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

EDUCATIONAL PROGRAM

6B05112 Biotechnology

code and name of the educational program

Level: *bachelor's*

Approved
by the Board of Directors of JSC
«K.Kulazhanov KazUTB»
"18" 03 2026, protocol №6

Recommended
by the Academic Council of JSC
«K.Kulazhanov KazUTB»
"27" 02 2026, protocol № 7

Astana, 2026

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Preface

The Educational Program "6B05112 Biotechnology" has been developed in accordance with the State Mandatory Standard of Higher and Postgraduate Education approved by Order №2 of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022. The program takes into account the requirements of the professional standards "Breeding Activities (Pedigree Management) in Animal Husbandry" dated October 26, 2022, and "Microbiologist-Laboratory Specialist" dated April 17, 2024, as well as the Atlas of New Professions and Competencies of the Republic of Kazakhstan for the profession of "Agrogeneticist", and the regional standard "Bioengineer in Animal Husbandry" (Kostanay Region, p. 118).

The educational program "6B05112 Biotechnology " was approved at the meeting of the Council on Academic Quality on "22" 09 2025, protocol № 3
Chairman Askarbekov E.B. _____

The educational program "6B05112 Biotechnology " was approved at the meeting of the Commission on Academic Quality of the Faculty on "19" 12 2025, protocol №. 3
Chairman Safuani Zh.Y. _____

The educational program "6B05112 Biotechnology " was developed and discussed at the meeting of the department "Technology and standardization " dated "19" 12 2025, protocol № 5
Head of the department Baitukenova S.B. _____

Approval sheet

Educational program "6B05112 Biotechnology "

AGREED:

Vice-Rector for Administrative Affairs		E. Askarbekov	"22" 09 2025 year
Head of Educational Programs Department	PP	B. Bayadilova	"22" 09 2025 year
Director of Scientific and Production Center of Ecological and Industrial Biotechnology LLP	PP	A. Usenova	"19" 12 2025 year
Director of «Kazakh research institute of processing and food industry» LLP	PP	Zh. Urazbaev	"18" 12 2025 year
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Chairman of the «Association of Halal Industry of Kazakhstan» ALE	PP	M. Sarsenbayev	"18" 12 2025 year
Director of «Capital managment» LLP	PP	D. Bahtiyarova	"18" 12 2025 year
Student of Group BT-231		A. Dildabayeva	"18" 12 2025 year

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	6B05 Natural Sciences, Mathematics and Statistics
Direction of training	6B051 Biological and Related Sciences
Number and name of the group of educational programs	B050 Biological and Related Sciences
Code and name of the educational program (EP)	6B05112 Biotechnology
Educational program profile	Higher natural science education
goal of the educational program	Comprehensive training of qualified, competitive bachelors, capable of using modern experimental methods of working with biological objects and modern equipment in the modernization of biotechnology industries
completion criterion of an educational program	At least 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 Science in Educational Program 6B05112 Biotechnology
Field of professional activity	Professional, scientific and technical activities
Types of professional activities	Organizational Managerial Production and technological Research
Object of professional activity	Manufacturing enterprises and laboratories of the food and processing industry; microbiological, pharmaceutical production; research institutes, environmental services and organizations, laboratories for quality control and safety of food and agricultural products.
Functions of professional activity	scientific research activities: - participation in the implementation of research and development results; - preparation of data for the preparation of reports, reviews, scientific publications; - participation in intellectual property protection events; organizational and managerial:

	- participation in the preparation of technical documentation (work schedules, technological instructions, safety instructions, applications for materials and equipment, business correspondence documents; - carrying out work on preparation for certification of new food products; production and technical: - management of individual stages of existing biotechnological productions; - organization of workplaces, their technological equipment, placement of technological equipment.

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	40
Component of choice	49
Professional practice	7
Cycle of major disciplines (MD)	**87**
University component	10
Component of choice	60
Professional practice	17
Final certification	**8**
Total	**240**

4 Additional educational programs (minor)

4.1 Minor « Modern aspects of artificial intelligence application»

Name of disciplines	Workload in academic credits
Introduction to Artificial Intelligence	5
Development of artificial neural networks	5
Artificial intelligence in object management	5
Total	15

5 Competency map of the educational program «6B05112 Biotechnology»

Competence map of the educational program	Learning outcome code	Learning Outcome (according to Bloom's Taxonomy)
Behavioral skills and personality traits (Softskills)	LO_{GEC1}	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_{GEC2}	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 key competencies in the fields of economics, law, entrepreneurship, and financial literacy for solving tasks in professional activities.
	LO2	Uses analytical methods to solve applied scientific problems.
	LO3	Analyzes molecular and cellular mechanisms to substantiate, develop, and improve biotechnological processes.
	LO4	Analyzes the main trends in biotechnology to conduct analytical, microbiological and sanitary-biological studies, assess the microflora of biological systems, as well as ensure preservation processes and quality control.
	LO5	Interprets the results of scientific research using modern methods, technologies, and artificial intelligence tools.
Digital competencies (Digital skills)	LO_{GEC3}	Promotes the development of information literacy through the mastery and use of modern in-formation and communication technologies in all areas of activity.
Professional skills (Hardskills)	LO6	Develops biotechnological approaches by applying modern methods and technologies to create new products and processes.
	LO7	Coordinates biotechnological process steps to explore, optimize and innovate biological systems using advanced digital artificial intelligence techniques to develop reference genome sequences and produce food, agricultural and veterinary products.
	LO8	Carries out production processes at biotechnology companies with the aim of improving the quality and efficiency of bioproducts, as well as ensuring their functionality, safety, and integrity.
	LO9	Designs biotechnological processes and equipment for enterprises, taking into account life safety, as well as the economic and environmental aspects of their operation and development.
	LO10	Designs biotechnological processes and equipment for enterprises, taking into account life safety, as well as the economic and environmental aspects of their operation and development.

6 Learning outcomes of the educational program and modules

Key competencies	Learning Outcomes (LO) for the educational program	Name of module	Learning outcomes for the module	Name of disciplines that form learning outcomes
Behavioral skills and personality traits (Softskills)	LO_{GEC1} - 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 Module of Socio-Political Knowledge (Political Science, Sociology, Cultural Studies, Psychology)
	LO_{GEC2} - 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 communi-cation in Kazakh, Russian, and foreign languages.	Foreign Language Kazakh (Russian) Language
Digital competencies (Digital skills)	LO_{GEC3} - Promotes the development of information literacy through the mastery and use of modern in-formation and communication technologies in all areas of activity.	Information and Communication Module	Possesses various types of information and communication technologies for searching, storing, processing, protecting, and disseminating information.	Information and Communication Technologies
Behavioral skills and personality traits (Softskills)	LO1- Forms key competencies in the fields of economics, law, entrepreneurship, and financial literacy for solving tasks in professional activities.	Self-education and personal development	He applies knowledge of economics and law, as well as business and financial literacy skills in his professional activities.	Module of Economics, Entrepreneurship, Law and Financial Literacy (Fundamentals of Economics and Entrepreneurship, Fundamentals of Law and Anti-corruption Culture, Fundamentals of Financial Literacy)
	LO2 - Uses analytical methods to solve applied scientific problems.	Natural sciences	Applies methods of mathematical, physico-chemical analysis in the organization of biotechnological production.	Higher Mathematics Physical and Colloidal Chemistry

	LO3 - Analyzes molecular and cellular mechanisms to substantiate, develop, and improve biotechnological processes.	Molecular biology	Integrates fundamental knowledge of the molecular and genetic mechanisms underlying the functioning of biological systems to solve professional tasks.	Biochemistry General and Molecular Genetics /Molecular Biology of The Cell Fundamentals of Genetic Engineering / Genetically Modified Organisms and Biosecurity
	LO4 - Analyzes the main trends in biotechnology to conduct analytical, microbiological and sanitary-biological studies, assess the microflora of biological systems, as well as ensure preservation processes and quality control.	The Theoretical Foundations of Biotechnology	Conducts microbiological analysis, laboratory monitoring, and assessment of the microflora of biological systems.	Introduction to Biotechnology Microbiology /Technical Microbiology Food Hygiene /Inclusive Approach in Nutritional Physiology Biotechnology of Microorganisms Objects of Biotechnology Virology
	LO5 - Interprets the results of scientific research using modern methods, technologies, and artificial intelligence tools.		Applies scientific research methodology and artificial intelligence tools for the analysis and modeling of biotechnological processes.	Fundamentals of Scientific Research in Biotechnology /Methodology of Biotechnological Research Introduction to Artificial Intelligence (Minor) Development of Artificial Neural Networks (Minor) Artificial Intelligence in Object Management (Minor) Production Practice I
Professional skills (Hardskills)	LO6 - Develops biotechnological approaches by applying modern methods and technologies to create new products and processes.	Applied biotechnology	Optimizes biotechnological processes for the production, processing, and application of bioproducts, taking into account microbiological, environmental, and nanobiotechnological aspects.	Biotechnology of Protein Substances /Microbiological Synthesis in Biotechnological Production Biotechnological Bases for the Processing of Vegetable Raw Materials /Theoretical Bases of Raw Materials and Products of Biotechnological Production Enzyme Preparations of the Food Industry

				/Biotechnology of Starter Cultures Applied Microbiology Environmental Biotechnology /Ecology and Biodiversity
	LO7 - Coordinates biotechnological process steps to explore, optimize and innovate biological systems using advanced digital artificial intelligence techniques to develop reference genome sequences and produce food, agricultural and veterinary products.		Develops biotechnological solutions based on modern digital methods for the production and quality control of food, agricultural, and veterinary products.	Biotechnology of Plants /Animal Biotechnology Food Additives and Biologically Active Substances /Mutagenesis with Fundamentals of Artificial Intelligence Industrial Biotechnology Biotechnology Fermentation Production /Wine Production Biotechnology and Winemaking Biotechnology of Bakery Production /Agrobiotechnology Biotechnology of Meat and Meat Products /Fundamentals of Veterinary Biotechnology with Elements of Artificial Intelligence
	LO8 - Carries out production processes at biotechnology companies with the aim of improving the quality and efficiency of bioproducts, as well as ensuring their functionality, safety, and integrity.		Improves biotechnological products and processes to enhance the functionality, safety, and preservation of food and bioproducts.	Food Biotechnology Biotechnology of Functional Food Products /Immunobiotechnology Biotechnology of Milk and Dairy Products /Biotechnology of Probiotics and Prebiotics Biotechnology of Canning Production /Cryopreservation of Biotechnological Objects Production Practice II

	LO9 - Designs biotechnological processes and equipment for enterprises, taking into account life safety, as well as the economic and environmental aspects of their operation and development.	Technological	Designs biotechnological processes and enterprises, taking into account sustainability, safety, and digital management methods.	Processes and Equipment in Biotechnology /Biotechnological Equipment Sustainable Development, Ecology and Life Safety Design of Biotechnological Enterprises /Design of Food Enterprises
	LO10 - Designs biotechnological processes and equipment for enterprises, taking into account life safety, as well as the economic and environmental aspects of their operation and development.		Carries out technological processes in accordance with established regulations using technical instruments to measure key parameters of biotechnological processes, as well as the properties of raw materials and products.	Standardization and Confirmation of Conformity /Metrology, Standardization and Certification Control and Estimation of Biotechnological Productions /Technochemical Control of Biotechnological Production Facilities Pre-graduate Practice/ Industrial practice
	LO11 - Forms conclusions and suggestions on improving and organizing work in the field of biotechnology, apply training skills in the field of biotechnology	The final assessment module	Uses modern scientific research methods to solve professional problems in the food industry and independently process, interpret and present the results of research and production activities in accordance with established forms. Perform and defend a thesis/graduation project or take a comprehensive exam.	Final certification

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 GEC1	LO GEC 2	LO G EC2	LO1	LO 2	LO 3	LO 4	LO 5	LO 6	LO7	LO 8	LO 9	LO 10
Cycle of general education disciplines Required component																
1	History of Kazakhstan	The purpose of the discipline shall be to give objective	5	+												

		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.															
2	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	8	+													

		leisure.															
3	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 relevant issues of contemporary global society.	5	+													
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	8	+													

		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.															
5	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		+												
6	Kazakh (Russian)	The purpose of the program - to teach the Kazakh (Russian)	10		+												

	Language	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 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.																
7	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 and transmitting information through digital technologies. Studies the fundamentals of working with information, digital technologies, and computer systems; the application of software, internet	5			+												

		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.															
CYCLE OF GENERAL EDUCATION DISCIPLINES University 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																		
9	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					+										
10	Introduction to Biotechnology	This discipline is designed to provide students with a foundational understanding of biotechnology as a scientific and industrial field. The curriculum covers the history of biotechnology, its main areas of focus, biotechnological processes, the use of microorganisms and cell cultures, and the production of bioproducts. As a result of mastering the discipline, the student applies the principles of biotechnology in professional	4							+								

		activities.															
11	Physical and Colloid Chemistry	The discipline is aimed at the study of the physical foundations of chemical processes, the properties of dispersed systems, and surface phenomena. The content includes chemical thermodynamics, chemical kinetics, phase equilibria, electrochemistry, properties of solutions, classification of colloidal systems, stability of dispersed systems, surface phenomena, and adsorption. As a result of studying the discipline, the student analyzes physicochemical regularities of processes and the properties of dispersed systems based on the methods of thermodynamics, kinetics, and colloid chemistry.	4					+									
12	Biochemistry	The discipline is aimed at studying the chemical composition of living organisms and the molecular mechanisms of life processes. The content includes the structure and functions of proteins, lipids, carbohydrates, and nucleic acids, enzymatic catalysis, bioenergetics, metabolism, as well as the regulation of biochemical processes. As a	4						+								

		result of studying the course, the student analyzes biochemical processes and the principles of functioning of living systems at the molecular level.															
13	Applied Microbiology	The discipline is aimed at developing knowledge in the field of general and food microbiology. The content includes opportunistic pathogenic microorganisms, sanitary microbiological investigations, laboratory diagnostics, identification methods, preparation of culture media, microbiological control, and assessment of food biosafety. Upon completion of the course, the student controls the microbiological safety of food products using laboratory diagnostics and microorganism identification methods.															
14	Biotechnology of Microorganisms	This discipline is designed to provide students with knowledge of microbiological processes and methods for producing industrial strains of microorganisms. The curriculum covers topics such as microbial synthesis of products, the production of fermented milk products, microbial proteins, organic acids, and polysaccharides, as well as	5							+							

		ensuring the safety of microbial strains. As a result of mastering the discipline, the student carries out microbiological processes for obtaining industrial strains of microorganisms for the production of bioproducts.														
15	Virology	The discipline is studied with the aim of developing knowledge about viruses, their structure, properties, and role in biological systems. The course content covers the classification of viruses, mechanisms of their replication, interaction with the host cell, as well as methods for diagnosing and controlling viral infections. As a result of mastering the discipline, the student analyzes viral processes and the methods for studying them in biotechnology and medicine.	3							+						
16	Food Biotechnology	The discipline is aimed at developing knowledge and skills in the application of biotechnological processes in food production. The content includes the use of microorganisms and enzymes, methods for process optimization, the development of functional food products, and the evaluation of production	5											+		

		efficiency. Upon completion of the course, the student applies biotechnological processes for the production and optimization of food products.															
17	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													+	
Cycle of basic disciplines Elective component																	
18	Microbiology	The discipline is aimed at developing systematic knowledge about microorganisms, their structure, physiology, and role in the biosphere and human activities. The content covers the morphology of microorganisms,	4							+							

		fundamentals of metabolism, growth and reproduction, elements of genetics and classification, as well as their importance in food and biotechnological systems and the role of analytical and microbiological methods in food preservation. Upon completion of the course, the student analyzes the structure, physiology, and practical significance of microorganisms in natural and industrial processes, as well as microbiological analysis methods for controlling the quality of preserved food products.														
19	Technical Microbiology	The discipline is studied with the aim of developing knowledge about the role of microorganisms in industrial and technological processes, the transformation of substances in nature and the food industry, the causes of alimentary diseases, and measures for their prevention. Methods of microbiological analysis, including staining, cultivation, and identification of microorganisms, are considered. Upon completion of the course, the student is able to carry out	4							+						

		sanitary and microbiological control in production.														
20	General and Molecular Genetics	The discipline is studied with the aim of developing knowledge about the genetic development of cells. Its content includes the material basis of inheritance, interactions of non-allelic genes, methods of mutational variability, genetics of ontogeny, and population genetics. As a result of mastering the discipline, the student applies genetic methods to analyze heredity and biotechnological processes.	5						+							
21	Molecular Biology of the Cell	The discipline is studied with the aim of developing an understanding of the mechanisms of molecular systems controlling biological processes and modern methods of molecular biology. Its content covers the properties of proteins, chromatin, genetic elements, and molecular-genetic processes used for biotechnological and industrial applications. As a result of mastering the discipline, the student applies molecular biology methods to analyze and obtain valuable bioproducts.	5						+							
22	Fundamentals of Scientific	The discipline is studied with the aim of developing knowledge of the methods and stages of	5								+					

	Research in Biotechnology	scientific research in biotechnology. Its content includes experimental planning, technical preparation of production, conducting research, data analysis, and drawing conclusions. As a result of mastering the discipline, the student applies scientific methods to plan, conduct, and analyze biotechnological research.															
23	Methodology of Biotechnological Research	The discipline is studied with the aim of developing knowledge of the principles of planning and conducting research and presenting its results in the form of scientific and technical documentation. Its content includes research methodology, justification of the relevance of the topic, analysis of scientific novelty, patent search, and processing data on biotechnological processes. As a result of mastering the discipline, the student analyzes biotechnological processes and their results in a scientific and technical form.	5								+						
24	Biotechnological Bases for the	The discipline is studied with the aim of developing knowledge about the processing of plant raw materials in biotechnological	5									+					

	Processing of Vegetable Raw Materials	production. Its content includes selection of raw materials, biotechnological processes, assessment of composition and nutritional value, as well as prospects for applying these methods. As a result of mastering the discipline, the student applies biotechnological methods for the processing and analysis of plant raw materials.														
25	Theoretical Bases of Raw Materials and Products of Biotechnological Production	The discipline is studied with the aim of developing knowledge on the rational processing of raw materials to obtain high-quality biotechnological products. Its content covers biotechnological processes, organization and structure of production, and main stages. As a result of mastering the discipline, the student applies biotechnological processes for raw material processing and ensuring product quality.	5									+				
26	Food Hygiene	The discipline is studied with the aim of developing knowledge on food hygiene and safety, the development of standards, and control methods. Its content includes analysis of food-related diseases, their prevention, as well as the application of artificial intelligence for monitoring and improving hygiene standards. As	5							+						

		a result of mastering the discipline, the student evaluates the quality and safety of food products using hygiene and control methods.															
27	Inclusive Approach in Nutritional Physiology	The discipline is studied with the aim of developing knowledge on the functional and hygienic aspects of nutrient interactions and their effects on the body. Its content includes food selection, assessment of nutritional value, providing the body with essential nutrients, applying dietary recommendations, and analyzing government policies. As a result of mastering the discipline, the student assesses the nutritional value of products, formulating evidence-based recommendations for rational nutrition.	5							+							
28	Processes and Equipment in Biotechnology	The discipline is studied with the aim of developing knowledge on technological processes and machine-apparatus schemes in biotechnological production. Its content covers the design and construction of apparatus, rational technological processes, their optimal parameters, process intensification, and equipment improvement. As a result of mastering the discipline, the	5													+	

		student applies technological processes and equipment for efficient and safe biotechnological production.															
29	Biotechnological Equipment	The discipline is studied with the aim of developing knowledge of the requirements for equipment in biotechnological production, its classification, design, and operating principles. Its content covers technological equipment for processing, storing, and transforming biological raw materials, including fermenters, separators, filters, and aeration tanks. As a result of mastering the discipline, the student applies biotechnological equipment for processing and storing biological raw materials.	5													+	
30	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	5								+						

		artificial intelligence technologies. As a result of studying the discipline, the student applies artificial intelligence technologies in various fields of professional activity.															
31	Biotechnology of Functional Food Products	The discipline is studied with the aim of developing basic knowledge of biotechnological principles for the development and production of functional food products. Its content includes methods for obtaining and stabilizing biologically active components, their incorporation into food products, and assessment of their functional properties. As a result of mastering the discipline, the student applies biotechnological methods for the development and production of functional food products.	5												+		
32	Immunobiotechnology	The discipline is studied with the aim of developing knowledge of the principles of using immune mechanisms and biotechnologies to create diagnostic, preventive, and therapeutic bioproducts. Its content includes the basics of the immune system, methods for producing monoclonal antibodies, vaccine and	5												+		

		immunodiagnostics technologies, and biotechnological approaches to developing immunobiological products. As a result of mastering the discipline, the student applies immunobiotechnology for the development of diagnostic, preventive, and therapeutic biopreparations.															
33	Fundamentals of Genetic Engineering	The discipline is studied with the aim of developing knowledge of molecular-genetic methods for creating recombinant DNA and genetically modified organisms. Its content includes molecular diagnostics, ex vivo and in vivo gene therapy, DNA sequencing, and amplification. As a result of mastering the discipline, the student applies genetic engineering methods to create and analyze recombinant DNA.	5						+								
34	Genetically Modified Organisms and Biosecurity	The discipline is studied with the aim of developing a systematic understanding of the production and application of genetically modified organisms (GMOs) and the biosafety of food raw materials. Its content includes recombinant DNA design, GMO safety control, international and national regulations, and methods for monitoring and	5						+								

		controlling the production and use of GMOs. As a result of mastering the discipline, the student assesses the risks and biosafety when using genetically modified organisms.															
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	Biotechnology of Plants	The discipline is studied with the aim of developing knowledge on the cultivation of plant cells, tissues, and organs on artificial media under aseptic conditions. Its content includes creating new plant forms and lines, assessing their resistance to stress factors,	5										+				

		methods for preserving biodiversity, and obtaining secondary metabolites. As a result of mastering the discipline, the student applies clonal propagation and biotechnological methods on plants.															
37	Animal Biotechnology	The discipline is studied to develop knowledge of methodological approaches in animal biotechnology, artificial insemination and cell cryopreservation. The content includes embryo transfer, embryo cultivation, embryo engineering, methods for producing biological products and vaccines, as well as skills in working with laboratory animals and specialized biotechnological equipment. As a result of mastering the discipline, the student applies biotechnological methods to improve animal productivity and genetic potential.	5										+			
38	Food Additives and Biologically Active Substances	The discipline is studied with the aim of developing knowledge on food additives, biologically active substances (BAS), and their impact on production and product quality. Its content includes slowing microbiological and oxidative spoilage, microbial	5										+			

		synthesis of biologically active substances, and their extraction from plant and animal cells. As a result of mastering the discipline, the student applies food additives and biologically active substances to improve product quality.															
39	Mutagenesis with Fundamentals of Artificial Intelligence	The discipline is aimed at developing systematic knowledge of the mechanisms and types of genetic changes, as well as the principles of coordinating biotechnological processes related to mutagenesis. It covers factors inducing mutations, methods for their detection, analysis, and interpretation, as well as approaches to using mutagenesis to obtain new genetic variants. Special attention is given to modeling and optimization of biological systems using modern computational methods, including the basics of artificial intelligence for predicting mutation consequences and improving the efficiency of biotechnological processes. Upon completion of the course, the student coordinates stages of biotechnological processes and performs analysis and modeling	5										+			

		of biological systems using elements of artificial intelligence.															
CYCLE OF PROFILE DISCIPLINES University Component																	
40	Objects of Biotechnology	The discipline is studied with the aim of enhancing knowledge of biological objects and principles of their application in biotechnology. Its content includes the structural and functional organization of organisms, selection of objects for industrial use, cultivation methods, and the creation of modified bio-objects. As a result of mastering the discipline, the student applies biological objects for their optimal use in biotechnological processes.	5							+						
41	Industrial Biotechnology	The discipline is studied to develop knowledge about the organization of biotechnological production. Its content covers the principles of industrial fermenters, process technologies, microbial protein synthesis, primary and secondary metabolites, as well as criteria for selecting methods to obtain the target product. As a result of mastering the discipline, the student applies microbiological synthesis technologies to obtain target bioproducts.	5										+			

CYCLE OF PROFILE DISCIPLINES Elective Component																	
42	Standardization and Confirmation of Conformity	The discipline is aimed at developing knowledge about the basics of the application of regulatory documents on standardization in industries that regulate the quality and safety of products. The content includes standardization methods, the application of technical regulations and standards, and product conformity assessment procedures. As a result of mastering the discipline, it ensures the quality and safety of products using regulatory documents and conformity assessment procedures to comply with established requirements in production processes.	5														+
43	Metrology, Standardization and Certification	The discipline is aimed at developing professional competencies in the field of metrology, standardization, and certification of products and processes. The content covers the fundamentals of measurements and ensuring their accuracy, national and international standards, as well as conformity assessment procedures and compliance with quality and safety requirements. Upon	5														+

		completion of the course, the student applies metrological support methods, standards, and regulatory requirements to ensure the quality and safety of biotechnological products.															
44	Modern Methods of Biotechnology	The discipline is studied with the aim of mastering biophysical, molecular genetic and immunological methods, as well as information technologies and artificial intelligence for the analysis of biotechnological data. The content covers the study of membrane structures, isolation and purification of proteins and nucleic acids, as well as the application of digital technologies and machine learning algorithms to increase the accuracy and efficiency of biological systems analysis. As a result of mastering the discipline, the learner applies modern biotechnological methods and artificial intelligence tools for in-depth analysis of biomolecules and forecasting their properties.	5								+					
45	Nanobiotechnology	The discipline is studied with the aim of mastering biotechnological and molecular-biological principles for working with atoms and molecules to solve nanotechnological tasks. Its	5								+					

		content covers bionanomaterials, molecular complexes, biomolecular sensing, self-replication, as well as analytical methods such as mass spectrometry, microscopy, and nuclear magnetic resonance. As a result of mastering the discipline, the student applies nanobiotechnological methods to analyze biomolecules and biomaterials.														
46	Artificial Intelligence in Object Management (Minor)	The discipline is aimed at forming knowledge and skills in the application of 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.	5								+					
47	Biotechnology Fermentation	The discipline is studied with the aim of developing knowledge on the fermentation system, chemical, microbiological,	5										+			

	Production	colloidal, biochemical, and thermophysical processes at various stages of fermentation production. Its content covers microbial cell metabolism, methods of food fermentation, and ways to improve biotechnological processes. As a result of mastering the discipline, the student manages fermentation processes using methods to optimize fermentation for the production of food bioproducts.														
48	Wine Production Biotechnology and Winemaking	The discipline is studied with the aim of developing knowledge on the physicochemical, kinetic, biochemical, and microbiological properties of wines, their nutritional value, and methods for quality assessment. Its content covers wine classification, production technology, defects and diseases, biochemical fermentation processes, maturation, storage, and the use of winemaking by-products. As a result of mastering the discipline, the student evaluates the biotechnological processes of winemaking and the quality of wine.	5										+			
49	Biotechnology of	The discipline is studied with the aim of developing knowledge on	5											+		

	Canning Production	biotechnological methods for producing canned products and processing agricultural raw materials. Its content covers raw material preparation, biotechnological methods of preservation, microbiological processes, and production stages. As a result of mastering the discipline, the student develops biotechnological processes in canning production, taking their optimization into account.														
50	Cryopreservation of Biotechnological Objects	The discipline is studied with the aim of developing knowledge and skills in the cryopreservation of biotechnological objects to maintain their viability and ensure effective use. Its content covers freezing and thawing methods, the use of cryoprotectors, storage conditions at low temperatures, and the assessment of the viability of preserved biomaterials. As a result of mastering the discipline, the student analyzes cryopreservation processes and the viability of biotechnological objects.	5											+		
51	Biotechnology of Bakery	The discipline aims to develop knowledge of biotechnological processes in baking and the use	5										+			

	Production	of microorganisms and enzymes to improve product quality. The content includes sourdough, yeast, enzymes, as well as methods for process optimization. Upon completion of the discipline, the student analyzes biotechnological processes in bakery production, taking into account product quality, nutritional value, and efficiency.															
52	Agrobiotechnology	The discipline is aimed at developing knowledge of biotechnological methods for improving agricultural efficiency and the rational use of biological resources. The content includes microbial preparations for crop production, biological plant protection, measures to improve soil fertility, the role of microorganisms in agroecosystems, as well as the basics of genomic selection, sequencing methods, and the development of reference genome sequences for analyzing genetic traits of plants and animals. Upon completion of the course, the student applies biotechnologies to improve agricultural efficiency and the sustainability of agroecosystems.	5										+				

53	Biotechnology of Milk and Dairy Products	The discipline is studied with the aim of developing knowledge on biotechnological production of milk and dairy products. Its content covers biochemical processes, methods of product acquisition, and quality control. As a result of mastering the discipline, the student analyzes the biotechnological processes of milk and dairy products, including quality control and the development of new products.	5											+		
54	Biotechnology of Probiotics and Prebiotics	The discipline is studied with the aim of developing knowledge and skills in the development, production, and application of probiotics and prebiotics to maintain human health and improve the functional properties of products. Its content covers microbiology and biochemical fundamentals, production methods, stabilization and quality control, as well as practical application. As a result of mastering the discipline, the student evaluates probiotics and prebiotics to improve the functional properties and safety of products.	5											+		
55	Biotechnology of Meat and	The discipline is studied with the aim of developing knowledge on biotechnological processes in	5										+				

	Meat Products	meat production and mastering methods of treating raw materials to improve product quality, safety, and nutritional value. Its content covers raw material processing stages, the use of innovative technologies for process optimization, and the application of microorganisms and enzymes. As a result of mastering the discipline, the student analyzes the biotechnological processes of meat and meat products, considering quality and safety.															
56	Fundamentals of Veterinary Biotechnology with Elements of Artificial Intelligence	The discipline is designed to develop understanding of biotechnological methods for obtaining veterinary biopreparations with elements of artificial intelligence, used for the prevention, diagnosis, and treatment of infectious animal diseases. The content of the course covers the principles of antibiotic production, technologies for producing biologically active substances, recombinant protein production, vaccine manufacturing technologies, as well as antibody-based biopreparations using modern digital and intelligent methods for analysis and	5										+				

		optimization of biotechnological processes. As a result of mastering the course, the student develops biotechnological methods for obtaining veterinary biopreparations using elements of artificial intelligence.														
57	Biotechnology of Protein Substances	The discipline is studied with the aim of developing knowledge on microbiological synthesis of products from protein-carbohydrate raw materials. Its content covers the biosynthesis of primary and secondary metabolites, production of microbial protein and feed biomass, raw material processing technologies, and the use of industrial biotechnological equipment. As a result of mastering the discipline, the student analyzes the microbiological processes of protein product synthesis.	5									+				
58	Microbiological Synthesis in Biotechnological Production	The discipline is studied with the aim of developing knowledge on microbiological processes of bio-product synthesis and the use of microorganisms in industrial biotechnological systems. Its content covers methods of microorganism cultivation, production of primary and secondary metabolites, microbial	5									+				

		protein, and other industrial products. As a result of mastering the discipline, the student controls the microbiological synthesis of bioproducts in industrial biotechnological systems.															
59	Enzyme Preparations of the Food Industry	The discipline is studied with the aim of developing knowledge on enzyme preparations and their application for optimizing food technological processes. Its content covers enzyme production, selection and implementation, development of innovative technologies, and analysis of their impact on product quality, safety, and efficiency. As a result of mastering the discipline, the student applies enzyme preparations to optimize food technological processes.	5									+				
60	Biotechnology of Starter Cultures	The discipline is studied with the aim of developing knowledge and skills in assessing the stability of yeast cultures and their application in the production of bio-products. Its content covers probiotic yeasts, culture selection, nutrient media optimization, cultivation methods, and determination of technological parameters. As a	5									+				

		result of mastering the discipline, the student analyzes the properties of starter cultures to improve the quality of bioproducts.															
61	Control and Estimation of Biotechnological Productions	The discipline is studied with the aim of developing knowledge and skills in monitoring and assessing the efficiency of biotechnological processes. Its content covers quality control methods at all stages of production, modern analytical and diagnostic technologies, and ensuring product safety. As a result of mastering the discipline, the student monitors biotechnological processes, considering product quality.	5														+
62	Technochemical Control of Biotechnological Production Facilities	The discipline is studied with the aim of developing knowledge about technochemical control in biotechnological production and its role in ensuring the quality of bio-products. Its content covers the organization of control, determination of chemical composition, acidity, mineral content, calculation of energy value, and process control schemes. As a result of mastering the discipline, the student controls the techno-chemical indicators of biotechnological	5														+

		productions to ensure product quality and safety.														
63	Environmental Biotechnology	The discipline is studied with the aim of developing knowledge about environmental issues and biotechnological methods for addressing them. Its content covers water purification, waste processing, biogas production, bioremediation, bioindication of pollution, as well as composting and biodegradation of plant raw materials. As a result of mastering the discipline, the student applies biotechnological methods for environmental purification and reduction of ecological pollution.	5									+				
64	Ecology and Biodiversity	The discipline is studied with the aim of forming knowledge about biodiversity and methods of its analysis at various levels of organization of the biosphere. The content covers monitoring the stability of ecosystems, threats to biodiversity, principles of its conservation, specially protected areas, as well as provisions of international agreements. As a result of mastering the discipline, the student assesses the state of ecosystems using methods for biodiversity conservation.	5									+				

65	Design of Biotechnological Enterprises	The discipline is designed to develop knowledge and skills in the design of biotechnological food industry enterprises and the rational selection of equipment. Its content covers design methods, layout of technological lines, analysis of production flows, approaches to reconstruction, and efficiency improvement. As a result of mastering the discipline, the student develops design solutions for biotechnological enterprises, including an assessment of production system efficiency.	5													+	
66	Design of Food Enterprises	The discipline is designed to develop knowledge and skills in designing food production enterprises and the rational organization of technological lines. The content covers design methods, production capacity calculations, analysis of raw material and product flows, requirements for enterprise reconstruction, as well as economic and environmental aspects of design. As a result of mastering the course, the student analyzes production processes of food enterprises with regard to their efficiency and safety using modern design approaches and														+	

		tools.														

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_{GEC1}	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.	Oral survey, colloquium, testing, control work, creative assignment, types of tasks and assignments, abstract, essay, presentation, debate, role-playing games, round table, case assignment, report, message, self-assessment, mutual assessment, project work, video project protection, online test, interactive assignment, checklist, SWOT analysis, mini-survey, etc.	Lecture – visualization, interactive lecture, lecture-conversation, case-study method, role-playing games, team-group method, remote and online methods, etc.
LO_{GEC2}	Capable of interpersonal social and professional communi-cation in Kazakh, Russian, and foreign languages.	Oral survey, testing, control work, dictation, exposition, essay, essay, abstract, message, project work, presentation, debate, role-playing games, round table, text analysis, text translation, annotation, vocabulary work, grammar exercises, case assignment, crossword, online quiz, video protection, self-assessment, mutual assessment, mini-survey, etc.	Interactive method, project method, discussion, peer-to-peer learning method, portfolio method, remote methods, etc.
LO_{GEC3}	Possesses various types of information and communication technologies for searching, storing, processing, protecting, and disseminating information.	Testing, control work, practical work, project work, project defense, presentation, electronic portfolio, oral survey, creative assignment, abstract, essay, online test, interactive assignment, work in Google Docs or Microsoft Office, Excel assignments, programming, graphics, case assignment, web-quest, video protection, debate, mini-survey, self-assessment, mutual assessment, observation map, checklist, digital resource analysis.	Practice-oriented method, demonstration, interactive method, problem-based method, methods of programmed learning, online courses, etc.

LO1	He applies knowledge of economics and law, as well as business and financial literacy skills in his professional activities.	Essays, abstracts, debates, role-playing, round table discussion, analysis of regulatory documents, situational tasks, work with diagrams and tables, mini-survey, questionnaire, financial calculations, modeling of economic processes, business plan, budgeting, case analysis on anti-corruption culture, etc.	Case method, project method, flip class, situational analysis method, lecture-conversation, collaborative learning, verbal method, etc.
LO2	Applies methods of mathematical, physico-chemical analysis in the organization of biotechnological production.	Control work, laboratory work, practical work, multi-level tasks and assignments, situational task solving, individual and group tasks, oral interview, mini-survey, work in a virtual laboratory, etc.	Group work with illustrative material, the method of the suspended group "buzz group"
LO3	Integrates fundamental knowledge of the molecular and genetic mechanisms underlying the functioning of biological systems to solve professional tasks.	Testing, control work, laboratory work, practical work, multi-level tasks and assignments, situational task solving, case assignment, computational and graphical work, experimental data analysis, project work, laboratory report protection, report, message, abstract, essay, presentation, modeling of biological processes, work in a virtual laboratory, oral survey, mini-survey, etc.	Lecture-visualization, demonstration, practice-oriented method, laboratory work, project method, case method, discussion, guiding lecture, etc.
LO4	Conducts microbiological analysis, laboratory monitoring, and assessment of the microflora of biological systems.	Testing, control work, laboratory work, practical work, multi-level tasks and assignments, project work, project protection, laboratory report protection, analysis of production or laboratory parameters, modeling of biotechnological processes, presentation, essay, abstract, report, communication, oral interview, mini-survey, round table, role-playing game (researcher, technologist, quality controller, etc.)	Guiding lecture, interactive lecture, research method, etc.
LO5	Applies scientific research methodology and artificial intelligence tools for the analysis and modeling of biotechnological processes.	Brainstorming, testing, control work, laboratory work, practical work, analysis of scientific publications, work with databases (Scopus, Web of Science, etc.), case assignment, solving research situational problems, scientific essay, abstract, report, message, scientific article (mini-version),	Interactive lecture, demonstration of software solutions, demonstration, research method, practice-oriented method, project method, process modeling, case method, flip class, etc.

		presentation, project work, defense of a scientific project, annotation and review of sources, development of a research plan, oral interview, mini-survey, round table, role-playing game (research group, expert commission, etc.)	
LO6	Optimizes biotechnological processes for the production, processing, and application of bioproducts, taking into account microbiological, environmental, and nanobiotechnological aspects.	Laboratory work, practical work, testing, written examination, problem-solving tasks, case study, analysis of microbiological synthesis flowcharts, calculation of fermentation parameters, development of bioproduct production schemes, evaluation of enzyme preparation efficiency, assessment of starter culture quality, environmental safety analysis of biotechnological processes, project work, laboratory report defense, project defense, presentation, report, oral questioning, mini-survey.	Interactive lecture, visualization lecture, laboratory practicum, practice-oriented learning, research method, case-study method, project-based learning, analysis of industrial situations, biotechnological process modeling, small-group work, problem-based learning.
LO7	Develops biotechnological solutions based on modern digital methods for the production and quality control of food, agricultural, and veterinary products.	Case study, laboratory work, practical work, project work, project defense, biotechnological process modeling, genetic data analysis, work with digital databases, development of AI-based biotechnological solutions, analysis of mutagenesis results, preparation of production flow charts, presentation, report, oral questioning.	Interactive lecture, research method, digital modeling, work with bioinformatics databases, project-based learning, case-study method, flipped classroom, problem-based learning, demonstration of AI software tools, small-group work.
LO8	Improves biotechnological products and processes to enhance the functionality, safety, and preservation of food and bioproducts.	Laboratory work, practical work, development of functional product formulations, technological product chart, calculation of nutritional and biological value, sensory analysis, evaluation of probiotic product quality, product safety analysis, case study, project work, laboratory report defense, project defense, presentation, oral questioning.	Laboratory practicum, interactive lecture, visualization lecture, research method, case-study method, project-based learning, technological process modeling, problem-based learning, discussion, analysis of industrial situations.
LO9	Designs biotechnological processes and enterprises, taking into account	Testing, written examination, practical work, calculation and graphical assignment, design of	Visualization lecture, practice-oriented learning, project method,

	sustainability, safety, and digital management methods.	technological schemes, development of process flow diagrams, equipment capacity calculations, production flow analysis, project work, project defense, business planning, financial and economic calculations, presentation, oral questioning.	analysis of industrial case studies, production process modeling, work with regulatory and technical documentation, problem-based learning, group work.
LO10	Carries out technological processes in accordance with established regulations using technical instruments to measure key parameters of biotechnological processes, as well as the properties of raw materials and products.	Testing, written examination, practical work, analysis of regulatory documents (GOST, ST RK, TR CU), preparation of conformity assessment documentation, development of production control schemes, analysis of techno-chemical indicators, metrological calculations, case study, presentation, role-playing (auditor, expert, quality controller), practical work defense.	Interactive lecture, practice-oriented learning, analysis of regulatory documents, case-study method, laboratory practicum, development of quality control schemes, simulation of certification procedures, group work, problem-based learning.
LO11	Uses modern scientific research methods to solve professional problems in the food industry and independently process, interpret and present the results of research and production activities in accordance with established forms. Perform and defend a thesis/graduation project or take a comprehensive exam.	Thesis/project defense, comprehensive examination, defense of pre-diploma internship report, presentation of research results, publication of research outcomes (if available), expert evaluation of the final work, oral examination, written examination.	Research method, project-based learning, thesis supervision and consultations, independent student work, scientific seminar, problem-based learning, discussion, defense of research results.

9 Correlation of learning outcomes of the educational program with the labor functions of professional standards (if any)

Name of the professional standards used	Professions at level 6 and/or 7 of the SQF	Labor functions	Tasks	Learning outcomes for the educational program
"Librarian-Microbiologist" Appendix 9 to the Order of the Minister of Culture and Information of the Republic of Kazakhstan №151 dated April 17,	Librarian-Microbiologist	JF 1. Scientific conservation and preservation of library collections. Conducting analytical and microbiological	Task 1. Mycological and microbiological monitoring of library collections.	LO4 - Analyzes the main trends in biotechnology to conduct analytical, microbiological and sanitary-biological studies, assess the microflora of biological

2024		activities in the field of conservation and restoration of documents.		systems, as well as ensure preservation processes and quality control.
"Breeding Activities (Animal Breeding) in Livestock Farming" Order of the Minister of Agriculture of the Republic of Kazakhstan №419 dated November 7, 2025	Research Engineer	JF 1. Solving research tasks within the implementation of a scientific (scientific-technical, innovative) project.	Task 1. Performing individual assignments within the framework of solving research tasks.	LO5 - Interprets the results of scientific research using modern methods, technologies, and artificial intelligence tools.

10 Graduate model

GRADUATE MODEL			
Professional Standard: Librarian-Microbiologist Breeding Activities (Animal Breeding) in Livestock Farming Atlas of New Professions and Competencies of the Republic of Kazakhstan: Agrogeneticist Regional Standard of Kostanay Region: Bioengineer in Animal Husbandry	Competencies (soft skills, digital skills)		
	Attributes of a graduate	knowledge	Skills
	Adheres to professional ethics and complies with biosafety requirements. Is capable of applying modern achievements in biotechnology in scientific and industrial activities. Uses modern microbiological, analytical, and sanitary-biological research methods. Works effectively with laboratory equipment and digital technologies. Plans, organizes, and conducts scientific research. Analyzes research results and makes evidence-based decisions. Applies artificial intelligence methods and digital tools for processing experimental data. Is able to work effectively in a team, uphold the principles of academic integrity, and continuously improve professional qualifications.	1. Fundamentals of general, industrial, and sanitary microbiology. 2. Modern methods of biotechnological research. 3. Methods for the cultivation of microorganisms. 4. Regulatory documents in the field of biotechnology and quality control. 5. Methods for the preservation (conservation) of biological materials. 6. Fundamentals of molecular biology, genetics, and breeding. 7. Statistical methods for processing research results. 8. Modern information	1. Conduct microbiological and sanitary-biological investigations. 2. Operate laboratory equipment and analytical instruments. 3. Perform quality control of raw materials and finished products. 4. Plan, organize, and conduct laboratory experiments. 5. Interpret the results of scientific research. 6. Apply modern biotechnological methods to solve professional tasks. 7. Use digital technologies and artificial intelligence methods for data analysis. 8. Comply with biosafety and occupational health and safety requirements.

		technologies and artificial intelligence applications in biotechnology.	
	Professional skills (hard skills)		
	Conducts microbiological, sanitary-microbiological, molecular biological, and biochemical analyses. Applies modern methods for the cultivation of microorganisms, cell cultures, and other biological materials. Performs laboratory quality control of raw materials, semi-finished products, and finished products. Uses PCR (Polymerase Chain Reaction), electrophoresis, spectrophotometry, chromatography, and other advanced analytical techniques. Carries out the isolation, purification, and analysis of biologically active compounds. Monitors biotechnological processes and controls technological parameters. Performs statistical analysis and interpretation of research results. Uses specialized software, databases, and Laboratory Information Management Systems (LIMS). Applies digital technologies, bioinformatics methods, and artificial intelligence tools for processing experimental data. Develops recommendations for improving biotechnological processes and enhancing product quality. Prepares laboratory, production, and scientific documentation in accordance with regulatory requirements. Complies with biosafety, environmental protection, and occupational health and safety requirements in professional practice.	

ОҚУ ЖҰМЫС ЖОСПАРЫ / РАБОЧИЙ УЧЕБНЫЙ ПЛАН / WORKING CURRICULUM

Технологиялық факультеті факультеті
Факультет Технологический факультет
Faculty Technological
Курс / Year 0
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 №	Пәннің № / № дисциплины / Discipline №	ОҚУ ПӘНДЕРІНІҢ АТАУЫ НАИМЕНОВАНИЕ УЧЕБНЫХ ДИСЦИПЛИН NAME OF TEACHING DISCIPLINES	Оқу пәнлерінің циклы (міндетті компонент / таңдау компонент) Цикл учебных дисциплин (обязательный компонент / компонент по выбору) Educational disciplines cycle (compulsory component / component of choice)	Оқу пәндерінің коды Код учебной дисциплины Educational discipline code	Семестр / semester	Кредиттер саны Количество кредитов Number of credits	Курстық жұмыс (жоба) Курсовая работа (проект) Course work (project)	Білім алушылардың жалпы уақытының бюджеті сағаттың 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 бақылау (емтихан, дифференциалды сынақ, мемлекеттік сынақ, жобаны қорғау 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 бақылаудың формасы (ауызша, жазбаша, тестілік, шығармалық 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	БАЖБ / 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 / Академических недель / Academic weeks	2 Академиялық кезең / Академических недель / Academic weeks	3 Академиялық кезең / Академических недель / Academic weeks	4 Академиялық кезең / Академических недель / Academic weeks	5 Академиялық кезең / Академических недель / Academic weeks	6 Академиялық кезең / Академических недель / Academic weeks	7 Академиялық кезең / Академических недель / Academic weeks	8 Академиялық кезең / Академических недель / Academic weeks		
										Д / ЛК / Lec	СТС / СПЗ / SPL	ЖС / ЛЗ / LC				Семестрдағы апталар саны / Недель в семестре / Weeks in a semester									
																15	15	15	15	15	15	15	15		
																аптасына аудиториялық сағат / аудиторных часов в неделю / classroom hours per week									
																17	18	19	20	21	22	23	24		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16									25	26
Модуль / Module № 1	1	Шетел тілі Иностранный язык Foreign Language	ЖБП (МК) ООД (ОК) GED (CS)	IYa 1104-26 (1) IYa 1104-26 (1) IYa 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
	2	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
	3	Қазақстан тарихы История Казахстана History of Kazakhstan	ЖБП (МК) ООД (ОК) GED (CS)	IK 1101-26 IK 1101-26 IK 1101-26	1	5		150	45	30	15		15	90	Барлық кафедралар Все кафедры All chairs	2 + 1 + 0								Емтихан Экзамен Examination	Аралас Комбинированный Combined
	4	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	FhK 1107-26 (1) FhK 1107-26 (1) FhK 1107-26 (1)	1	2		60	30		30			30	Дене шынықтыру Физическое воспитание physical education	0 + 2 + 0								Меңгеретін экзамен Государственная аттестация Attestation	Ауызша Устный Oral
	5	Шетел тілі Иностранный язык Foreign Language	ЖБП (МК) ООД (ОК) GED (CS)	IYa 1104-26 (2) IYa 1104-26 (2) IYa 1104-26 (2)	2	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs		0 + 3 + 0							Дифференциалды сынақ Дифференцированный зачет Mark	Баға Другое Mark
	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		0 + 3 + 0							Емтихан Экзамен Examination	Аралас Комбинированный Combined
	8	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	ЖБП (МК) ООД (ОК) GED (CS)	MEPPFG 1101-26 MEPPFG 1101-26 MEPPFG 1101-26	2	5		150	45		45		15	90	Барлық кафедралар Все кафедры All chairs		1 + 0 + 2							Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование Computer testing
	9	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	FhK 1107-26 (2) FhK 1107-26 (2) FhK 1107-26 (2)	2	2		60	30		30			30	Барлық кафедралар Все кафедры All chairs		0 + 3 + 0							Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование Computer testing
	10	Әлеуметтік-саяси ғылым модулі (әлеуметтану, саясаттану, мәдениеттану, психология) Модуль социально-политических знаний (социология, 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	Дене шынықтыру Физическое воспитание physical education		0 + 2 + 0							Дифференциалды сынақ Дифференцированный зачет Mark	Баға Другое Mark
	11	Философия Философия Philosophy	ЖБП (МК) ООД (ОК) GED (CS)	FI 2102-26 FI 2102-26 FI 2102-26	3	5		150	45	30	15		15	90	Барлық кафедралар Все кафедры All chairs			4 + 4 + 0						Емтихан Экзамен Examination	Баға Другое Mark
	12	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	FhK 1107-26 (3) FhK 1107-26 (3) FhK 1107-26 (3)	3	2		60	30		30			30	Әлеуметтік-гуманитарлық пәндер Социально-гуманитарных дисциплин Socio-humanitarian disciplines			2 + 1 + 0						Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование Computer testing
	13	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CS)	FhK 1107-26 (4) FhK 1107-26 (4) FhK 1107-26 (4)	4	2		60	30		30			30	Дене шынықтыру Физическое воспитание physical education			0 + 2 + 0						Дифференциалды сынақ Дифференцированный зачет Mark	Баға Другое Mark
	14	Биотехнологияға кіріспе Введение в биотехнологию Introduction to Biotechnology	БП (ОК) БД (ВК) BD (EC)	VB 1201-26 VB 1201-26 VB 1201-26	1	4		120	45	15	30		3	72	Барлық кафедралар Все кафедры All chairs				0 + 2 + 0					Дифференциалды сынақ Дифференцированный зачет Mark	Баға Другое Mark
	15	Физикалық және коллоидтық химия Физическая и коллоидная химия Physical and Colloid Chemistry	БП (ОК) БД (ВК) BD (EC)	FKH 1202-26 FKH 1202-26 FKH 1202-26	1	4		120	45	15	15	15	3	72	Технология және стандарттандыру Технология и стандартизация Technology and standardization	1 + 2 + 0								Емтихан Экзамен Examination	Жазбаша Письменный Writing
	16	Жоғары математика Высшая математика Higher Mathematics	БП (ОК) БД (ВК) BD (EC)	VM 1201-26 VM 1201-26 VM 1201-26	1	5		150	45	15	30		15	90	Химия, химиялық технология және экология Химия, химическая технология и экология Chemistry, chemical technology and ecology	1 + 1 + 1								Емтихан Экзамен Examination	Жазбаша Письменный Writing
	17	Биология Биология Biochemistry	БП (ОК) БД (ВК) BD (EC)	Bh 1202-26 Bh 1202-26 Bh 1202-26	2	4		120	45	15	15	15	3	72	Аппаратты технология Информационные технологии Information technology	1 + 2 + 0								Емтихан Экзамен Examination	Жазбаша Письменный Writing
	18	Қолданбалы микробиология Прикладная микробиология Applied Microbiology	БП (ОК) БД (ВК) BD (EC)	PM 2203-26 PM 2203-26 PM 2203-26	3	5		150	45	15		30	15	90	Барлық кафедралар Все кафедры All chairs		1 + 1 + 1							Емтихан Экзамен Examination	Жазбаша Письменный Writing
	19	Микропрограммалар биотехнологиясы Биотехнология микроорганизмов Biotechnology of Microorganisms	БП (ОК) БД (ВК) BD (EC)	BM 2204-26 BM 2204-26 BM 2204-26	4	5		150	45	15		30	15	90	Технология және стандарттандыру Технология и стандартизация Technology and standardization			1 + 0 + 2						Емтихан Экзамен Examination	Жазбаша Письменный Writing
	20	Вирусология Вирусология Virology	БП (ОК) БД (ВК) BD (EC)	B 2205-26 B 2205-26 B 2205-26	4	3		90	30	15	15		6	54	Технология және стандарттандыру Технология и стандартизация Technology and standardization			1 + 1 + 0						Емтихан Экзамен Examination	Жазбаша Письменный Writing
	21	Тағамдық биотехнология Пищевая биотехнология Food Biotechnology	БП (ОК) БД (ВК) BD (EC)	PB 3206-26 PB 3206-26 PB 3206-26	5	5		150	45	15	30		15	90	Технология және стандарттандыру Технология и стандартизация Technology and standardization									Емтихан Экзамен Examination	Жазбаша Письменный Writing
	22	Тұрақты даму, экология және тіршілік қауіпсіздігі Устойчивое развитие, экология и безопасность жизнедеятельности Sustainable Development, Ecology and Life Safety	БП (ОК) 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					1 + 2 + 0				Емтихан Экзамен Examination	Жазбаша Письменный Writing
	23	Өндірістік практика 1 Производственная практика 1 Industrial Practice 1	БеП (ОК) ПД (ВК) PD (EC)	PP 1 26 (B) PP 1 26 (B) PP 1 26 (B)	4	5		150	0												2 + 1 + 0				Емтихан Экзамен Examination	Компьютерлік тестілеу Компьютерное тестирование Computer testing
	24	Биотехнология нысандары Объекты биотехнологии Objects of Biotechnology	БеП (ОК) ПД (ВК) PD (EC)	OB 3301-26 OB 3301-26 OB 3301-26	5	5		150	45	15	30		15	90	Технология және стандарттандыру Технология и стандартизация Technology and standardization				5 апта / жедель / weeks					Практика бойынша қорытынды баға Итоговая оценка по практике Practice mark	Баға Другое Mark
	25	Өндірістік биотехнология Промышленная биотехнология Industrial Biotechnology	БеП (ОК) ПД (ВК) PD (EC)	PB 3302-26 PB 3302-26 PB 3302-26	6	5		150	45	15	30		15	90	Технология және стандарттандыру Технология и стандартизация Technology and standardization					1 + 2 + 0				Емтихан Экзамен Examination	Жазбаша Письменный Writing
	26	Өндірістік практика 2 Производственная практика 2 Industrial Practice 2	БеП (ОК) ПД (ВК) PD (EC)	PP 2 26 (B) PP 2 26 (B) PP 2 26 (B)	6	5		150	0						Технология және стандарттандыру Технология и стандартизация Technology and standardization						1 + 2 + 0			Емтихан Экзамен Examination	Жазбаша Письменный Writing
	27	Диплом алдындағы практика/ Өндірістік практика Преддипломная практика/Производственная практика Pre-graduate Practice/ Industrial Practice	ПД (ВК) BD (EC)	PDP/PP 26 (B) PDP/PP 26 (B)	8	7		210	0						Технология және стандарттандыру Технология и стандартизация Technology and standardization						5 апта / жедель / weeks			Практика бойынша қорытынды баға Итоговая оценка по практике Practice mark	Баға Другое Mark
Барлығы модуль бойынша / Итого по модулю / Total for module					123			3690	1080	315	645	120	264	1836								7 апта / жедель / weeks		Практика бойынша қорытынды баға Итоговая оценка по практике Practice mark	Баға Другое Mark
Модуль / Module № 2	1	Техникалық микробиология Техническая микробиология Technical Microbiology	БП (ТК) БП (ТК)	TM 1201-26 TM 1201-26 TM 1201-26	3	4		120	45	15		30	3	72	Технология және стандарттандыру Технология и стандартизация Technology and standardization		1 + 0 + 2							Емтихан Экзамен	Жазбаша Письменный

Модуль	2	Микробиология Микробиология Microbiology	BD (UC)	Mb 1201-26 Mb 1201-26 Mb 1201-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						4		120	45	15	0	30	3	72																	
Модуль / Module № 3		//																													
	1	Жалпы және молекулалық генетика Общая и молекулярная генетика General and Molecular Genetics	БП (ТК) БД (КВ) BD (UC)	OMG 2202-26 OMG 2202-26 OMG 2202-26	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
	2	Жасушалық молекулалық биология Молекулярная биология клетки Molecular Biology of the Cell		MBK 2202-26 MBK 2202-26 MBK 2202-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 4		//																													
	1	Биотехнологиядағы ғылыми зерттеулердің негіздері Основы научных исследований в биотехнологии Fundamentals of Scientific Research in Biotechnology	БП (ТК) БД (КВ) BD (UC)	ONIB 2203-26 ONIB 2203-26 ONIB 2203-26	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
	2	Биотехнологиялық зерттеу әдістемесі Методология биотехнологических исследований Methodology of Biotechnological Research		MBI 2203-26 MBI 2203-26 MBI 2203-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 5		//																													
	1	Өсімдік шикізатын өңдеудің биотехнологиялық негіздері Биотехнологические основы переработки растительного сырья Biotechnological Bases for the Processing of Vegetable Raw Materials	БП (ТК) БД (КВ) BD (UC)	BOPRS 2204-26 BOPRS 2204-26 BOPRS 2204-26	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	Биотехнологиялық өндіріс шикізаттары мен өнімдерінің теориялық негіздері Теоретические основы сырья и продуктов биотехнологических производств Theoretical Bases of Raw Materials and Products of Biotechnological Production		TOSPBP 2204-26 TOSPBP 2204-26 TOSPBP 2204-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 6		//																													
	1	Тамақтану гигиенасы Гигиена питания Food Hygiene	БП (ТК) БД (КВ) BD (UC)	GP 2205-26 GP 2205-26 GP 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	Тамақтану физиологиясы және нутрициология Физиология питания и нутрициология Inclusive Approach in Nutritional Physiology		PhPN 2205-26 PhPN 2205-26 PhPN 2205-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 7		//																													
	1	Жасанды интеллектке кіріспе (Минор) Введение в искусственный интеллект (Минор) Introduction to Artificial Intelligence (Minor)	БП (ТК) БД (КВ) BD (UC)	VII 2200-26 (Minor 1) VII 2200-26 (Minor 1) VII 2200-26 (Minor 1)	4	5		150	45	15	30		15	90	Барлық кафедралар Все кафедры All chairs			1 + 2 + 0					Емтихан Экзамен Examination	Басқа Другое More
	2	Биотехнологиялық жүйелер Биотехнологическое оборудование Biotechnological Equipment		BIO 2207-26 BIO 2207-26 BIO 2207-26																											
	3	Биотехнологиялық үрдістер мен жабдықтар Процессы и аппараты в биотехнологии Processes and Equipment in Biotechnology		PAB 2207-26 PAB 2207-26 PAB 2207-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 8		//																													
	1	Функционалды тамақ өнімдерінің биотехнологиясы Биотехнология функциональных пищевых продуктов Biotechnology of Functional Food Products	БП (ТК) БД (КВ) BD (UC)	BFPP 3208-26 BFPP 3208-26 BFPP 3208-26	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	Иммунобиотехнология Иммунобиотехнология Immunobiotechnology		ImB 3208-26 ImB 3208-26 ImB 3208-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 9		//																													
	1	Гендік инженерия негіздері Основы генной инженерии Fundamentals of Genetic Engineering	БП (ТК) БД (КВ) BD (UC)	OGI 3209-26 OGI 3209-26 OGI 3209-26	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	Гендік-модификацияланған организмдер және биобезпенділік Генетически модифицированные организмы и биобезопасность Genetically Modified Organisms and Biosecurity		GMOB 3209-26 GMOB 3209-26 GMOB 3209-26																											
	3	Жасанды нейрондық желілерді кіріктіру (Минор) Разработка искусственных нейронных сетей (Минор) Development of Artificial Neural Networks (Minor)		RINS 3200-26 (Minor 2) RINS 3200-26 (Minor 2) RINS 3200-26 (Minor 2)																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 10		//																													
	1	Өсімдіктер биотехнологиясы Биотехнология растений Biotechnology of Plants	БП (ТК) БД (КВ) BD (UC)	BR 3210-26 BR 3210-26 BR 3210-26	5	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	Жануарлар биотехнологиясы Биотехнология животных Animal Biotechnology		BZh 3210-26 BZh 3210-26 BZh 3210-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90																	
Модуль / Module № 11		//																													
	1	Тағамдық қоспалар және биологиялық белсенді заттар Пищевые добавки и биологически активные вещества Food Additives and Biologically Active Substances	БП (ТК) БД (КВ) BD (UC)	PDBAV 3211-26 PDBAV 3211-26 PDBAV 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	Жасанды интеллект негіздерімен мутагенез Мутагенез с основами искусственного интеллекта Mutagenesis with Fundamentals of Artificial Intelligence		MOI 3211-26 MOI 3211-26 MOI 3211-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 12		//																													
	1	Стандартау және сәйкестікті растау Стандартизация и подтверждение соответствия Standardization and Confirmation of Conformity	БеП (ТК) ПД (КВ) PD (UC)	SPS 3301-26 SPS 3301-26 SPS 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	Метрология, стандартау және сертификаттау Метрология, стандартизация и сертификация Metrology, Standardization and Certification		MSS 3301-26 MSS 3301-26 MSS 3301-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 13		//																													
	1	Объектілерді басқарудағы жасанды интеллект (Минор) Искусственный интеллект в управлении объектами (Минор) Artificial Intelligence in Object Management (Minor)	БеП (ТК) ПД (КВ) PD (UC)	IIUO 3301-26 (Minor 3) IIUO 3301-26 (Minor 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	Басқа Другое More
	2	Биотехнологиядағы заманауи әдістер Современные методы в биотехнологии Modern Methods of Biotechnology		SMB 3302-26 SMB 3302-26 SMB 3302-26																											
	3	Наноинженерология Наноинженерология Nanoengineering		NIN 3302-26 NIN 3302-26 NIN 3302-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90																	
Модуль / Module № 14		//																													
	1	Шарап және спирт алкоголь өндірісінің биотехнологиясы Биотехнология производства вина и виноделие Wine Production Biotechnology and Winemaking	БеП (ТК) ПД (КВ) PD (UC)	BPVV 3303-26 BPVV 3303-26 BPVV 3303-26	6	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	Ашыту өндірісінің биотехнологиясы Биотехнология бродильных производств Biotechnology Fermentative Production		BBP 3303-26 BBP 3303-26 BBP 3303-26																											
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90																	
Жк №		//																													

Модуль / Module № 15	1	Консерві өндірісінің биотехнологиясы Биотехнология консервного производства Biotechnology of Canning Production	БеП (ТК) ПД (КВ) PD (UC)	BKP 4304-26 BKP 4304-26 BKP 4304-26	7	5		150	45	15		30	15	90	Технология және стандарттау Технология и стандартизация Technology and standardization								1 + 0 + 2	Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Биотехнологиялық объектілерді криоконсервациялау Криоконсервация биотехнологических объектов Cryopreservation of Biotechnological Objects		KBO 4304-26 KBO 4304-26 KBO 4304-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90											
							/ /																		
Модуль / Module № 16	1	Нан өнімдерінің биотехнологиясы Биотехнология хлебопекарного производства Biotechnology of Bakery Production	БеП (ТК) ПД (КВ) PD (UC)	BHP 4305-26 BHP 4305-26 BHP 4305-26	7	5		150	45	15		30	15	90	Технология және стандарттау Технология и стандартизация Technology and standardization								1 + 0 + 2	Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Агробиотехнология Агробиотехнология Agrobiotechnology		Ab 4305-26 Ab 4305-26 Ab 4305-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90											
							/ /																		
Модуль / Module № 17	1	Пробиотиктер мен пребиотиктердің биотехнологиясы Биотехнология пробиотиков и пребиотиков Biotechnology of Probiotics and Prebiotics	БеП (ТК) ПД (КВ) PD (UC)	BPP 4306-26 BPP 4306-26 BPP 4306-26	7	5		150	45	15		30	15	90	Технология және стандарттау Технология и стандартизация Technology and standardization								1 + 0 + 2	Емтихан Экзамен Examination	Жазбаша Письменный Writing
	2	Сүт және сүт өнімдерінің биотехнологиясы Биотехнология молока и молочных продуктов Biotechnology of Milk and Dairy Products		BMMP 4306-26 BMMP 4306-26 BMMP 4306-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	0	30	15	90											
							/ /																		
Модуль / Module № 18	1	Жасанды интеллект элементтері бар ветеринарлық биотехнология негіздері Основы ветеринарной биотехнологии с элементами искусственного интеллекта Fundamentals of Veterinary Biotechnology with Elements of Artificial Intelligence	БеП (ТК) ПД (КВ) PD (UC)	OBBEII 4307-26 OBBEII 4307-26 OBBEII 4307-26	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	Ет және ет өнімдерінің биотехнологиясы Биотехнология мяса и мясных продуктов Biotechnology of Meat and Meat Products		BMMP 4307-26 BMMP 4307-26 BMMP 4307-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90											
							/ /																		
Модуль / Module № 19	1	Ақуыз заттардың биотехнологиясы Биотехнология белковых веществ Biotechnology of Protein Substances	БеП (ТК) ПД (КВ) PD (UC)	BBV 4308-26 BBV 4308-26 BBV 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	Биотехнологиялық өндірістердегі микробиологиялық синтез Микробиологический синтез в биотехнологических производствах Microbiological Synthesis in Biotechnological Production		MSBP 4308-26 MSBP 4308-26 MSBP 4308-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90											
							/ /																		
Модуль / Module № 20	1	Тағам өнеркәсібінің ферменттік препараттары Ферментные препараты пищевой промышленности Enzyme Preparations of the Food Industry	БеП (ТК) ПД (КВ) PD (UC)	FPPP 4309-26 FPPP 4309-26 FPPP 4309-26	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	Ашытқы дақылдарының биотехнологиясы Биотехнология заквасочных культур Biotechnology of Starter Cultures		BZK 4309-26 BZK 4309-26 BZK 4309-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90											
							/ /																		
Модуль / Module № 21	1	Биотехнологиялық өндірісті бақылау және бағалау Контроль и оценка биотехнологических производств Control and Estimation of Biotechnological Productions	БеП (ТК) ПД (КВ) PD (UC)	KOBP 4310-26 KOBP 4310-26 KOBP 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	Биотехнологиялық өндірістерді технохимиялық бақылау Технохимический контроль биотехнологических производств Technochemical Control of Biotechnological Production Facilities		THKBP 4310-26 THKBP 4310-26 THKBP 4310-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90											
							/ /																		
Модуль / Module № 22	1	Экологиялық биотехнология Экологическая биотехнология Environmental Biotechnology	БеП (ТК) ПД (КВ) PD (UC)	EBt 4311-26 EBt 4311-26 EBt 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	Экология және биоалуантүрлілік Экология и биоразнообразие Ecology and Biodiversity		EB 4311-26 EB 4311-26 EB 4311-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90											
							/ /																		
Модуль / Module № 23	1	Биотехнологиялық кәсіпорындарды жобалау Проектирование биотехнологических предприятий Design of Biotechnological Enterprises	БеП (ТК) ПД (КВ) PD (UC)	PBP 4312-26 PBP 4312-26 PBP 4312-26	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	Тамақ кәсіпорындарын жобалау Проектирование пищевых предприятий Design of Food Enterprises		PPP 4312-26 PPP 4312-26 PPP 4312-26																					
Барлығы модуль бойынша / Итого по модулю / Total for module						5		150	45	15	30	0	15	90											
Модуль / Module № 24		Қорытынды аттестация / Итоговая аттестация / Final assessment																							
	1	Қорытынды аттестаттау Итоговая аттестация Final Assessment			2	8		240																	
Барлығы модуль бойынша / Итого по модулю / Total for module						131		240	0	0	0	0	0	0									6 апта / недель / weeks		
БАРЛЫҒЫ МОДУЛЬДАР БОЙЫНША / ИТОГО ПО МОДУЛЯМ / TOTAL FOR MODULES						240		3510	990	330	480	180	318	1962											

EXPERT OPINION

of the Bachelor's Educational Program "6B05112 – Biotechnology" under the field of study "6B051 – Biological and Related Sciences" of K. Kulazhanov Kazakh University of Technology and Business JSC

Academic Year 2026–2027

During the expert review of the educational program, an assessment was conducted of the curriculum structure, the content of the educational modules, the intended learning outcomes, and their compliance with the current requirements for training specialists in the field of biotechnology.

It should be noted that the educational program has been developed based on a competency-based approach and ensures the sequential study of fundamental biological disciplines followed by specialized professional training. Such a structure contributes to the development of students' systematic scientific thinking and their ability to apply acquired knowledge in solving practical problems.

A significant advantage of the program is the inclusion of courses focused on modern areas of biotechnology, including molecular biology, cell technologies, bioengineering, industrial and food biotechnology, as well as digital technologies and elements of artificial intelligence. This demonstrates the university's commitment to keeping pace with global scientific trends and meeting the demands of high-tech industries.

The analysis of the learning outcomes demonstrates their close relationship with the professional competencies expected of graduates. The academic disciplines are logically organized according to the stages of training and provide opportunities for developing skills in laboratory research, experimental data analysis, biotechnology process design, and compliance with biosafety requirements.

Particular attention should be paid to the practice-oriented component of the educational program. Industrial internships, students' research activities, and the completion of a bachelor's thesis create favorable conditions for integrating theoretical knowledge with practical experience and facilitate graduates' successful adaptation to the professional environment.

At the same time, it is advisable to continue developing students' academic mobility, expand cooperation with research institutes and foreign universities, and increase the number of courses related to bioinformatics, big biological data analysis, and modern genome editing technologies.

Conclusion

Based on the results of the expert evaluation, it can be concluded that the educational program "6B05112 – Biotechnology" complies with the requirements of the higher education system of the Republic of Kazakhstan, ensures the achievement

of the declared learning outcomes, has a modern scientific and methodological foundation, and is recommended for implementation in the educational process.

Expert:

Associate Professor, Department of Biotechnology and Microbiology
L.N. Gumilyov Eurasian National University
Candidate of Biological Sciences — A.U. Tuyakbayeva

ҚОЛЫН КУӘЛАНДЫРАМЫН
«Л.Н. Гумилев атындағы Еуразия ұлттық университеті» КеАҚ
ҚЫЗМЕТКЕРЛЕР БАСҚАРМАСЫ
«____» _____ ж.
қолы _____

EXPERT OPINION

of the Bachelor's Educational Program "6B05112 – Biotechnology" under the field of study "6B051 – Biological and Related Sciences" of K. Kulazhanov Kazakh University of Technology and Business JSC

Academic Year 2026–2027

As an employer and expert representing «Belasar Er-N» LLP, an analysis of the Bachelor's degree educational program "6B05112 – Biotechnology", implemented at K. Kulazhanov Kazakh University of Technology and Business, has been conducted.

The educational program has been developed in accordance with the State Compulsory Standard of Higher Education of the Republic of Kazakhstan and is aimed at training competitive specialists who are in demand in research, industrial, and innovative activities in the field of modern biotechnology.

The objective of the educational program meets the current requirements of the labor market and is focused on preparing specialists possessing professional, research, digital, and managerial competencies necessary for employment at biotechnology enterprises. The program structure demonstrates a logical sequence of fundamental and specialized courses, ensuring the development of essential professional knowledge and practical skills.

The content of the educational program covers modern areas of biotechnology, including molecular biology, microbiology, genetic engineering, food biotechnology, industrial biotechnology, environmental biotechnology, and agricultural biotechnology. Particular attention is paid to modern laboratory research methods, standardization and quality control, as well as the application of digital technologies and artificial intelligence in biotechnological processes.

The practice-oriented nature of the educational program should be especially noted. The curriculum includes professional internships, research projects, and the study of modern methods for analyzing and controlling biotechnological processes, which contributes to the development of graduates' professional competencies and their readiness to work in industrial environments.

From the employer's perspective, the educational program meets the current requirements of biotechnology enterprises. Graduates acquire the necessary knowledge and practical skills in the production of bioproducts, quality control, microbiological research, design, and management of biotechnological processes, ensuring their competitiveness in the labor market.

A significant strength of the program is the integration of innovative technologies, the development of students' research competencies, the use of modern digital solutions and artificial intelligence tools, as well as its alignment with international trends in biotechnology science and industry.

To further improve the educational program, it is recommended to:

- expand cooperation with industrial enterprises in the biotechnology sector;

- strengthen students' training in industrial biotechnology, bioinformatics, and digital technologies.

Conclusion

Based on the conducted analysis, I conclude that the educational program "6B05112 – Biotechnology" complies with current employers' requirements, national educational standards, and modern trends in the development of the biotechnology industry. The program ensures high-quality training of specialists with highly demanded professional competencies and can be recommended for implementation in the educational process.

Expert:

Director
«Belasar Er-N» LLP



A. E. Dosbayeva

EXPERT OPINION

of the Bachelor's Educational Program "6B05112 – Biotechnology" under the field of study "6B051 – Biological and Related Sciences" of K. Kulazhanov Kazakh University of Technology and Business JSC

Academic Year 2026–2027

During the expert evaluation of the educational program "6B05112 – Biotechnology", an analysis was conducted of the program content, learning outcomes, curriculum structure, compliance with current labor market requirements, professional standards, and the strategic development directions of the biotechnology industry.

The expert review established that the educational program has been updated in accordance with the current requirements of the higher education system of the Republic of Kazakhstan and is aimed at training competitive specialists in the field of biotechnology.

A significant strength of the program is the integration of competencies from the Atlas of New Professions and Competencies of the Republic of Kazakhstan for the profession "Agrogeneticist", as well as the Regional Standard of Kostanay Region for the profession "Bioengineer in Animal Husbandry." This has enhanced the practice-oriented nature of the training and updated Learning Outcome LO7, which focuses on the application of modern digital technologies and artificial intelligence methods in agricultural biotechnology.

The educational program also complies with the requirements of the professional standard "Microbiologist", which is reflected in the revision of Learning Outcome LO4, aimed at developing competencies in microbiological and sanitary-biological research as well as quality control of biotechnological products. In addition, Learning Outcome LO8 has been updated through the introduction of new courses focused on modern technologies for the production of functional food products and biotechnological objects.

Particular attention should be given to the revision of the course catalogue based on employers' recommendations. The educational program now includes modern courses such as Virology, Microbiology, Applied Microbiology, Biotechnology of Functional Food Products, Immunobiotechnology, Biotechnology of Probiotics and Prebiotics, Cryopreservation of Biotechnological Objects, Design of Food Processing Enterprises, Agricultural Biotechnology, Fundamentals of Veterinary Biotechnology with Elements of Artificial Intelligence, and Mutagenesis with Fundamentals of Artificial Intelligence. The introduction of these courses significantly expands graduates' professional competencies and strengthens their training in molecular biology, agricultural biotechnology, food biotechnology, veterinary biotechnology, and the digitalization of biotechnological processes.

At the same time, the educational program has been optimized by removing a number of courses that had become outdated or duplicated the content of newly introduced subjects. This has made the curriculum more relevant and better aligned with the actual needs of employers.

The editorial work carried out to standardize the brief course descriptions also deserves positive evaluation. Their unification into a consistent format improves the quality of the program's methodological support and facilitates a clearer understanding of the educational content.

Overall, the educational program is characterized by a logical structure, a strong alignment between learning outcomes and academic disciplines, consideration of current trends in biotechnology, digital technologies, and artificial intelligence, and a focus on preparing specialists who are in demand in the agro-industrial sector, food industry, microbiological enterprises, and research organizations.

Conclusion

Based on the results of the expert evaluation, it can be concluded that the educational program "6B05112 – Biotechnology" complies with the requirements of the State Mandatory Standard of Higher Education of the Republic of Kazakhstan, professional standards, current trends in the biotechnology industry, and employers' expectations.

The educational program is recommended for approval and implementation without any comments.

Expert:

Senior Lecturer at the Institute of Animal Science and Veterinary Medicine
S. Seifullin Kazakh Agrotechnical Research University, PhD — E.K. Adilbekova



EXPERT REVIEW

of the Bachelor's Educational Program "6B05112 – Biotechnology" under the field of study "6B051 – Biological and Related Sciences" of K. Kulazhanov Kazakh University of Technology and Business JSC

Academic Year 2026–2027

As a foreign academic advisor, I have conducted an expert review of the Bachelor's Educational Program "6B05112 – Biotechnology" implemented at K. Kulazhanov Kazakh University of Technology and Business JSC.

The educational program has been developed in accordance with the requirements of the State Mandatory Standard of Higher Education of the Republic of Kazakhstan and current trends in the development of biological sciences. It is aimed at training competitive specialists for research, industrial, and innovative activities in the field of biotechnology.

The objective of the educational program is to develop a comprehensive set of professional, research, digital, and communication competencies required to address contemporary challenges in biotechnology. The structure of the program ensures a logical sequence in mastering fundamental and applied disciplines, as well as the gradual development of professional skills among future specialists.

The content of the educational program reflects modern achievements in molecular biology, genetics, microbiology, cell engineering, microbial biotechnology, and biotechnological production processes. The curriculum includes disciplines that provide students with theoretical knowledge and practical skills demanded by research institutions, industrial laboratories, and biotechnology enterprises.

Particular attention should be given to the practice-oriented nature of the program. During their studies, students master modern biological research methods, acquire skills in operating laboratory equipment, study technologies for obtaining biologically active substances, methods of microbiological and molecular genetic analysis, as well as the fundamentals of bioinformatics and biological data processing.

The analysis of the course syllabi demonstrates their compliance with the declared learning outcomes and the graduate competency model. The learning outcomes enable graduates to effectively apply modern research methods, analyze biological processes, work with scientific information, and participate in the development and implementation of biotechnological solutions across various sectors of the economy.

A significant strength of the educational program is the integration of modern digital technologies into the educational process. The curriculum incorporates elements of digitalization, large-scale biological data processing, and the use of artificial intelligence tools, which correspond to global trends in biotechnology science and industry.

The program content meets current labor market demands and takes into account promising areas of biotechnology development, including biopharmaceuticals, agricultural biotechnology, food biotechnology, environmental biotechnology, and sustainable development technologies. Graduate training is focused on developing competencies that are in demand both in the Republic of Kazakhstan and in the international labor market.

It should also be noted that the university possesses the necessary educational, methodological, and laboratory resources to ensure high-quality training and the effective implementation of practical and research activities. An important advantage of the program is its focus on developing students' research competencies and encouraging their active involvement in scientific activities.

For the further enhancement of the educational program, it is recommended to continue expanding international academic cooperation, developing joint educational and research projects with foreign universities and research centers, and strengthening training in bioinformatics, digital biotechnology, and the application of artificial intelligence in solving biotechnological challenges.

Based on the conducted analysis, I conclude that the educational program "6B05112 – Biotechnology" fully complies with current national and international requirements for Bachelor's degree training in the field of "6B051 – Biological and Related Sciences", demonstrates a high level of academic and practical content, ensures the development of relevant professional competencies, and can be recommended for implementation in the educational process.

Doctor of Chemical Sciences, Professor, Head of the ICESCO Chair of Biomedical Materials, Baku State University

Hasanova U.A.



ЭКСПЕРТНОЕ ЗАКЛЮЧЕНИЕ

на образовательную программу 6B05112 – «Биотехнология» по направлению подготовки 6B051 «Биологические и смежные науки» АО «Казахский университет технологий и бизнеса имени К. Кулажанова»

В качестве зарубежного академического консультанта проведена экспертиза образовательной программы 6B05112 «Биотехнология».

Анализ представленной образовательной программы показал, что она разработана в соответствии с требованиями Государственного общеобязательного стандарта высшего образования Республики Казахстан и ориентирована на подготовку квалифицированных специалистов, способных осуществлять профессиональную деятельность в научно-исследовательской, производственно-технологической и инновационной сферах биотехнологии. Цель программы направлена на подготовку конкурентоспособных бакалавров, владеющих современными экспериментальными методами исследования биологических объектов и технологиями биотехнологического производства.

Структура образовательной программы отличается логичной последовательностью освоения дисциплин и обеспечивает формирование профессиональных компетенций от фундаментальной естественно-научной подготовки до специализированных биотехнологических дисциплин. Учебный план включает общеобразовательный, базовый и профилирующий циклы, профессиональные практики и итоговую аттестацию общим объемом 240 академических кредитов, что соответствует требованиям подготовки бакалавров данного направления.

Содержание программы отражает современные направления развития биотехнологии. Особое внимание уделено изучению молекулярной биологии, генетики, микробиологии, вирусологии, биохимии, пищевой биотехнологии, промышленной биотехнологии, биотехнологии микроорганизмов, экологической биотехнологии, а также вопросам проектирования биотехнологических предприятий и контроля качества продукции. Такой подход обеспечивает формирование комплексного профессионального мышления будущих специалистов.

Положительной особенностью программы является интеграция цифровых технологий в образовательный процесс. В образовательную программу включены дисциплины и результаты обучения, связанные с использованием инструментов искусственного интеллекта, обработкой экспериментальных данных, цифровым моделированием биотехнологических процессов и применением современных информационных технологий в профессиональной деятельности, что соответствует мировым тенденциям развития биотехнологической отрасли.

Заслуживает высокой оценки практическая направленность образовательной программы. Значительное место занимают лабораторные занятия, производственные практики, дисциплины, связанные с технологией получения биопродуктов, стандартизацией, метрологией и контролем биотехнологических производств. Это позволяет сформировать у обучающихся навыки работы в производственных лабораториях, научно-исследовательских организациях и на предприятиях пищевой, микробиологической и фармацевтической промышленности.

Следует отметить, что результаты обучения ориентированы не только на освоение современных биотехнологических методов, но и на развитие аналитического мышления, исследовательских компетенций, способности проектировать технологические процессы, принимать инженерные решения, соблюдать требования биологической безопасности, экологических стандартов и нормативных документов.

Вместе с тем для дальнейшего повышения качества подготовки специалистов представляется целесообразным продолжить развитие международного академического сотрудничества, расширять участие студентов в совместных научных исследованиях с

зарубежными университетами, совершенствовать дисциплины, связанные с цифровой биотехнологией, биоинформатикой, промышленной автоматизацией биотехнологических процессов и использованием современных интеллектуальных технологий в управлении производством.

На основании проведенного анализа считаю, что образовательная программа 6B05112 «Биотехнология» соответствует современным национальным и международным требованиям к подготовке бакалавров по направлению «Биологические и смежные науки», обеспечивает достижение заявленных результатов обучения и может быть рекомендована к реализации и дальнейшему развитию в системе высшего образования Республики Казахстан.

Зарубежный академический консультант:

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

Educational Program/ Білім беру бағдарламасы/ Образовательная программа	6B05112 Biotechnology 6B05112 Биотехнология 6B05112 Биотехнология
Level/ Дәрежесі/ Уровень	Bachelor Бакалавр Бакалавр
International Academic Advisor/ Шетелдік академиялық кеңесші/ Зарубежный консультант	Bavlankulova Kanaim Dzhumakovna Бавланкулова Канаим Джумаковна Бавланкулова Канаим Джумаковна
Academic degree/ Ғылыми дәреже/ Ученая степень	Candidate of Biological Sciences Биология ғылымдарының кандидаты Кандидат биологических наук
Position/ Лауазымы/ Должность	Associate Professor Доцент Доцент
University/ Университет/ Университет	Kyrgyz State Technical University named after I. Razzakov И. Раззақов атындағы Қырғыз мемлекеттік техникалық университеті Кыргызский государственный технический университет имени И. Раззакова
Country/ Ел/ Страна	Kyrgyz Republic Қырғызстан Республикасы Республика Кыргызстан

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	K. Bavlankulova/ К. Бавланкулова/ К. Бавланкулова	*(Signature/ Қолы/ Подпись)*	15.06.2026 г *(Date/ Күні/ Дата)*

Seal/ MO/ МП

Биология институту / Институт Биологии

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