Machines/ Mechanics of Robotic Systems
	LO 3 Analyzes the principle of operation, design features, and technical characteristics of technological equipment for the correct selection, operation, and maintenance in accordance with the requirements of the production process.	General Engineering Mechanics	Classifies the main types of machines and mechanisms, determining their technological purpose in engineering activities.	Introduction to Engineering
			Calculates forces, stresses, and movement parameters of mechanical systems to assess their operability.	Theoretical and Applied Mechanics
			Calculates stresses and strains of structural elements to assess their strength and stability.	Strength of Materials
			Develops a technological process for manufacturing machine parts according to specified accuracy and production conditions.	Machining Technology
	LO 4 Determines the relationship between equipment design and its functionality in various technological processes to optimize operations and improve the efficiency of production systems	Process and Equipment	Develops designs of machine parts and process equipment units according to the specified loads and operating conditions. Calculates the parameters of parts of technological equipment by load and operating conditions to check their strength and durability.	Fundamentals of Design/Machine Parts
			Selects machines and devices of food production according to the specified productivity and temperature regime to ensure the required technological process. Designs process machines and apparatuses according to the specified process parameters and operating conditions.	Machines and Apparatus of Food Production/ Computer-Aided Machine Design

			Justifies the choice of machines and apparatus of processing plants based on the calculation of productivity and process parameters.	Machines and Apparatus of Processing Industries
			Determines the parameters of technological processes of food production by the type of raw materials and processing conditions to ensure the quality of products. Calculates pressure, flow and load parameters of hydraulic and pneumatic actuators of process equipment to ensure their operation.	Fundamentals of Food Production Technology/Hydropneumatic Machines and Drives
			Calculates cooling system parameters and designs energy-efficient operating modes using artificial intelligence and predictive diagnostics methods. It calculates parameters of heat-mass exchange processes for selection of food production equipment.	Refrigeration Engineering and Technology/Heat and Mass Transfer Equipment of Food Production
			Studies the activities, structure of the enterprise, purpose, classification, design and operating principles of technological machines, safety techniques in direct production, which will allow better orientation in the profession.	Internship 1
	LO 5 Models intelligent systems and digital twins of equipment, applying artificial intelligence algorithms to optimize machine parameters and implement predictive maintenance technologies into production.	Automation and Intelligence	Performs engineering drawings and 3D models according to USDD (Unified System of Design Documentation) requirements.	Engineering and Computer Graphics
			Uses artificial intelligence tools for data analysis and the solution of applied tasks.	Introduction to Artificial Intelligence (Minor)
			Analyzes the effectiveness of neural network models in data processing, assessing the possibilities of applying neural network technologies in various subject areas.	Artificial Neural Network Development (Minor)
			Uses intelligent algorithms to support decision-making in object control systems.	Artificial Intelligence in Control Systems (Minor)
			Creates 3D models of products in CAD systems and applies AI-based generative design methods to optimize the	Computer-Aided Design Systems/Theory of

			geometric and strength parameters of structures. Calculates the parameters of automatic control systems to ensure the accuracy of metalworking.	Automatic Control in Manufacturing
			Calculates heat loss and efficiency (Efficiency) of equipment to justify energy-saving modes of operation. Designs digital control systems, integrates artificial intelligence for process optimization, and enhances the operational autonomy of technological lines.	Energy-Saving Technologies in Food Industry/Automation of Technological Processes
			Industrial practice develops practical skills and abilities in installation, maintenance, repair, and adjustment of equipment in food and processing enterprises.	Industrial Practice 2
	LO 6 Predicts the technical condition of equipment based on predictive analytics for the organization of maintenance work, development and implementation of new technologies to increase reliability and minimize downtime.	Reliability, Operation and Energy Efficiency	Regulates the operating parameters of technological equipment according to the requirements of the technological process.	Technological Equipment
			Performs tests of the equipment with assessment of its technical condition according to the established methods. Assesses the reliability of process machines based on the analysis of quality indicators and failures.	Testing and Testing Equipment/Quality and Reliability of Technological Machines
			Predicts the time of failure and residual life of components using statistical methods and algorithms for processing streaming monitoring data. Evaluates the technical condition and identifies hidden equipment defects by analyzing vibration indicators, thermal fields, and wear parameters to predict component reliability.	Predictive Diagnostics in Mechanical Engineering/Design and Calculation of Machines and Apparatus of Food Production
	LO 7 Organizes technical operation and repair of equipment on the basis of quality standards and industrial safety standards using instrumentation to prevent emergencies and ensure uninterrupted operation of production systems.	Machine Design and Engineering	Evaluates products, analyzes existing quality systems, develops QMS processes, and applies skills to implement the quality management system in production. Evaluates the quality of manufactured machine parts based on size deviations, reliability, and the presence of defects.	Quality Management Systems/Quality Management in Mechanical Engineering
			Calculates the parameters of flows and hydraulic and pneumatic drives of technological equipment by pressure, speed, and flow rate to ensure their operation. Assesses food safety by microbiological, physicochemical	Fluid Mechanics and Hydraulic and Pneumatic Drives/Food Safety and Quality

			and sanitary indicators.	
			Assesses hazard risks for accident prevention and safety with safety standards in production. Applies safety requirements when working on processing plant equipment.	Industrial Safety/Safety Techniques at Processing Industry Enterprises
			Verifies the compliance of parts and products with the requirements of standards and technical documentation. Using Defines tolerances and fits of parts according to specified accuracy and operating conditions.	Standardization and Certification in Mechanical Engineering /Interchangeability, Standardization and Technical Measurements
	LO8 Develops maintenance plans, preventive maintenance schedules and equipment modernization programs based on tribotechnical calculations, logistics schemes and energy efficiency indicators to ensure uninterrupted operation of automated systems and air conditioning units.	Production Management and Practical Training	Justifies the choice of part restoration technologies and organizes a set of repair works to eliminate failures, applying accuracy control and alignment methods to ensure the specified equipment life. Performs installation and commissioning of process machines according to technical requirements.	Repair of Technological Machines/Installation and Operation of Technological Machines
			Calculates aspiration system parameters by air flow and dust concentration to ensure air cleaning. Calculates ventilation and air conditioning parameters by flow, temperature and humidity to ensure sanitary conditions of production.	Aspiration and Ventilation Systems of Processing Industries/ Ventilation Systems and Air Conditioning in Food Production
			Calculates the coefficient of friction and wear of machine components to assess their durability. Calculates parameters of hydromechanical processes for selection of food production equipment.	Fundamentals of Tribology/Machines and Equipment for Hydromechanical Processes
	LO9 Justifies the strategies of technical re-equipment and modernization of equipment on the basis of		Calculates and designs machines and devices for food production for processing raw materials according to the specified process parameters and loads. Optimizes material flows in production in terms of inventory	Design and Calculation of Machines and Apparatus of Food Production/Production

	analysis of the causes of wear, examination of rationalization proposals and monitoring data of hydraulic and pneumatic systems to improve the efficiency of the operation of production assets.		and movement time.	Logistics
			Industrial/pre-graduation practice develops practical skills in conducting research related to the student's final qualifying work topic, as well as the ability to use the acquired experience in production to make decisions on organizational and technological tasks at food and processing enterprises.	Industrial/Pre-Graduation Internship
			Prepares patent documentation. Develops innovative solutions for professional problems and research projects based on TRIZ methodology.	Patent Protection/ Fundamentals of TIPS
			Calculates costs and plans production activities of the enterprise in terms of output and resources. Develops a comprehensive implementation plan for an engineering project, justifying resource allocation and risk management strategies to ensure economic efficiency and compliance with industrial production regulatory requirements.	Enterprise Economics and Planning/Project Management in the Food Industry
			Understands the goals, methodology, and methods of professional activity of a mechanical engineer, manager, production foreman of machinery, and equipment technology. Capable of applying the acquired skills to continue further education in the field of the studied educational program.	Final Assessment

7 The relationship between the attainability of the formed learning outcomes according to the educational program and academic disciplines

№	Name of the discipline	Brief description of the discipline	Number of credits	Formed learning outcomes (codes)											
				LO_{OOK1}	LO_{OOK2}	LO_{OOK3}	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9
Cycle of general education disciplines Required component															
1.	History of Kazakhstan	The purpose of the discipline shall be to give objective knowledge about the main stages in the development of the history of Kazakhstan from ancient times to the present. The program consists of 5 thematic blocks: Ancient people and the formation of a nomadic civilization, Turkic civilization and the Great Steppe, Kazakhstan in a new era (XVIII-early XX centuries), Kazakhstan in the Soviet period, and Independent Kazakhstan. Upon completion of the discipline, student applies skills of analytical, axiological, critical analysis in the study of historical processes for an objective understanding of the modern Kazakh model of development.	5	+											
2.	Philosophy	The purpose of the program is to develop students' holistic understanding of philosophy as a special form of knowledge of the world, its main branches, problems, and methods of their study in the context of future professional activity. The discipline covers the key directions in the emergence and development of philosophy, the foundations of the philosophical understanding of the world, the philosophy of the human being, and the world of values. Upon completion of the discipline, student argue their own moral position regarding	5	+											

		relevant issues of contemporary global society.													
3.	Physical Culture	The goal of the curriculum shall be the formation of socio-personal competences of students and the ability to purposefully use the means and methods of physical culture for conservation, promotion of health to prepare for professional activities; to take physical stress, mental stress and adverse factors in their future activities. Upon completion of the curriculum, the student shall to use a variety of forms and types of physical activities for healthy life, active recreation and leisure.	8	+											
4.	Module of Socio-Political Knowledge (Political Science, Sociology, Cultural Studies, Psychology)	The objective of the discipline is to form the socio-humanitarian worldview of learners in the context of addressing the tasks of modernizing public consciousness, encompassing the interdisciplinary study of sociology, political science, cultural studies, and psychology while integrating principles of inclusion and the «Adal Azamat» (Honest Citizen) value orientations as fundamental pillars for the development of modern society. Upon completion of the discipline, the student interprets socio-humanitarian knowledge and ethical values based on scientific methods of social analysis, participates in conflict resolution, and provides reasoned advocacy for positions regarding the modernization of Kazakhstan.	8		+										
5.	Information and Communication Technologies	The purpose of the program is to develop the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, and methods of collecting	5			+									

		and transmitting information through digital technologies. Studies the fundamentals of working with information, digital technologies, and computer systems; the application of software, internet services, and ICT in professional and research activities; information security; and artificial intelligence technologies. Upon completion of the discipline, student will be able to utilize digital technologies to develop data analysis and management tools for various fields of activity.														
6.	Foreign language	The goal of the curriculum shall be the formation of intercultural communicative competence of students in the process of foreign language education at a sufficient level (A2, common European framework) and the level of basic sufficiency (B1, common European framework). The course content entails a sequential study of language proficiency levels by integrating social, socio-cultural, and academic-professional communication spheres. Upon completion of the discipline, student will be able to articulate potential solutions to contemporary issues in a foreign language, utilizing evidence-based information and reasoned arguments.	10			+										
7.	Kazakh (Russian) language	The purpose of the program - to teach the Kazakh (Russian) language in accordance with international standards for teaching languages, to increase the importance of the Kazakh language as the state language and the Russian language as a medium for intercultural and professional	10			+										

		communication, developing competence in the use of the Kazakh (Russian) language by a future specialist as a means of communication in scientific, socio-cultural, political, professional spheres of public life. Upon completion of the curriculum, the student shall show competence in conditions of personal, social and professional communication in accordance with the peculiarities of the language, culture, communication situation.														
Cycle of general education disciplines University component/Elective component																
8.	Module of Economics, Entrepreneurship, Law and Financial Literacy (Fundamentals of Economics and Entrepreneurship, Fundamentals of Law and Anti-corruption Culture, Fundamentals of Financial Literacy)	The discipline is aimed at developing entrepreneurial thinking, financial responsibility, legal literacy, fostering an anti-corruption culture, and commitment to the principles of law and order in a market economy. Its content includes the fundamentals of economics, entrepreneurship, financial literacy, law, anti-corruption culture. As a result of studying the discipline, the student has the skills to make effective economic decisions, ensure legal protection, apply financial literacy, and adhere to anti-corruption practices.	5				+									
Cycle of basic disciplines University component/Elective component																
9.	Theoretical and Applied Mechanics	The discipline is aimed at forming competencies in the analysis of equilibrium and motion of material	5						+							

		bodies and mechanical systems. The content covers the laws of statics, kinematics of a point and a rigid body, general theorems of dynamics, as well as methods for studying oscillatory processes in mechanisms. As a result of mastering the discipline, the learner analyzes the dynamic characteristics and equilibrium conditions of technical devices for their subsequent design.														
10	Strength of materials	Discipline forms competencies to ensure the strength and rigidity of structural elements. The content includes analysis of stresses, deformations, calculations for bending, torsion and stability of rods under various types of loading. As a result of mastering the discipline, the student calculates the strength parameters of the parts and checks the stiffness of the units using analytical methods to justify the reliability of technical systems and prevent their destruction in real operating conditions.	5						+							
11	Engineering Computer Graphics	The discipline is aimed at studying the main topics related to the creation and processing of graphic images used in engineering and technical fields. The main components of graphics systems, Hardware and software for working with graphics. Students master the theoretical knowledge and practical skills necessary to work with graphical systems in the mode of solving engineering problems.	5						+							

12	Sustainable Development, Ecology, and Life Safety	This discipline is designed to cultivate a systemic understanding of the principles of balancing economic development, social well-being, environmental preservation, and the protection of human life and health. It covers key issues in ecology, environmental protection, life safety, and sustainable development. Upon completion of the course, students will be able to apply the principles of sustainable development, environmental safety, and occupational health and safety to manage energy and waste within a circular economy framework.	5				+									
13	Higher Mathematics	The discipline is aimed at forming knowledge of the fundamentals of higher mathematics and familiarization with mathematical methods for solving standard problems and their application in practice. The content of the discipline covers theoretical and practical problems related to elements of linear and vector algebra, mathematical analysis, and probability theory. As a result of studying the discipline, the student solves applied problems by constructing mathematical models.	5					+								
14	Physics	The discipline is aimed at forming fundamental knowledge of physical laws and developing skills in their application in technology. The content of the discipline covers mechanics, molecular physics, thermodynamics,	4					+								

		electromagnetism, optics, the basics of atomic and quantum physics, as well as methods of experimental measurements. As a result of studying the discipline, the student applies the laws of physics for the computational analysis of processes, processing of experimental data, determination of equipment parameters, and substantiation of professional decisions.														
15	Introduction to Engineering	The discipline is studied with the aim of forming basic knowledge in the field of modern mechanical engineering and the fundamentals of engineering activity. The content covers the classification of machines, the theory of mechanisms, as well as the basics of manufacturing and assembly technology of parts. As a result of mastering the discipline, the learner analyzes the operating principles of technical systems for their design, efficient operation, and modernization.	3						+							
16	Organic and Inorganic Chemistry	The discipline is aimed at the formation of competencies in understanding the properties and reactions of organic and inorganic substances. The content includes the classification of the compounds, the types of reactions and the relationship of the composition with the properties. As a result of mastering the discipline, the student determines the reactivity and physicochemical properties of substances based on their structure for the selection of reagents	4					+								

		and optimization of chemical transformations in production processes.													
17	General Chemistry	The discipline is aimed at studying the fundamental laws of chemistry necessary for solving practical problems. The content includes atomic structure, the periodic law, chemical bonding and molecular structure, classification and properties of inorganic substances, formulating and balancing chemical reactions, calculations based on chemical formulas and equations, solutions, concentrations, and the basics of chemical kinetics and thermochemistry. As a result of studying the discipline, the student substantiates the patterns of chemical processes by performing calculations based on chemical formulas and equations.	4					+							
18	Materials Science	The discipline is aimed at studying the relationship between the microstructure and properties of metals for engineering design. The content includes analysis of marking systems, alloy characteristics and methods for assessing corrosion resistance. As a result of mastering the discipline, the student selects structural materials based on the analysis of physical and mechanical characteristics and operating conditions in order to ensure the durability of technical systems and the optimal combination of cost and reliability in the manufacture of machine parts.	5					+							

19	Structural Materials and Heat Treatment	The discipline is aimed at studying transformations in alloys under thermal exposure and strengthening methods. Technologies of annealing, hardening, tempering and chemical-thermal treatment are considered. The effect of cooling modes on structure and performance is described. Methods of improving wear resistance and corrosion resistance are being studied. As a result of mastering the discipline, the student chooses heat treatment modes and methods of strengthening materials to achieve the given physical and mechanical characteristics of alloys.	5					+								
20	Theory of Mechanisms and Machines	The discipline is aimed at the formation of competencies for the study of the structure and movement of mechanisms. Content includes structural, kinematic, and dynamic analyses of linkage, cam, and gear systems. As a result of mastering the discipline, the student analyzes the kinematic schemes and dynamic parameters of machine links, performing the synthesis of mechanisms according to given criteria to ensure high accuracy and reliability of the operation of technological equipment in production.	5					+								
21	Mechanics of Robotic Systems	The discipline is aimed at creating competencies in the calculation and design of robot actuators. Content includes manipulator kinematics, dynamic modeling of ladder systems,	5					+								

		and load calculations. As a result of mastering the discipline, the student simulates kinematic schemes and dynamic characteristics of manipulators, calculating working zones and trajectories to create high-precision automated production complexes that ensure efficient performance of technological operations.													
22	Electrical Engineering	The discipline is aimed at the formation of competencies in the analysis of electrical devices of automation systems. The laws of electrical circuits, DC and AC machines, measuring instruments are studied. As a result of mastering the discipline, the student calculates the parameters of electrical drives and power circuits, justifying the choice of equipment power to ensure the operability and reliable functioning of automated complexes and control systems at modern industrial enterprises.	5					+							
23	Automation	The discipline is aimed at creating competencies for the use of automation tools in technical systems. The principles of operation of sensors, actuators and control logic are considered. Methods of adjusting regulators are being studied. As a result of mastering the discipline, the student adjusts the parameters of automatic systems and control algorithms, ensuring that the specified parameters of temperature, pressure or flow are	5					+			+				

		maintained in production cycles for stable operation of technological equipment.														
24	Standardization and Certification in Mechanical Engineering	The discipline forms competencies in the application of certification standards and procedures in mechanical engineering. The content includes regulatory documents, quality standards, technical regulations and certification rules. As a result of mastering the discipline, the student develops technical documentation and quality assurance schemes, ensuring strict compliance of the products with the requirements of the current standards to increase their competitiveness and safety in the modern market for technical devices.	5											+		
25	Interchangeability, Standardization and Technical Measurements	The discipline is aimed at the formation of competencies to ensure the interchangeability of parts and the performance of technical measurements. The content of the discipline includes tolerances and fits, dimensional systems, surface roughness, measurement methods, and controls. As a result of mastering the discipline, the student monitors the accuracy of the manufacture of parts for compliance with established standards.	5											+		
26	Heat Engineering	The discipline is aimed at the formation of basic engineering competencies in the analysis of thermal phenomena. The content includes the fundamental laws of	5					+								

		thermodynamics, the principles of thermal conductivity, convection and radiation in technical systems. As a result of mastering the discipline, the student calculates the parameters of heat balances and heat exchange indicators using physical laws to justify the efficiency of technological equipment and prepare for the study of special engineering disciplines.													
27.	Metrological Support of Production	The discipline builds competencies in ensuring the uniformity of measurements in engineering practice. The content includes error theory, instrument calibration and verification methods, as well as the application of artificial intelligence (AI) algorithms to improve the accuracy of results. As a result of mastering the course, the student performs metrological control and instrument calibration to ensure the operational accuracy of modern production systems.	5					+					+		
28.	Introduction to Artificial Intelligence (Minor)	The discipline is aimed at forming fundamental knowledge about the principles and methods of artificial intelligence and the application of intelligent technologies in solving professional tasks. The content covers the stages of the development of artificial intelligence, the fundamentals of machine learning, elements of neural networks, data processing methods, intelligent systems, and the areas of application of artificial intelligence technologies. As a result of studying the discipline, the student applies	5								+				

		artificial intelligence technologies in various fields of professional activity.														
29.	Patent Protection	The discipline is aimed at creating competencies in the field of legal protection of technical solutions and the results of intellectual activity. The content of the discipline includes objects of patent law, criteria for patentability, search for patent information, structure of a patent application, design of a description and claims. Mastering the discipline provides the ability to determine the patentability of decisions and execute patent documentation.	3				+									+
30.	Fundamentals of TIPS	The discipline aims to master methods for solving technical problems, invention algorithms, and research skills. The course content covers methods of scientific inquiry and research, identification and elimination of technical contradictions, modeling of inventive situations, and laws of technical system development. As a result of study, the student develops research projects to improve equipment and technologies based on TRIZ methods, justifying the engineering decisions made.	3					+								+
31.	Fundamentals of Food Production Technology	The discipline aims to master methods for solving technical problems, invention algorithms, and research skills. The course content covers methods of scientific inquiry and research, identification and elimination of technical contradictions, modeling of inventive situations, and laws of technical system development. As a	5							+						

		result of study, the student develops research projects to improve equipment and technologies based on TRIZ methods, justifying the engineering decisions made.														
32.	Hydropneumatic Machines and Drives	The discipline is aimed at forming competencies in the calculation and application of hydraulic and pneumatic machines and drives. The content of the discipline includes the laws of fluid and gas movement, pumps, compressors, hydraulic and pneumatic drives, calculation of operating parameters, and system diagrams. As a result of mastering the discipline, the learner performs the design and verification calculation of machine units to ensure their reliable operation.	5							+					+
33.	Machine Elements	The discipline is aimed at the formation of competencies in the calculation and selection of machine elements. The content of the discipline includes connections, gears, bearings, shafts, couplings, calculation of strength and durability of elements. As a result of mastering the discipline, the student designs units and parts of general-purpose machines (gearboxes, drive shafts, connections), performing calculations for strength, rigidity and wear resistance to create workable and safe technical systems.	5						+						

34.	Fundamentals of Food Production Technology	The discipline is aimed at the formation of competencies in understanding and applying the technological processes of food production. The content includes characteristics of raw materials, basic processing processes, line equipment and product quality indicators. As a result of mastering the discipline, the student establishes optimal parameters of technological modes and requirements for raw materials, ensuring stable quality of finished products and effective operation of automated lines at processing enterprises.	5							+					
35.	Development of Artificial Neural Networks (Minor)	The discipline is aimed at forming theoretical knowledge and practical skills in the development and application of artificial neural networks for intelligent information processing. The content covers the principles of construction and functioning of artificial neural networks, the main neural network architectures, training methods, data preparation and processing, and tools for developing neural network models. As a result of studying the discipline, the student develops neural networks to solve problems of data processing and intelligent systems.	5								+				
36.	Refrigeration Engineering and Technology	Discipline forms competencies in the use of refrigeration equipment and technologies in production. The contents include thermodynamic cycles, refrigerants and compressor design. The use of artificial intelligence to optimize	5							+					+

		energy consumption is being studied. As a result of mastering the discipline, the student calculates heat exchange parameters and designs automated installations using intelligent control algorithms to maintain accurate temperature conditions and increase the energy efficiency of modern refrigeration equipment.														
37.	Heat and Mass Transfer Equipment of Food Production	The discipline forms competencies in the selection and design of heat and mass transfer devices. The content includes the study of heat transfer, the structures of drying and evaporating plants and the analysis of their operating modes. As a result of mastering the discipline, the student calculates the parameters of heat exchangers and mass transfer equipment, justifying the choice of technical means to ensure the specified productivity and quality of the finished product in accordance with the technological requirements of the food industry.	5							+					+
38.	Fluid Mechanics and Hydraulic and Pneumatic Drives	The discipline forms competencies in the calculation of medium transportation and the operation of power systems. The content includes the laws of hydrodynamics, calculation of pumps, compressors, pressure losses and operating modes of hydraulic and pneumatic systems. As a result of mastering the discipline, the student calculates the parameters of pressure, flow rate and flow rate for the design of technological lines.	5										+		+

39.	Food Safety and Quality	The discipline is aimed at the formation of competencies for the control of physicochemical and microbiological indicators of products. Content includes risk factors, laboratory controls, health regulations, and HACCP system principles. As a result of mastering the discipline, the student monitors the quality and safety indicators of raw materials and finished products at all stages of production, using laboratory analysis methods and HACCP principles to prevent defects.	5										+		
40.	Quality Management in Mechanical Engineering	The discipline forms competencies in quality management of mechanical engineering products based on the analysis of production and control processes. Content includes quality assessment methods, statistical control methods, process control and defect analysis. As a result of mastering the discipline, the student performs a statistical analysis of product parameters to identify defects and assess the stability of technological processes.	5										+		
41.	Quality Management Systems	The discipline is studied with the aim of providing students with knowledge of ISO 9000 series requirements, development of processes and documented procedures, implementation of ISO 9001 at food production enterprises, as well as conducting inspection control, internal and external audits. The discipline content covers principles and methods of building	5										+		

		a quality management system, development, implementation, control, and improvement of QMS processes. As a result of studying the discipline, the student acquires the skills of analysis, development and practical application of a quality management system at enterprises.															
Cycle of Major Disciplines University Component/Elective Component																	
42.	Machines and Apparatus of Processing Industries	The discipline is aimed at the formation of competencies in the engineering selection and calculation of processing machines. The content includes the theoretical foundations of the processes, the design features of the equipment, the calculation of technological parameters and the analysis of operating modes. As a result of mastering the discipline, the student justifies the choice of specific machines and devices based on engineering calculations, ensuring high efficiency of production lines and strict compliance with the technological requirements of the processing industry.	5							+						
43.	Machining Technology	Discipline forms competencies in the development of technological processes for the manufacture of machine parts. The content includes the selection of workpieces, processing operations, processing modes, equipment, accuracy and quality of processing. As a result of mastering the discipline, the student develops route and operational maps for the manufacture of parts in accordance	5						+							+	

		with the production task.													
44.	Technological Equipment	Discipline forms competencies in the operation and regulation of process equipment. The content includes equipment operating modes, process parameters, control methods and operation requirements. As a result of mastering the discipline, the student adjusts the production modes of the equipment to ensure the specified technological parameters.	5									+	+		
45.	Machines and Apparatus of Food Production	The discipline is aimed at studying the design and operating principles of grinding, mixing, heat and mass transfer equipment. The content includes the classification of machines and methods for calculating their performance. As a result of mastering the discipline, the student differentiates the design features of machines according to their functional purpose and calculates their technological parameters, which makes it possible to reasonably choose equipment for the effective operation and implementation of complex production processes.	5							+					
46.	Computer-Aided Machine Design	The discipline is aimed at mastering the methods of calculating geometric parameters, the strength of units and the layout of the working elements of the equipment. The content includes the development of assembly drawings and justification of design solutions for given loads. As a result of mastering the discipline, the student develops design	5							+					

		documentation and diagrams of equipment components, calculating technical parameters based on in-depth analysis of the design to ensure reliable functionality and safety of systems.													
47.	Fundamentals of Tribology	The discipline is aimed at the formation of competencies for the analysis of friction and wear processes in machine components. The content includes the study of friction coefficients, types of wear, lubrication modes and calculation of contact stresses. As a result of mastering the discipline, the student calculates the wear parameters and characteristics of tribo-conjugations, using the data obtained to justify the durability of the equipment and predict the technical condition of mechanical systems in various operating conditions.	5							+				+	
48.	Machines and Equipment for Hydromechanical Processes	The discipline is aimed at studying equipment for mixing, filtration and separation of media. The content includes hydrodynamic laws, hydraulic parameters, pumping equipment and operating modes of devices. As a result of mastering the discipline, the student selects the standard sizes of pumps and phase separation devices, justifying the technical characteristics of the systems based on the analysis of hydraulic parameters to ensure stable performance and reliability of production lines in the food industry.	5							+				+	
49.	Artificial Intelligence in	The discipline is aimed at forming knowledge and skills in the application of	5								+				

	Control Systems (Minor)	artificial intelligence methods for the analysis, modeling, and control of technical and information objects. The content covers methods and algorithms of artificial intelligence in control systems, intelligent decision-making methods, data processing and analysis, and the application of machine learning and intelligent systems. As a result of studying the discipline, the student applies artificial intelligence technologies in object control systems.														
50.	Ventilation Systems and Air Conditioning in Food Production	The discipline is aimed at creating competencies in the calculation and use of ventilation units and air conditioning systems in food production. The content of the discipline includes air parameters, air exchange, ventilation systems, air conditioning, air flow calculation, thermal and humidity modes. As a result of mastering the discipline, the student calculates the required air consumption and heat and humidity loads to maintain the specified technological modes in the production premises.	5											+	+
51.	Aspiration and Ventilation Systems of Processing Industries	The discipline is aimed at creating competencies for the removal of dust and harmful impurities from the air of processing plants. The content of the discipline includes dust sources, aspiration systems, dust collection equipment, air flow rate calculation, emission cleaning. As a result of mastering the discipline, the student calculates the parameters of air	5											+	+

		exchange and selects treatment equipment to ensure sanitary standards in the production premises.													
52.	Computer-Aided Design Systems	The discipline builds competencies in using CAD and artificial intelligence in engineering activities. The content includes work in CAD systems, parametric modeling, and generative design. As a result of mastering the course, the student models complex products in modern software packages using digital tools and artificial intelligence technologies for automated optimization and design documentation creation.	5								+				+
53.	Theory of Automatic Control in Manufacturing	The discipline is aimed at studying the methods of analysis and configuration of control systems for machines and robots. The content includes models of dynamic systems, transfer functions and the use of intelligent regulators. As a result of mastering the discipline, the student synthesizes automatic control algorithms with elements of artificial intelligence and adjusts the parameters of the systems, ensuring high accuracy of metalworking and stability of dynamic processes in the design of modern automated complexes of machine-building production.	5								+				+
54.	Quality and Reliability of Technological Machines	The discipline is aimed at creating competencies in the field of ensuring the durability and reliability of equipment. The content includes a study of reliability indicators, life calculation and analysis of the causes of failures. As a result of	5									+			+

		mastering the discipline, the student predicts the technical condition of machines using predictive analytics methods to justify engineering solutions for the introduction of new strengthening technologies, which ensures high operational reliability and safety of industrial systems.													
55.	Testing and Testing Equipment	The discipline is aimed at creating competencies for testing machines using modern control and measurement methods. Content includes arrangement of test benches and processing of experimental data. As a result of mastering the discipline, the student diagnoses the technical condition of the equipment based on signal analysis, justifying the choice of effective test methods to increase the operational reliability of systems and minimize production downtime in mechanical engineering.	5									+	+		+
56.	Technical Diagnostics of Technological Equipment	The discipline is aimed at creating competencies for assessing the technical condition and predicting the residual life of equipment using digital technologies. The content covers methods for collecting data from sensors, analyzing vibration and thermal signals, as well as algorithms for monitoring parameters in real time. As a result of mastering the discipline, the student identifies hidden defects and reasons for deviating the operating parameters of the equipment for planning preventive maintenance.	5									+			

57.	Predictive Diagnostics in Mechanical Engineering	The discipline is aimed at mastering strategies for proactive equipment reliability management through predictive analytics tools. Content covers building digital wear models, using machine learning algorithms to process big data, and integrating diagnostic information into asset management systems. As a result of mastering the discipline, the student predicts the timing of the onset of limit states of machine nodes to optimize maintenance schedules and prevent unscheduled failures.	5									+	+		+
58.	Design and Calculation of Machines and Apparatus of Food Production	The discipline is aimed at mastering the methods of strength calculation and development of equipment units for processing raw materials. The content includes the selection of materials, calculation of structural parameters and consideration of operational loads. As a result of mastering the discipline, the student performs strength tests and develops design solutions, arguing for the choice of advanced technologies to improve the reliability of equipment and ensure the safety of the operation of technical systems of the food industry.	5												+
59.	Production Logistics	The discipline is aimed at creating skills in optimizing the physical movement of material flows within the enterprise. The content includes the design of warehouse systems, management of in-plant transport and optimization of equipment layouts to reduce the paths of raw	5											+	+

		materials. We study the methods of picking orders and the Just-in-Time system. As a result of mastering the discipline, the student plans routes for the movement of material resources to minimize transportation costs and reduce the production cycle.													
60.	Repair of Technological Machines	The discipline is aimed at organizing the repair and maintenance of equipment to ensure its reliable operation. The content includes a study of the preventive maintenance system, defect control methods and methods for repairing parts. As a result of mastering the discipline, the student develops technological processes for restoring the operability of machines, choosing effective methods for repairing and assembling units to reduce the risk of breakdowns and ensure stable operation of equipment.	5										+	+	
61.	Installation and Operation of Technological Machines	The discipline is aimed at the formation of competencies in the organization of installation, commissioning and commissioning of technological machines. The content covers methods for installing and aligning equipment, connecting to engineering systems, methods for adjusting operating parameters and rules for putting machines into repair. As a result of mastering the discipline, the student draws up maintenance schedules and equipment acceptance certificates to ensure its operational reliability and safety.	5										+	+	

62.	Enterprise Economics and Planning	The discipline is aimed at forming knowledge about the principles of enterprise functioning and the planning of its economic activities. The content covers the economic foundations of enterprise operations, the planning of production and financial indicators, the use of fixed assets and working capital, labor resource planning, cost formation, and the evaluation of enterprise performance efficiency. As a result of studying the discipline, the student substantiates planning decisions on the basis of economic calculations.	5				+									
63.	Project Management in the Food Industry	The discipline is aimed at creating competencies for managing innovative projects for the modernization and technical re-equipment of production. The content covers project lifecycle planning, resource and risk management, and cost-effectiveness assessment of new technology implementation. As a result of mastering the discipline, the student develops a project implementation schedule with justification of key indicators of reliability and return on investment.	5				+									
64.	Industrial Safety	The discipline is aimed at creating competencies to ensure industrial safety at work. The content includes the study of hazardous production factors, regulatory requirements, risk assessment and accident prevention methods. As a result of mastering the discipline, the student	5										+		+	

		identifies potential sources of hazards and develops comprehensive risk mitigation measures, ensuring safe working conditions and preventing emergencies during the operation of complex technological equipment.													
65.	Occupational Safety in Processing Industries	The discipline is aimed at creating competencies to ensure safe working conditions at processing enterprises. Content includes hazard studies, equipment regulations, personal protective equipment, and sanitation requirements. As a result of mastering the discipline, the student regulates the procedure for the safe performance of technological operations and develops labor protection instructions, ensuring the prevention of industrial injuries and compliance with safety standards by personnel during the operation of equipment.	5										+		+
66.	Energy-Saving Technologies in Food Industry	The course aims to build competencies in optimizing energy consumption. The content includes heat loss analysis, efficiency calculation, energy recovery methods, and the application of artificial intelligence (AI) for predictive cost analysis. As a result of mastering the course, the student evaluates the energy efficiency of production lines and justifies measures for implementing intelligent control algorithms that ensure resource minimization and optimization of technological equipment operating modes	5								+			+	

		at modern food enterprises.														
67.	Automation of Technological Processes	The discipline builds competencies in designing automation systems using intelligent technologies. The content includes the selection of sensors and controllers, and the development of adaptive control schemes with the integration of artificial intelligence to create neural network optimization models. As a result of mastering the course, the student drafts algorithms and control schemes for digital systems using artificial intelligence elements to ensure the autonomy of technological lines.	5								+				

8 Alignment of planned learning outcomes with assessment technologies and teaching methods within the module

Learning Outcomes (LO) Number	Planned learning outcomes for the module	Assessment technologies (tools)	Methods of learning and teaching
LO_{OOK1}	Applies the fundamental laws of Kazakhstan's history, philosophy, and socio-political knowledge for effective socialization and adaptation in changing socio-cultural conditions, shaping a personality capable of mobility in the modern world, critical thinking, and physical self-improvement.	Educational research project, content analysis, abstract, report, creative work, essay justification, analytical review, research project, case analysis, testing, others.	Interactive lecture (problem lecture, discussion lecture, lecture-conference, lecture-consultation, lecture "Press conference," lecture "Questions-answers-discussion"), test tasks, solution of situational tasks, set of test tasks for other options.
LO_{OOK2}	Capable of interpersonal social and professional communication in Kazakh, Russian, and foreign languages.	Simulator, case task, creative task, project, testing, etc.	Interactive lecture, seminar (seminar "Problem identification," seminar "Problem solution," seminar "Application of problem solution"), discussions, work in mini-groups and others.
LO_{OOK3}	Possesses various types of information and communication technologies for searching, storing, processing, protecting, and disseminating information.	Simulator, case task, creative task, oral questioning, testing, multi-level tasks and tasks, test work, etc.	Communication-activity approach to language mastery, practical methods, interactive lecture, seminar, test tasks, solution of situational tasks, set of test tasks for other options.
LO1	Forms competencies in the field of economics, law, the basics of anti-corruption culture, entrepreneurship skills and financial literacy for effective energy and waste management in making management and technical decisions.	Simulator, laboratory work on information technology, case task, creative task, testing, report, message, workbook, blitz survey, etc.	Interactive lecture, seminar (seminar "Problem identification," seminar "Problem solution," seminar "Application of problem solution"), test tasks, solution of situational tasks, set of test tasks for options and others.
LO2	Applies fundamental natural science and engineering knowledge in professional activities, providing calculation, design and optimization of technical solutions.	Training and research project, technical tasks and tasks, protection of laboratory work with physical, chemical or virtual equipment, report, message, workbook, blitz survey, etc.	Case task (analysis of specific situations), project method (development and transformation of own experience and competence) and others.
LO3	Analyzes the principle of operation, design features and technical characteristics of technological equipment for the correct selection, operation and	Multi-level technical tasks and tasks, solving production cases, oral survey, testing, blitz survey, presentation protection, content analysis,	Interactive lecture; visual methods (video materials, phenomena, visual aids); brainstorming, test tasks, solution of situational

	maintenance in accordance with the requirements of the production process.	abstract, report, etc.	tasks, a set of control tasks for options, etc.
LO4	Defines the relationship between equipment design and functionality in different processes to optimize operation and improve the efficiency of production systems.	Technical and situational tasks, graphic work protection, drawing analysis, testing, blitz survey, presentation protection, report, etc.	Process modeling, working with graphic editors, brainstorming, test tasks, solving situational problems, a set of test tasks for options, etc.
LO5	Models intelligent systems and digital twins of equipment, applying artificial intelligence algorithms to optimize machine parameters and implement predictive maintenance technologies into production.	Technical tasks, calculation and graphic work, research work with physical or virtual equipment, modeling, protection of a digital project, report, oral questioning, testing, test work, etc.	Interactive lecture; workshops using computer simulation, simulation, work in AutoCAD training through problem-making, research, brainstorming.
LO6	Predicts the technical condition of equipment based on predictive analytics for the organization of maintenance work, development and implementation of new technologies to increase reliability and minimize downtime.	Research Project, Analysis Report, Feasibility Study, Drawing Review, Project Protection, etc.	Analysis of production situations, engineering tasks, analysis of cases, brainstorming, test tasks, etc.
LO7	Organizes technical operation and repair of equipment on the basis of quality standards and industrial safety standards using instrumentation to prevent emergencies and ensure uninterrupted operation of production systems.	Technical tasks and tasks, calculation and graphic work, checklist, assessment of compliance with standards, reports, etc.	Design and analytical activities, study of regulatory documentation, analysis of cases, etc.
LO8	Develops maintenance plans, preventive maintenance schedules and equipment modernization programs based on tribotechnical calculations, logistics schemes and energy efficiency indicators to ensure uninterrupted operation of automated systems and air conditioning units.	Technical tasks and tasks, research project, analytical review, project protection, technical report, etc.	Analysis of production situations, engineering tasks, analysis of cases, brainstorming, test tasks, solution of situational tasks, a set of test tasks for options, etc.
LO9	Justifies the strategies of technical re-equipment and modernization of equipment on the basis of analysis of the causes of wear, examination of rationalization proposals and monitoring data of hydraulic and pneumatic systems to improve the efficiency of the operation of production assets.	Project Work Protection, Analytical Review, Feasibility Study, Drawing Review, Expert Review, etc.	Engineering design, course and diploma design, teamwork on TR (terms of reference), modeling.

9 Correlation of learning outcomes of the educational program with the labor functions of professional standards

Name of the professional standards used	Professions at Level 6 ORC	Labor functions	Tasks	Learning outcomes for the program
"Operation and repair of process equipment" (Enbek career). Appendix 1 to the Order of the Minister of Energy of the Republic of Kazakhstan dated October 15, 2025 No. 387-н/қ Appendix 5 to the Order of the Minister of Energy of the Republic of Kazakhstan dated December 23, 2024 No. 479. Transportation and storage.	Maintenance and Repair Engineer of Process Equipment	LF 1. Maintenance and Repair of Technological Equipment	Task 1: Operation of Technological Equipment	LO 3 Analyzes the principle of operation, design features and technical characteristics of technological equipment for the correct selection, operation and maintenance in accordance with the requirements of the production process.
			Task 2: Organizing and conducting technical inspection, industrial safety audit, and operational reliability assessment of process equipment	LO 6 Predicts the technical condition of equipment based on predictive analytics for the organization of maintenance work, development and implementation of new technologies to increase reliability and minimize downtime.
			Task 3: Conducting routine maintenance in accordance with the equipment maintenance and repair schedule	LO 7 Organizes technical operation and repair of equipment on the basis of quality standards and industrial safety standards using instrumentation to prevent emergencies and ensure uninterrupted operation of production systems.
		LF 2. Development of scheduled preventive maintenance plans for units, equipment maintenance and	Task 1: Preparation of annual and monthly maintenance schedules for the organization's process equipment, their coordination with departments, and tracking	LO 7 Organizes technical operation and repair of equipment on the basis of quality standards and industrial safety standards using instrumentation to prevent emergencies and ensure uninterrupted operation of production systems.

		repair schedules, modernization programs, and technical reequipment	of their execution	
			Task 2: Calculation of the maintenance fund for the planning year, and submitting it to management for review and approval	LO 8 Develops maintenance plans, preventive maintenance schedules and equipment modernization programs based on tribotechnical calculations, logistics schemes and energy efficiency indicators to ensure uninterrupted operation of automated systems and air conditioning units.
		LF 3: Development and implementation planning of new equipment and advanced technology	Task 1: Development and implementation of plans for the deployment of new equipment and technology, conducting organizational and technical measures, and research and development (R&D) activities	LO 6 Predicts the technical condition of equipment based on predictive analytics for the organization of maintenance work, development and implementation of new technologies to increase reliability and minimize downtime.
			Task 2: Ensuring the preparation of technical documentation	LO 7 Organizes technical operation and repair of equipment on the basis of quality standards and industrial safety standards using instrumentation to prevent emergencies and ensure uninterrupted operation of production systems.
			Task 3: Analysis of the causes of accidents and production malfunctions	LO 9 Justifies the strategies of technical re-equipment and modernization of equipment on the basis of analysis of the causes of wear, examination of rationalization proposals and monitoring data of hydraulic and pneumatic systems to improve the efficiency of the operation of production assets.
Personal Skill Requirements: Stress tolerance. Leadership skills. Ability to work effectively as a team member. Analytical thinking. Computer literacy. Precision in task execution. Independence. Ability to make quick decisions. Accountability for one's own work and the work of the team. Ability to independently develop professional qualifications and skills.				

10 Graduate model

<table>
<tr><td colspan="4">GRADUATE MODEL</td></tr>
<tr><td rowspan="4">Professional standard «Professional Standard 'Operation and Maintenance of Process Equipment», the Sectoral Atlas and Regional Atlas of Professions and Competencies 'Mechanical Engineer', 'Predictive Diagnostics Specialist', and 'Predictive Maintenance Specialist',</td><td colspan="3">Competencies (soft skills, digital skills)</td></tr>
<tr><td>Attributes of a graduate</td><td>Knowledge</td><td>Skills</td></tr>
<tr><td>Competence, responsibility, analytical thinking, observation, decision-making ability, independence, systems thinking, focus on quality and safety.</td><td>1. Equipment Design and Operating Modes
2. Operating and Setup Principles
3. Calculation and Design Methods
4. Diagnostic and Repair Methods
5. Reliability and Wear
6. Quality Control
7. CAD, AI, and Digital Technologies
8. Process Modeling
9. Production Organization
10. Regulatory Requirements.</td><td>1.Performs calculations
2.Selects equipment
3.Designs structures
4.Apply digital technologies
5.Diagnoses equipment
6.Improves reliability
7.Organizes installation and setup
8.Ensures quality
9.Optimizes processes
10. Prepares documentation</td></tr>
<tr><td colspan="3">Professional skills (hard skills)</td></tr>
<tr><td colspan="3">1. Organizes equipment operation;
2. Performs diagnostics and repairs;
3. Designs equipment;
4. Selects and implements equipment;
5. Ensures quality and safety;
6. Organizes production processes;
7. Applies digital technologies.</td></tr>
</table>

ОҚУ ЖҰМЫС ЖОСПАРЫ / РАБОЧИЙ УЧЕБНЫЙ ПЛАН / WORKING CURRICULUM

Технологиялық факультеті факультеті
Факультет Технологический факультет
Faculty Technological
Курс Year
на / for 2025-2026 оқу жылына / учебный год / academic year

Қазақ бөлімі / Казахское отделение / Kazakh group: 0 білім алушы/ обучающихся / students
Орыс бөлімі / Русское отделение / Russian group: 0 білім алушы/ обучающихся / students

Топ / группа / group _
Топ / группа / group

ОҚУ ПРОЦЕСІНІҢ ЖОСПАРЫ
ПЛАН УЧЕБНОГО ПРОЦЕССА
PLAN OF EDUCATIONAL PROCESS

Модульдің № / № модуля / Module №	Нөмірлеу № / № дисциплины / Discipline №	ОҚУ ПӘНДЕРІНІҢ АТАУЫ НАИМЕНОВАНИЕ УЧЕБНЫХ ДИСЦИПЛИН NAME OF TEACHING DISCIPLINES	Оқу семестрінің циклдегі (пәндері компоненті / компоненті по выбору) / Цикл учебных дисциплин (обязательный компонент / компонент по выбору) / Educational disciplines cycle (compulsory component /	Оқу пәндерінің циклы Блок учебных дисциплин Educational disciplines cycle	Семестр / semester	Кредиттер саны Количество кредитов Number of credits	Курстық жұмыс (жоба) Курсовая работа (проект) Course work (project)	Білім алушылардың жұмыс уақытының бюджеті сағатпен Бюджет рабочего времени (час) Budget of working time (hours)							Кафедра атауы Наименование кафедры Name of the department	Семестр бойынша бөлу Распределение по семестрам Distribution of semesters								Пән бойынша қорытынды бағалау (емтихан, дифференциалды сынақ, мемлекеттік емтихан, жоба және т.б.) Форма итогового контроля по дисциплине (экзамен, дифференцированный зачет, государственный экзамен, проект и др.) Final assessment form for the discipline (exam, differentiated credit, state exam, project, etc.)	Пән бойынша қорытынды бағалаудың форматы (ауызша, жазбаша, тестілік, шығармашылық және т.б.) Форма проведения итогового контроля по дисциплине (устно, письменно, тест, творческий и т. д.) The format of the final assessment for the discipline (orally, in writing, test, creative, etc.)
								Барлық сағат / Всего часов / Total hours	Аудиториялық жұмыс / Аудиторная работа / Class work				СӨЖ / СРОП / IWST	БАОЖ / СРО / IWS		1 КУРС / YEAR		2 КУРС / YEAR		3 КУРС / YEAR		4 КУРС / YEAR			
									Барлық аудит. сағат / Всего аудит. часов / Total classroom hours	оның ішінде / в том числе / including					1 Академиялық кезең / Academic period	2 Академиялық кезең / Academic period	3 Академиялық кезең / Academic period	4 Академиялық кезең / Academic period	5 Академиялық кезең / Academic period	6 Академиялық кезең / Academic period	7 Академиялық кезең / Academic period	8 Академиялық кезең / Academic period		
										ДІ / ЛК / Lec	ТСТ / СПЗ / SPL	ЗТС / ЛР / LC			Семестрдағы апталар саны Недель в семестре / Weeks in a semester		Семестрдағы апталар саны Недель в семестре / Weeks in a semester		Семестрдағы апталар саны Недель в семестре / Weeks in a semester		Семестрдағы апталар саны / Недель в семестре / Weeks in a semester			
															15	15	15	15	15	15	15	15		
															апталына аудиториялық сағат аудиторных часов в неделю / classroom hours per week		апталына аудиториялық сағат аудиторных часов в неделю / classroom hours per week		апталына аудиториялық сағат аудиторных часов в неделю / classroom hours per week		апталына аудиториялық сағат аудиторных часов в неделю / classroom hours per week			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
								/ /																	
Модуль / Module № 1	1	Экономика, кәсіпкерлік, құқық және қаржылық сауаттылық модулі (экономика және кәсіпкерлікті негіздері, құқық негіздері және сыбайлас жемқорлыққа қарсы мәдениет, қаржылық сауаттылық негіздері) Модуль экономики, предпринимательства, права и финансовой грамотности (основы экономики и предпринимательства, основы права и антикоррупционная культура, основы финансовой грамотности) Module of Economics, Entrepreneurship, Law and Financial Literacy (Fundamentals of Economics and Entrepreneurship, Fundamentals of Law and Anti-corruption Culture, Fundamentals of Financial Literacy)	ЖБП (МК) ООД (ВК) GED (EC)	MEPPEG 1101-26 MEPPEG 1101-26 MEPPEG 1101-26	2-қосымша академиялық кезең Дополнительный академический период 2 Additional term 2	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs									Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование Computer testing
	2	Шетел тілі Иностранный язык Foreign Language	ЖБП (МК) ООД (ОК) GED (CS)	ІҮа 1104-26 (1) ІҮа 1104-26 (1) ІҮа 1104-26 (1)	1	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs	0 + 3 + 0								Емтихан Экзамен Examination	Аралас Комбинированный Combined
	3	Қазақ (Орыс) тілі Казахский (Русский) язык Kazakh (Russian) Language	ЖБП (МК) ООД (ОК) GED (CS)	K(R)Ya 1105-26 (1) K(R)Ya 1105-26 (1) K(R)Ya 1105-26 (1)	1	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs	0 + 3 + 0								Емтихан Экзамен Examination	Аралас Комбинированный Combined
	4	Қазақстан тарихы История Казахстана History of Kazakhstan	ЖБП (МК) ООД (ОК) GED (CS)	ІК 1101-26 ІК 1101-26 ІК 1101-26	1	5		150	45	30	15		15	90	Барлық кафедралар Все кафедры All chairs	2 + 1 + 0								Мемлекеттік емтихан Государственная аттестация	Ауызша Устный Oral
	5	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	PhK 1107-26 (1) PhK 1107-26 (1) PhK 1107-26 (1)	1	2		60	30		30			30	Барлық кафедралар Все кафедры All chairs	0 + 2 + 0								Дифференциалдық сынақ Дифференцированный зачет	Басқа Другое More
	6	Қазақ (Орыс) тілі Казахский (Русский) язык Kazakh (Russian) Language	ЖБП (МК) ООД (ОК) GED (CS)	K(R)Ya 1105-26 (2) K(R)Ya 1105-26 (2) K(R)Ya 1105-26 (2)	2	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs		0 - 3 - 0							Емтихан Экзамен Examination	Аралас Комбинированный Combined
	7	Ақпараттық-коммуникациялық технологиялар Информационно-коммуникационные технологии Information and Communication Technologies	ЖБП (МК) ООД (ОК) GED (CS)	IKT 1106-26 IKT 1106-26 IKT 1106-26	2	5		150	45	15		30	15	90	Барлық кафедралар Все кафедры All chairs		1 - 0 - 2							Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование
	8	Шетел тілі Иностранный язык Foreign Language	ЖБП (МК) ООД (ОК) GED (CS)	ІҮа 1104-26 (2) ІҮа 1104-26 (2) ІҮа 1104-26 (2)	2	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs		0 - 3 - 0							Емтихан Экзамен Examination	Аралас Комбинированный Combined
	9	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	PhK 1107-26 (2) PhK 1107-26 (2) PhK 1107-26 (2)	2	2		60	30		30			30	Барлық кафедралар Все кафедры All chairs		0 - 2 - 0							Дифференциалдық сынақ Дифференцированный зачет	Басқа Другое More
	10	Философия Философия Philosophy	ЖБП (МК) ООД (ОК) GED (CS)	Fil 2102-26 Fil 2102-26 Fil 2102-26	3	5		150	45	30	15		15	90	Әлеуметтік-гуманитарлық пәндер Социально-гуманитарных дисциплин			2 - 1 - 0						Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование
	11	Әлеуметтік-саясаттану: білім модулі (әлеуметтану, саясаттану, мәдениеттану, психология) Модуль социально-политических знаний (политология, социология, культурология, психология) Module of Socio-Political Knowledge (Political Science, Sociology, Cultural Studies, Psychology)	ЖБП (МК) ООД (ОК) GED (CS)	MSPZ 2103-26 MSPZ 2103-26 MSPZ 2103-26	3	8		240	120	60	60		24	96	Барлық кафедралар Все кафедры All chairs			4 - 4 - 0						Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование Computer testing
	12	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	PhK 1107-26 (3) PhK 1107-26 (3) PhK 1107-26 (3)	3	2		60	30		30			30	Дене шынықтыру Физическое воспитание physical education			0 - 2 - 0						Дифференциалдық сынақ Дифференцированный зачет	Басқа Другое More
	13	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	PhK 1107-26 (4) PhK 1107-26 (4) PhK 1107-26 (4)	4	2		60	30		30			30	Барлық кафедралар Все кафедры All chairs				0 - 2 + 0					Дифференциалдық сынақ Дифференцированный зачет	Басқа Другое More
	14	Жоғары математика Высшая математика Higher Mathematics	БП (ЖК) БД (ВК) BD (EC)	VM 1201-26 VM 1201-26 VM 1201-26	1	5		150	45	15	30		15	90	Ақпараттық технология Информационные технологии Information technology	1 + 2 + 0								Емтихан Экзамен Examination	Жазбаша Письменный Writing
	15	Физика Физика Physics	БП (ЖК) БД (ВК) BD (EC)	Fiz 1203-26 Fiz 1203-26 Fiz 1203-26	1	4		120	45	15	15	15	3	72	Ақпараттық технология Информационные технологии Information technology	1 + 1 + 1								Емтихан Экзамен Examination	Жазбаша Письменный Writing
	16	Инженерлік және компьютерлік графика Инженерная и компьютерная графика Engineering Computer Graphics	БП (ЖК) БД (ВК) BD (EC)	IKG 2210-26 IKG 2210-26 IKG 2210-26	2	5		150	45	15		30	15	90	Ақпараттық технология Информационные технологии Information technology		1 - 0 - 2							Емтихан Экзамен Examination	Аралас Комбинированный Combined
	17	Инженерлік кәсіпке кіріспе Введение в инженерную деятельность Introduction to Engineering	БП (ЖК) БД (ВК) BD (EC)	VID 1202-26 VID 1202-26 VID 1202-26	2	3		90	30	15	15		6	54	Технология және стандартизация Технология и стандартизация Technology and standardization		1 - 1 - 0							Емтихан Экзамен Examination	Жазбаша Письменный Writing

	18	Теориялық және қолданбалы механика Теоретическая и прикладная механика Theoretical and Applied Mechanics	БП (ЖК) БД (ВК) BD (EC)	ТРМ 2205-26 ТРМ 2205-26 ТРМ 2205-26	3	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization			1 + 2 + 0						Емтихан Экзамен Examination	Жазбаша Письменный Writing
	19	Материалдар кедергісі Сопротивление материалов Strength of Materials	БП (ЖК) БД (ВК) BD (EC)	SM 2206-26 SM 2206-26 SM 2206-26	4	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization				1 + 2 + 0					Емтихан Экзамен Examination	Жазбаша Письменный Writing
	20	Тұрақты даму, экология және тіршілік қауіпсіздігі Устойчивое развитие, экология и безопасность жизнедеятельности Sustainable Development, Ecology, and Life Safety	БП (ЖК) БД (ВК) BD (EC)	UREBZh 3207-26 UREBZh 3207-26 UREBZh 3207-26	6	5		150	45	30	15		15	90	Барлық кафедралар Все кафедры All chairs						2 + 1 + 0			Емтихан Экзамен Examination	Жазбаша Письменный Writing
	21	Өндірістік практика 1 Производственная практика 1 Industrial Practice 1	БеП (ЖК) ПД (ВК) PD (EC)	PP 1-26 (Tmo) PP 1-26 (Tmo) PP 1-26 (Tmo)	4	5		150	0						Технология және стандартизация Технология и стандартизация Technology and standardization				5 апта / недель / weeks					Практика бойынша қорытынды баға Итоговая оценка по	Басқа Другое More
	22	Қайта өңдеу өндірістерінің машиналары мен аппараттары Машины и аппараты перерабатывающих производств Machines and Apparatus of Processing Industries	БеП (ЖК) ПД (ВК) PD (EC)	MAPP 3301-26 MAPP 3301-26 MAPP 3301-26	5	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization					1 - 2 - 0				Емтихан Экзамен Examination	Жазбаша Письменный Writing
	23	Машинажасау технологиясы Технология машиностроения Machinine Technology	БеП (ЖК) ПД (ВК) PD (EC)	TM 3302-26 TM 3302-26 TM 3302-26	5	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization					1 - 2 - 0				Емтихан Экзамен Examination	Басқа Другое More
	24	Технологиялық жабдық Технологическое оборудование Technological Equipment	БеП (ЖК) ПД (ВК) PD (EC)	TO 3303-26 TO 3303-26 TO 3303-26	6	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization						1 + 2 + 0			Емтихан Экзамен Examination	Басқа Другое More
	25	Өндірістік практика 2 Производственная практика 2 Industrial Practice 2	БеП (ЖК) ПД (ВК) PD (EC)	PP 2-26 (Tmo) PP 2-26 (Tmo) PP 2-26 (Tmo)	6	5		150	0						Технология және стандартизация Технология и стандартизация Technology and standardization						5 апта / недель weeks			Практика бойынша қорытынды баға Итоговая оценка по	Басқа Другое More
	26	Дипломалдындағы практика/ Өндірістік практика Преддипломная практика/Производственная практика Pre-Diploma Practice/ Industrial Practice	БеП (ЖК) ПД (ВК) PD (EC)	PDP PP 26 (Tmo) PDP PP 26 (Tmo) PDP PP 26 (Tmo)	8	7		210	0						Технология және стандартизация Технология и стандартизация Technology and standardization								7 апта / недель / weeks	Практика бойынша қорытынды баға Итоговая оценка по	Басқа Другое More
Барлығы модуль бойынша / Итого по модулю / Total for module						**120**		**3600**	**1035**	**300**	**660**	**75**	**273**	**1782**											
									//																
Модуль / Module № 2	1	Органикалық және бейорганикалық химия Органическая и неорганическая химия Organic and Inorganic Chemistry	БП (ТК) БД (КВ) BD (UC)	ONH 1201-26 ONH 1201-26 ONH 1201-26	1	4		120	45	15	15	15	3	72	Химия, химиялық технология және экология Химия, химическая технология и экология Chemistry, chemical technology and ecology	1 - 1 - 1								Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Жалпы химия Общая химия General Chemistry		OH 1204-26 OH 1204-26 OH 1204-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						4		120	45	15	15	15	3	72											
									//																
Модуль / Module № 3	1	Құрылымдық материалдар мен термоөңдеу Конструкционные материалы и термообработка Structural Materials and Heat Treatment	БП (ТК) БД (КВ) BD (UC)	KMTO 2202-26 KMTO 2202-26 KMTO 2202-26	3	5		150	45	15		30	15	90	Технология және стандартизация Технология и стандартизация Technology and standardization			1 - 0 - 2						Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Материалтану Материаловедение Materials Science		Mat 2202-26 Mat 2202-26 Mat 2202-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90											
									//																
Модуль / Module № 4	1	Робототехникалық жүйелер механикасы Механика робототехнических систем Mechanics of Robotic Systems	БП (ТК) БД (КВ) BD (UC)	MRS 2203-26 MRS 2203-26 MRS 2203-26	3	5		150	45	15	30		15	90	Ақпараттық технология Информационные технологии Information technology			1 - 2 - 0						Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Машиналар мен механизмдер теориясы Теория механизмов и машин Theory of Mechanisms and Machines		TMM 2203-26 TMM 2203-26 TMM 2203-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		**150**	**45**	**15**	**30**	**0**	**15**	**90**											
									//																
Модуль / Module № 5	1	Автоматика Автоматика Automation	БП (ТК) БД (КВ) BD (UC)	Av 2204-26 Av 2204-26 Av 2204-26	4	5		150	45	15		30	15	90	Технология және стандартизация Технология и стандартизация Technology and standardization				1 + 0 + 2					Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Электротехника Электротехника Electrical Engineering		EE 2204-26 EE 2204-26 EE 2204-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90											
									//																
Модуль / Module № 6	1	Машина жасауды стандарттау және сертификаттау Стандартизация и сертификация в машиностроении Standardization and Certification in Mechanical Engineering	БП (ТК) БД (КВ) BD (UC)	SSM 2205-26 SSM 2205-26 SSM 2205-26	4	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization				1 + 2 + 0					Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Өзара алмастыру, стандарттау және техникалық өлшемдер Взаимозаменяемость, стандартизация и технические измерения Interchangeability, Standardization and Technical Measurements		VzSTI 2205-26 VzSTI 2205-26 VzSTI 2205-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		**150**	**45**	**15**	**30**	**0**	**15**	**90**											
									//																
Модуль / Module № 7	1	Жылу техникасы Теплотехника Heat Engineering	БП (ТК) БД (КВ) BD (UC)	T 2206-26 T 2206-26 T 2206-26	4	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization				1 + 2 + 0					Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Өндірісті метрологиялық қамтамасыз ету Метрологическое обеспечение производства Metrological Support of Production		MOP 2206-26 MOP 2206-26 MOP 2206-26																					
	3	Жасанды интеллектке кіріспе (Minor) Введение в искусственный интеллект (Minor) Introduction to Artificial Intelligence (Minor)		VII 2200-26 (Minor 1) VII 2200-26 (Minor																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		**150**	**45**	**15**	**30**	**0**	**15**	**90**											
									//																
Модуль / Module № 8	1	ОШТП негіздері Основы ТРИЗ Fundamentals of TIPS	БП (ТК) БД (КВ) BD (UC)	OTRIZ 2207-26 OTRIZ 2207-26 OTRIZ 2207-26	4	3		90	30	15	15		6	54	Технология және стандартизация Технология и стандартизация Technology and standardization				1 + 1 + 0					Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Патенттану Патентоведение Patent Protection		Pat 2204-26 Pat 2204-26 Pat 2204-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						3		90	30	15	15	0	6	54											
									//																
Модуль / Module № 9	1	Тамақ өндірісі технологиясының негіздері Основы технологии пищевых производств Fundamentals of Food Production Technology	БП (ТК) БД (КВ)	OTPP 3208-26 OTPP 3208-26 OTPP 3208-26	5	5		150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация					1 - 2 - 0				Емтихан Экзамен	Жазбаша Письменный

Модуль	2	Гидропневматикалық машиналар мен жетектер Гидропневматические машины и приводы Hydropneumatic Machines and Drives		BD (UC)	GMP 3208-26 GMP 3208-26 GMP 3208-26											Технология және стандартизация Technology and standardization								Емтихан Examination	Жазбаша Письменный Writing
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 10									/ /																
	1	Конструкциялау негіздері Основы конструирования Fundamentals of Engineering Design		БП (ТК) БД (КВ) BD (UC)	OK 3209-26 OK 3209-26 OK 3209-26											Технология және стандартизация Технология и стандартизация Technology and standardization				1 – 2 – 0				Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Машина бөлшектері Детали машин Machine Elements			DM 3209-26 DM 3209-26 DM 3209-26		5	5	150	45	15	30		15	90										
	3	Жасанды нейрондық желілерді әзірлеу (Minor) Разработка искусственных нейронных сетей (Minor) Development of Artificial Neural Networks (Minor)			RNS 3209-26 (Элиот 2) RNS 3209-26 (Minor 2)																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 11									/ /																
	1	Тамақ өндірісінің зат-масса алмасу процестерінің машиналары мен жабдықтары Машины и оборудование тепло-массообменных процессов пищевых производств Heat and Mass Transfer Equipment of Food Production		БП (ТК) БД (КВ) BD (UC)	MOTMPPP 3210-26 MOTMPPP 3210-26 MOTMPPP 3210-26		5	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization				1 – 2 – 0				Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Тоңазытқыш техникасы және технологиясы Холодильная техника и технология Refrigeration Engineering and Technology			HTT 3210-26 HTT 3210-26 HTT 3210-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 12									/ /																
	1	Тамақ өнімдерінің қауіпсіздігі және сапасы Безопасность и качество пищевых продуктов Food Safety and Quality		БП (ТК) БД (КВ) BD (UC)	BKPP 3211-26 BKPP 3211-26 BKPP 3211-26		5	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization				1 – 2 – 0				Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Сұйық және газ механикасы, гидро және пневможетек Механика жидкости и газа, гидро-и пневмопривод Fluid Mechanics and Hydraulic and Pneumatic Drives			MZhGGP 3211-26 MZhGGP 3211-26 MZhGGP 3211-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 13									/ /																
	1	Сапа менеджменті жүйелері Системы менеджмента качества Quality Management Systems		БП (ТК) БД (КВ) BD (UC)	SMK 3206-26 SMK 3206-26 SMK 3206-26		6	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization					1 + 2 + 0			Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Машина жасау өнімдерінің сапасын басқару Управление качеством продукции машиностроения Quality Management in Mechanical Engineering			UKPM 3212-26 UKPM 3212-26 UKPM 3212-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 14									/ /																
	1	Тамақ өндірісінің машиналары мен аппараттары Машины и аппараты пищевых производств Machines and Apparatus of Food Production		БеП (ТК) ПД (КВ) PD (UC)	MAPP 3301-26 MAPP 3301-26 MAPP 3301-26		6	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization					1 + 2 + 0			Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Технологиялық машиналар мен аппараттарды жобалау Проектирование технологических машин и аппаратов Computer-Aided Machine Design			PTMA 3301-26 PTMA 3301-26 PTMA 3301-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 15									/ /																
	1	Объектілерді басқарудағы жасанды интеллект (Minor) Искусственный интеллект в управлении объектами (Minor) Artificial Intelligence in Object Management (Minor)		БеП (ТК) ПД (КВ) PD (UC)	IIUO 3301-26 (Элиот 3) IIUO 3301-26 (Minor 3)		6	5	150	45	15	30		15	90	Барлық кафедралар Все кафедры All chairs					1 + 2 + 0			Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Триботехника негіздері Основы триботехники Fundamentals of Tribology			OT 3302-26 OT 3302-26 OT 3302-26																				
	3	Тамақ өндірісінің гидромеханикалық процестерінің машиналары мен жабдықтары Машины и оборудование гидромеханических процессов пищевых производств Machines and Equipment for Hydromechanical Processes			MOGP 3302-26 MOGP 3302-26 MOGP 3302-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 16									/ /																
	1	Қайта өңдеу өндірістерінің аспирациялық және желдеткіш қондырғылары Аспирационные и вентиляционные установки перерабатывающих производств Aspiration and Ventilation Systems of Processing Industries		БеП (ТК) ПД (КВ) PD (UC)	ABUPP 4303-26 ABUPP 4303-26 ABUPP 4303-26		7	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization						1 – 2 – 0		Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Тамақ өндірісінің желдету қондырғылары және ауаны баптау жүйелері Вентиляционные установки и системы кондиционирования воздуха пищевых производств Ventilation Systems and Air Conditioning in Food Production			BUSKVPP 4303-26 BUSKVPP 4303-26 BUSKVPP 4303-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 17									/ /																
	1	Автоматтандырылған жобалау жүйесі Система автоматизированного проектирования Computer-Aided Design Systems		БеП (ТК) ПД (КВ) PD (UC)	SAP 4304-26 SAP 4304-26 SAP 4304-26		7	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization						1 – 2 – 0		Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Металл өңдеудегі автоматты басқару теориясы Теория автоматического управления в металлообработке Theory of Automatic Control in Manufacturing			TAUM 4304-26 TAUM 4304-26 TAUM 4304-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
Модуль / Module № 18									/ /																
	1	Машина жасаудағы болжамды диагностика Предиктивная диагностика в машиностроении Predictive Diagnostics in Mechanical Engineering		БеП (ТК) ПД (КВ) PD (UC)	PDM 4306-26 PDM 4306-26 PDM 4306-26		7	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация Technology and standardization						1 – 2 – 0		Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Технологиялық жабдықтың техникалық диагностикасы Техническая диагностика технологического оборудования Technical Diagnostics of Technological Equipment			TDTO 4306-26 TDTO 4306-26 TDTO 4306-26																				
Барлығы модуль бойынша / Итого по модулю / Total for module							5		150	45	15	30	0	15	90										
к / Module № 19									/ /																
	1	Өндірістік логистика Производственная логистика Production Logistics		БеП (ТК) ПД (КВ)	PL 4307-26 PL 4307-26 PL 4307-26		7	5	150	45	15	30		15	90	Технология және стандартизация Технология и стандартизация						1 – 2 – 0		Емтихан Экзамен	Жазбаша Письменный

Модуль	2	Тамақ өндірісінің машиналары мен аппараттарын есептеу және құрастыру Расчет и конструирование машин и аппаратов пищевых производств Design and Calculation of Machines and Apparatus of Food Production		ЕҚМАРР 4307-26 РКМАРР 4307-26 RKMAPP 4307-26											Технология және стандарттау Технология и стандартизация Technology and standardization									Емтихан Экзамен Examination	Жазбаша Письменный Writing
Барлығы модуль бойынша / Итого по модулю / Total for module						**5**		**150**	**45**	**15**	**30**	**0**	**15**	**90**													
Модуль / Module № 20																											
	1	Технологиялық машиналарды монтаждау және пайдалану Монтаж и эксплуатация технологических машин Installation and Operation of Technological Machines	БеП (ТК) ПД (КВ) PD (UC)	МЕТМ 4308-26 МЕТМ 4308-26 METM 4308-26	7	5		150	45	15	30		15	90	Технология және стандарттау Технология и стандартизация Technology and standardization							1 - 2 - 0		Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Технологиялық машиналарды жөндеу Ремонт технологических машин Repair of Technological Machines		RTM 4308-26 RTM 4308-26 RTM 4308-26																							
Барлығы модуль бойынша / Итого по модулю / Total for module						**5**		**150**	**45**	**15**	**30**	**0**	**15**	**90**													
Модуль / Module № 21																											
	1	Сынақ және сынақ жабдықтары Испытание и испытательное оборудование Testing and Testing Equipment	БеП (ТК) ПД (КВ) PD (UC)	ЖО 4305-26 ЖО 4305-26 ЖО 4305-26	7	5		150	45	15	30		15	90	Технология және стандарттау Технология и стандартизация Technology and standardization							1 - 2 - 0		Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Технологиялық машиналардың сапасы мен сенімділігі Качество и надежность технологических машин Quality and Reliability of Technological Machines		КЖТМ 4305-26 КЖТМ 4305-26 KNTM 4305-26																							
Барлығы модуль бойынша / Итого по модулю / Total for module						**5**		**150**	**45**	**15**	**30**	**0**	**15**	**90**													
Модуль / Module № 22																											
	1	Машина жасау және тамақ өнеркәсібінде жобалық менеджмент Проектный менеджмент в машиностроении и пищевой промышленности Project Management in the Food Industry	БеП (ТК) ПД (КВ) PD (UC)	РММПР 4309-26 РММПР 4309-26 PMMPP 4309-26	8	5		150	45	15	30		15	90	Қаржы және есеп Финансы и учет Finance and accounting								1 - 2 - 0	Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Кәсіпорынды экономика және жоспарлау Экономика и планирование на предприятии Enterprise Economics and Planning		ЕРР 4309-26 ЕРР 4309-26 EPP 4309-26																							
Барлығы модуль бойынша / Итого по модулю / Total for module						**5**		**150**	**45**	**15**	**30**	**0**	**15**	**90**													
Модуль / Module № 23																											
	1	Өнеркәсіптік қауіпсіздік Промышленная безопасность Industrial Safety	БеП (ТК) ПД (КВ) PD (UC)	РБ 4310-26 РБ 4310-26 РВ 4310-26	8	5		150	45	15	30		15	90	Технология және стандарттау Технология и стандартизация Technology and standardization								1 - 2 - 0	Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Қайта өңдеу өндірістері кәсіпорындарындағы қауіпсіздік техникасы Техника безопасности на предприятиях перерабатывающих производств Occupational Safety in Processing Industries		ТВРРР 4310-26 ТВРРР 4310-26 TBPPP 4310-26																							
Барлығы модуль бойынша / Итого по модулю / Total for module						**5**		**150**	**45**	**15**	**30**	**0**	**15**	**90**													
Модуль / Module № 24																											
	1	Тамақ өнеркәсібіндегі энергияны үнемдейтін технологиялар Энергосберегающие технологии в пищевой промышленности Energy-Saving Technologies in Food Industry	БеП (ТК) ПД (КВ) PD (UC)	ЕТРР 4311-26 ЕТРР 4311-26 ETPP 4311-26	8	5		150	45	15	30		15	90	Технология және стандарттау Технология и стандартизация Technology and standardization								1 - 2 - 0	Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Технологиялық үрдістерді автоматтандыру Автоматизация технологических процессов Automation of Technological Processes		АТР 4311-26 АТР 4311-26 ATP 4311-26																							
Барлығы модуль бойынша / Итого по модулю / Total for module						**5**		**150**	**45**	**15**	**30**	**0**	**15**	**90**													
Модуль / Module №		**Қорытынды аттестаттау / Итоговая аттестация / Final assessment**																									
	1	Қорытынды аттестаттау Итоговая аттестация Final assessment			2	8		240																6 апта недель weeks			
Барлығы модуль бойынша / Итого по модулю / Total for module						**128**		**240**	**0**	**0**	**0**	**0**	**0**	**0**													
БАРЛЫҒЫ МОДУЛЬДАР БОЙЫНША / ИТОГО ПО МОДУЛЯМ / TOTAL FOR MODULES						**240**		**3600**	**1020**	**345**	**600**	**75**	**324**	**2016**													

«ҚАЗАҚСТАН ИНЖИНИРИНГ»
«RESEARCH & DEVELOPMENT
ОРТАЛЫҒЫ» ЖШС

ТОО «RESEARCH &
DEVELOPMENT ЦЕНТР
«КАЗАХСТАН ИНЖИНИРИНГ»

LLP «RESEARCH AND DEVELOPMENT CENTER «KAZAKHSTAN ENGINEERING»

№ 02-3/303 2026ж. « 26 » 05

EXPERT OPINION
on the Educational Program
"6B07119 Technological Machines and Equipment (by branches)"
JSC "K. Kulazhanov Kazakh University of Technology and Business", Astana

1. General Characteristics of the Educational Program

The educational program "6B07119 Technological Machines and Equipment (by branches)" has been developed by JSC "K. Kulazhanov Kazakh University of Technology and Business" in accordance with the State Compulsory Standard of Higher Education, approved by the Order of the Minister of Science and Higher Education of the Republic of Kazakhstan No. 2 dated July 20, 2022. The program is based on the professional standard "Operation of Machines and Equipment in Industry" (Order of the Minister of Industry and Construction of the RK No. 220 dated June 23, 2025), as well as sectoral and regional atlases of professions and competencies.

The program aims to train specialists of the 6th level of the Sectoral Qualifications Framework (SQF) — Bachelors of Engineering and Technology. These specialists possess skills in managing the installation, repair, diagnostics, and service of technological machines and equipment using digital technologies and artificial intelligence to solve production tasks in the food and processing industries.

The program corresponds to:

- Level 6 of the International Standard Classification of Education (ISCED);
- Level 6 of the National Qualifications Framework (NQF);
- Level 6 of the Sectoral Qualifications Framework (SQF).

The target orientation of the educational program reflects the current demands of the regional and national labor markets regarding the training of engineers for maintenance, repair, operation, and digitalization of technological machines and equipment.

A distinctive feature of the program is the integration of traditional engineering training with modern competencies in predictive diagnostics, digital modeling, and the application of artificial intelligence algorithms. The introduction of an additional educational program (minor) "Modern Aspects of Artificial Intelligence Application" significantly expands the digital competencies of graduates.

2. Description and Evaluation of the Educational Program Structure

The educational program provides for the acquisition of at least 240 academic credits, which include cycles of:

- General education disciplines (56 credits);
- Basic disciplines (89 credits);
- Major disciplines (87 credits);
- Professional practice (17 credits);
- Final examination (8 credits).

The structure of the program covers the entire lifecycle of industrial equipment and includes the following key blocks:

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010000, Республика Казахстан
город Астана ул. М. Ауезова д.2, н.п.1
Тел: +7 /7172/ 32 21 24;
Факс: +7 /7172/ 32 21 39
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n.p. 1, h.2, Auezov st.
010000, Astana c., Republic of Kazakhstan
Tel.: +7 /7172/ 32 21 24;
Fax: +7 /7172/ 32 21 39
e-mail:info@rdke.kz

- **Technical service and reliability:** disciplines on scheduled maintenance, tribotechnical calculations, predictive analytics, diagnostics, and equipment repair (*Repair of Technological Machines*, *Technical Diagnostics*, *Predictive Diagnostics in Mechanical Engineering*, *Quality and Reliability of Technological Machines*);
- **Production organization and industrial safety:** modules on the installation, commissioning, and operation of machines using instrumentation and control devices in compliance with industrial safety standards;
- **Digitalization and design:** studying AI algorithms, creating digital twins, engineering and computer graphics, CAD, and automation of technological processes;
- **Modernization and energy efficiency:** monitoring of hydraulic and pneumatic systems, expert evaluation of rationalization proposals, and energy-saving technologies in the food industry.

The professional practice (consisting of three stages) ensures the sequential formation of practical skills directly at manufacturing enterprises, which aligns with the principle of practice-oriented learning.

The competency map of the program and the matrix linking learning outcomes with academic disciplines are correctly formulated, demonstrating a logical structure for building the graduate's professional, digital, and behavioral competencies. The learning outcomes (LO1–LO9) fully correspond to the job functions of the professional standard "Operation of Machines and Equipment in Industry" for the following positions: maintenance and repair engineer, equipment operation engineer, production organization engineer, and design/process engineer.

3. General Conclusion

The educational program "6B07119 Technological Machines and Equipment (by branches)" of JSC "K. Kulazhanov KazUTB" is relevant, high-tech, and practically significant.

JSC "NC "Kazakhstan Engineering", as an employer and partner in the defense-industrial complex and mechanical engineering sectors of the Republic of Kazakhstan, confirms the high demand for specialists of this profile. The program successfully combines classical engineering education with modern competencies in the digital transformation of production, predictive maintenance, and intelligent control systems. Graduates of this program will be able to effectively solve practical tasks at enterprises within the defense, mechanical engineering, food, and processing industries of Kazakhstan.

Based on the conducted expert evaluation, the educational program "6B07119 Technological Machines and Equipment (by branches)" **is recommended for implementation** in the educational process of JSC "K. Kulazhanov KazUTB" in the 2026–2027 academic year.

4. Recommendations for Improving the Educational Program

In order to enhance the quality of specialist training and increase their competitiveness in the labor market, it is recommended to:

1. **Expand the application of specialized software** for creating digital twins of technological machines and simulation modeling of production processes (*Siemens NX, ANSYS, MATLAB/Simulink*).
2. **Strengthen the practical component** in the field of using sensors and artificial intelligence systems for diagnostics of industrial equipment and the prevention of emergency production shutdowns.
3. **Integrate modules on monitoring and optimizing energy consumption** of industrial installations, taking into account energy saving and environmental safety requirements.
4. **Implement production case studies** based on real enterprises focusing on the analysis of equipment wear causes, the assessment of rationalization proposals, and the development of technical upgrade programs.

Acting Director General "R&D centre "Kazakhstan Engineering" LLP

_____ /A. Tulembaev /

_____ 2026

EXPERT OPINION

on the educational program
'6B07119 Technological Machines and Equipment (by branches)'
developed by JSC "K. Kulazhanov Kazakh University of Technology and Business"
(Astana, Republic of Kazakhstan)

Expert: Prof. h. c. Dr. sc. nat. (habil.) Peter Enders, Honorary Professor at the Kazakh National Pedagogical Abai University, Almaty, associate researcher at the Pavlodar Pedagogical Margulan University, former Associate Professor at the University of Applied Sciences Wildau (Germany), group leader at the German Physical Society (DPG)

1. General assessment and relevance of the program

The Bachelor's educational program '6B07119 Technological Machines and Equipment (by branches)' is designed to train competitive specialists for the modern industrial sector, specifically focusing on the food and processing industries.

The program successfully complies with international education standards, aligning with Level 6 of the International Standard Classification of Education (ISCED) and the National Qualifications Framework of the Republic of Kazakhstan. The strategic objective of the program meets the demands of the global and regional engineering labor markets, which increasingly require professionals capable of integrating classical engineering with intelligent automation.

2. Evaluation of the curriculum structure and content

The structure of the educational program (comprising 240 academic credits) is logically built and covers the entire lifecycle of industrial machinery. The curriculum represents a balanced combination of foundational engineering principles and advanced technological trends.

The following key strengths of the curriculum structure should be highlighted:

- **Integration of digital technologies:** The inclusion of disciplines dedicated to predictive analytics, computer-aided design (CAD/CAE), and digital twins demonstrates a forward-thinking approach.
- **The minor program:** The introduction of the minor program *'Modern Aspects of Artificial Intelligence Application'* is highly commendable. It effectively bridges the gap between traditional mechanical engineering and modern computer science, giving graduates a significant competitive advantage.
- **Practical orientation:** The sequence of professional practices ensures that theoretical knowledge in diagnostics, maintenance, and reliability (*repair of technological machines, technical diagnostics*) is properly consolidated in real-world industrial environments.

3. Compliance with Industry 4.0 and scientific trends

From an international perspective, the program correctly emphasizes the transition toward *Industry 4.0* paradigms. The focus on predictive diagnostics rather than reactive maintenance, the monitoring of hydraulic/pneumatic systems, and the application of machine learning algorithms for equipment failure prevention perfectly match current European and global engineering trends.

The learning outcomes (LO1–LO9) are well-defined, measurable, and directly address the core competencies required for modern maintenance, design, and operations engineers.

4. Recommendations for further development

To further enhance the international visibility and quality of the program, the following minor recommendations are proposed:

1. **Advanced software tooling:** Continue expanding the practical use of industry-standard simulation and digital twin software (such as ANSYS, Siemens NX, or MATLAB/Simulink) within laboratory tasks.
2. **Focus on green technologies:** Strengthen the focus on energy efficiency and eco-friendly monitoring systems for industrial equipment to align with global sustainability goals.
3. **International collaboration:** Encourage the inclusion of guest lectures or joint webinars with international experts in AI and smart engineering to broaden students' global perspective.

5. Conclusion

The educational program '6B07119 Technological Machines and Equipment (by branches)' offered by the K. Kulazhanov Kazakh University of Technology and Business is a well-structured, modern, and highly relevant program. It successfully matches the high standards of contemporary engineering education.

The program **is fully recommended for implementation** in the academic process for the upcoming 2026–2027 academic year.

Expert:



Prof. Dr. Peter Enders

Date: June 05, 2026

International Academic Advisor Confirmation/ Шетелдік кеңесшінің қатысуы/ Участие зарубежного консультанта

Educational Program/ Білім беру бағдарламасы/ Образовательная программа	6B07119 Technological machines and equipment (by industry) /6B07119 Технологиялық машиналар мен жабдықтар (салалар бойынша) /6B07119 Технологические машины и оборудование (по отраслям)
Level/ Дәрежесі/ Уровень	6
International Academic Advisor/ Шетелдік академиялық кеңесші/ Зарубежный консультант	Plotkin Juriy Romanovich / Плоткин Юрий Романович / Плоткин Юрий Романович
Academic degree/ Ғылыми дәреже/ Ученая степень	Doctor of Engineering Sciences / Инженерлік ғылымдарының докторы / Доктор инженерных наук
Position/ Лауазымы/ Должность	Professor / Профессор / Профессор
University/ Университет/ Университет	Hochschule für Wirtschaft und Recht Berlin / Берлин экономика және құқық жоғары мектебі / Берлинская высшая школа экономики и права
Country/ Ел/ Страна	Germany / Германия / Германия

Approved/ Келісілді/ Согласовано

The educational program has been reviewed and approved. The updated content of the educational program, the sequence of courses, and the revised learning outcomes (LO) have been developed in accordance with modern academic approaches.

Білім беру бағдарламасы қарастырылып, келісілді. Білім беру бағдарламасының жаңартылған мазмұны, пәндерді оқу реттілігі және жаңартылған оқу нәтижелері (ОН) заманауи академиялық тәсілдерге сәйкес әзірленді.

Образовательная программа рассмотрена и согласована. Актуализированное содержание образовательной программы, последовательность изучения дисциплин и обновленные результаты обучения (РО) сформированы с учетом современных академических подходов.

International Academic Advisor/ Шетелдік академиялық кеңесші/ Зарубежный консультант	J. Plotkin / Ю.Плоткин / Ю.Плоткин

Seal/ МО/ МП

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