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» "02" 04 2025
protocol No. 3

Recommended
by the Academic Council of JSC
«K.Kulazhanov KazUTB» "28" 03 2025
protocol No. 8

Astana-2025

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Preface

The educational program "6B05112 Biotechnology" was developed in accordance with the State Compulsory Standard of Higher Education / Postgraduate Education, approved by the order of the Minister of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No. 2, and also on the basis of the professional standard "Производство сыров" dated 05.30.2023.

The educational program "6B05112 Biotechnology " was approved at the meeting of the Council on Academic Quality on "27" 03 2025, protocol No. 4
Chairman Baibolova L.K. _____

The educational program "6B05112 Biotechnology " was approved at the meeting of the Commission on Academic Quality of the Faculty on "29" 11 2024, protocol No. 2
Chairman Zhunusova G.S. _____

The educational program "6B05112 Biotechnology " was developed and discussed at the meeting of the department "Technology and standardization " dated "21" 10 2024, protocol No. 3
Head of the department Baitukenova S.B. _____

Approval sheet

Educational program "6B05112 Biotechnology "

AGREED:

Vice-Rector for Administrative Affairs	E.Askarbekov	"27" 03	2025 year
Head of Educational Programs Department	B.Bayadilova	"27" 03	2025 year
Director of Scientific and Production Center of Ecological and Industrial Biotechnology LLP	K. Usenova	"21" 10	2024 year
Acting Director of Astana branch of «Kazakh Research Institute of Processing and Food Industry» LLP	N.Alzhaksina	"21" 10	2024 year
Director Bio DELTA Trading KZ LLP	K. Aitkenov	"21" 10	2024 year
Chairman of the Association of Halal Industry of Kazakhstan	Sarsenbayev M	"21" 10	2024 year
Director LLP "Barys "R A"	S. Khairlieva	"21" 10	2024 year
Student of the BT-231 group	A. Dildabayeva	"21" 10	2024 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	-
Partner University	-

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)	**94**
University component	33
Component of choice	54
Professional practice	7
Cycle of major disciplines (MD)	**82**
University component	10
Component of choice	60
Professional practice	12
Final assessment	**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_{GED1}	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_{GED2}	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 for the justification, development, and improvement of biotechnological processes.
	LO4	Evaluates biological and microbiological parameters of objects in order to enhance the efficiency and safety of biotechnological and food processes
	LO5	Interprets the results of scientific research using modern methods, technologies, and artificial intelligence tools.
Digital competencies (Digital skills)	LO_{GED3}	Promotes the development of information literacy through the mastery and use of modern in-formation and communication technologies in all areas of activ-ity.
Professional skills (Hardskills)	LO6	Develops biotechnological approaches by applying modern methods and technologies to create new products and processes.
	LO7	Analyzes biotechnological processes in the production of functional food products based on modern industrial technologies
	LO8	Participates in the production process of biotechnological enterprises by developing technological solutions for raw material processing to improve the efficiency of food products.
	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 com-petencies	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 Physical Culture Module on Socio-Political Knowledge (Political Science, So-ciology, Cultural Studies, Psychol-ogy)
	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 Language 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 activ-ity.	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	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, basics of law and anti-corruption culture, basics 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 for the justification, development, and improvement of biotechnological processes.	Molecular biology	Applies theoretical knowledge and practical skills in the organization of biotechnological production to improve the production efficiency of biotechnological products and solve practical problems.	Biochemistry General and molecular genetics /Molecular biology of the cell Biotechnology of microorganisms /Technology of cultivation of biotechnological objects Educational practice
	LO4 - Evaluates biological and microbiological parameters of objects in order to enhance the efficiency and safety of biotechnological and food processes	The Theoretical Foundations of Biotechnology	Demonstrates knowledge of the main trends of biotechnology, both for production and scientific research	Plant biotechnology /Animal biotechnology /Technical microbiology Introduction to biotechnology Food hygiene /Nutrition physiology and nutritionology Biotechnology facilities Food microbiology
	LO5 - Interprets the results of scientific research using modern methods, technologies, and artificial intelligence tools.		Demonstrates knowledge in the field of biotechnological research, modern methods and nanotechnology in biotechnology, environmental biotechnology and biodiversity, as well as in the application of artificial intelligence, with the successful application of acquired competencies in industrial practice	Fundamentals of Scientific Research in Biotechnology/Methodology of biotechnological research /Introduction to Artificial Intelligence(MINOR) Modern methods of biotechnology / Nanobiotechnology /Artificial intelligence in the management of object (MINOR) Biotechnology of fermentation industries/Development of artificial neural networks (MINOR) Environmental biotechnology/ Ecology and Biodiversity Industrial practice 1

Professional skills (Hardskills)	LO6 - Develops biotechnological approaches by applying modern methods and technologies to create new products and processes.	Applied biotechnology	Applies the basics and genetically modified methods using exact and applied sciences in the field of key areas of biotechnology in order to organize biotechnological production	Fundamentals of genetic yngineering / Genetically modified organisms and biosecurity Biotechnology of protein substances /Microbiological synthesis of processing industries Biotechnological foundations of processing of plant raw materials /Theoretical foundations of raw materials and products of biotechnological industries Enzyme preparations of the food industry / Biotechnology of starter cultures
	LO7 - Analyzes biotechnological processes in the production of functional food products based on modern industrial technologies		Applies knowledge and skills in the field of biotechnology for the development and production of biologically active substances, food additives, and food processing technologies, taking into account microbiological processes and innovative industrial production methods.	Food additives and biologically active substances /Microbiological production of biologically active substances Industrial biotechnology Biotechnology fermentation production/Wine production biotechnology and winemaking Biotechnology of bakery production /Biotechnology of meat and meat products/ Offal biotechnology
	LO8 - Participates in the production process of biotechnological enterprises by developing technological solutions for raw material processing to improve the efficiency of food products.		Analyzes modern methods of food production using biotechnologies, raw material processing technologies and process optimization in various fields of the food industry	Food biotechnology Biotechnology of national foods / Biotechnological bases for the processing of non-traditional raw materials Biotechnology of milk and dairy products / Biotechnology of cheese and whey products Biotechnology of canning production / Biotechnology of specialized food products Industrial practice 2

	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	Demonstrates knowledge in the field of technological processes and devices of biotechnological industries	Processes and vehicles are in a biotechnology/Biotechnological equipment Design of biotechnological enterprises / Design of processing plants / Economics and enterprise planning Sustainable development, ecology and life safety
	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 the technological process in accordance with the regulations and uses technical means to measure the basic parameters of biotechnological processes, 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 assessment

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

№	Name of the discipline	Brief description of the discipline	Number of credits	Formed learning outcomes (codes)												
				LO GED1	LO GED2	LO GED2	LO1	LO2	LO3	LO4	LO5	LO6	LO7	LO8	LO9	LO10
Cycle of general education disciplines Required component																
1	History of Kazakhstan	The program consists of five thematic blocks: Ancient people, the formation of nomadic civilization, Turkic civilization and the Great Steppe, Kazakhstan in a new era (XVIII - early XX centuries), Kazakhstan in the Soviet period, Independent Kazakhstan. The purpose of the discipline is to provide objective knowledge about the main stages in the development of the history of Kazakhstan from ancient times to the present.	5	+												
2	Philosophy	This program is aimed at studying the updated content of the general education discipline "Philosophy", the formation of students' openness of consciousness, understanding of their own national code and national identity, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, the assimilation of such key worldview concepts as justice, dignity and freedom, and It is also aimed at developing and strengthening the values of tolerance, intercultural dialogue and a culture of peace.	5	+												
3	Foreign language	This curriculum shall be designed to train students on general education discipline "Foreign language" as one of the compulsory subjects of general education course. 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	10		+											

		of basic sufficiency (B1, common European framework). Depending on the level of training, the student, at the time of completion of the course, shall reach the level B2 of common European framework of reference if the student, at the start, has the level of common European framework of reference above B1.															
4	Kazakh (Russian) language	This curriculum for general education discipline "Kazakh language" shall be aimed at a new format of study of language and formation of social and humanitarian outlook in the framework of the national idea of spiritual modernization. This curriculum shall be intended for development of language personality of a student capable to perform cognitive and communicative activity in the Russian language in the spheres of interpersonal, social, professional and intercultural communication in the context of implementation of the state programs of trilingualism, and spiritual modernization of the national consciousness.	10		+												
5	Information and communication technologies	The program is aimed at studying the updated content of the general educational discipline "Information and Communication Technologies" (hereinafter referred to as the Discipline), developing the ability to critically understand the role and significance of modern information and communication technologies in the era of digital globalization, forming a new "digital" thinking, acquiring knowledge and skills use of modern information and communication technologies in various activities.	5			+											
6	Module of socio-political knowledge (political science, sociology, cultural studies, psychology)	This curriculum shall suggest the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology, and research methods. The interaction between these scientific disciplines shall be based on the principles of informational complementarity; integrity; methodological integrity of the research approaches of these disciplines; the result-oriented unity of education methodology; a single system perspective of the typology of learning outcomes as the formed abilities.	8	+													
7	Physical Culture	This curriculum shall be aimed at the study of the general education	8	+													

		discipline "Physical culture", providing for physical training in accordance with international standards of education. The curriculum shall determine the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements to the level of mastering of the discipline.															
		Cycle of general education disciplines University component															
8	Module of economics, entrepreneurship, law and financial literacy (fundamentals of economics and entrepreneurship, basics of law and anti-corruption culture, basics of financial literacy)	Integrated discipline covers the fundamentals of economics, entrepreneurship, law and financial literacy. Examines key economic concepts, business principles, legal aspects of business and the basics of anti-corruption culture. Examines basic principles of financial planning, personal finance and investment management. Develops skills for effective economic decision-making, legal defense, building sustainable business competences and personal financial management	5				+										
		Cycle of basic disciplines University component															
9	Biochemistry	The purpose of studying the discipline is to acquire knowledge about the structure and properties of chemical compounds that make up living organisms, the basic laws of biochemical processes and mechanisms of metabolic regulation. Familiarization with the basics of classes of organic compounds and biochemical processes occurring in the body, structure, properties, metabolism of proteins, lipids and carbohydrates. Study of the energy metabolism system, properties of nucleic acids, protein synthesis and its regulation. Understanding the role of enzymes, hormones and vitamins in the functioning of the body.	6						+								
10	Economics and	The course is aimed at studying the basics of economics and	3													+	

	enterprise planning	enterprise planning, developing skills to assess the technical and economic level of production, analyzing product quality indicators and the effectiveness of the enterprise. Students master the methods of planning resource and labor costs, as well as develop strategies to increase productivity, optimize business processes and increase competitiveness in order to achieve maximum efficiency and sustainability of the enterprise in market conditions															
11	Food biotechnology	The objective of the course is to develop knowledge and skills in the application of biotechnological processes for the development and production of food products, as well as improving their quality, safety, and nutritional properties. During the course, students will learn methods for using microorganisms, enzymes, and other biological agents in food production, optimize technological processes, evaluate the impact of biotechnology on the creation of innovative products, such as functional and fermented foods, and enhance the efficiency of food production.	5												+		
12	Higher mathematics	The discipline is aimed at studying the mathematical apparatus that allows you to model and solve mathematical problems, practical problems of elements of linear and vector algebra, mathematical analysis, probability theory. After mastering the discipline, students will be able to apply mathematical methods to solve problems in their professional activities.	5					+									
13	Introduction to biotechnology	The purpose of studying of the discipline: mastering the main issues that reveal the content of biotechnology as a science and industry. Familiarization with the main stages and prospects of biotechnology development. Study of schemes of biotechnological processes used in the food industry. Characteristics of producers used in biotechnology. Generalization of information about the processes of obtaining various substances with the help of microbes, genetically modified strains, their isolation using membrane technologies. Mastering methods of growing microorganisms, plant and animal cells and purification of biological products.	5							+							
14	Physical and	The purpose of studying the discipline is to reveal the content of the	4					+									

	colloidal chemistry	laws of thermodynamics and the basic equations of chemical thermodynamics, the thermodynamics of electrolyte solutions and electrochemical systems, the foundations of homogeneous, heterogeneous and enzymatic catalysis. Students acquire the ability to apply kinetic equations to describe complex, chain, heterogeneous and photochemical reactions, as well as use methods for thermodynamic description of chemical and phase equilibria in multicomponent systems.															
15	Sustainable development, ecology and life safety	The course is aimed at forming a systemic understanding of the principles of ensuring balance between economy, social development of society, preservation of environment, protection of life and human health. Develops skills of effective management of energy and waste in the circular economy in the development of national strategies and implementation of business processes; analysis, forecasting and minimization of technological, natural and social risks; Sustainable lifestyle and responsible attitude to one's own security.	5													+	
		Cycle of basic disciplines Elective component															
16	Animal biotechnology	The objective of the course is to explore the methodological approaches in animal biotechnology, artificial insemination methods, and cell cryopreservation issues. It includes the analysis of current data on the accelerated reproduction of animal genotypes through embryo transplantation, embryo culture, and embryo engineering. The course also aims to develop skills in handling animal specimens, microscopic techniques, and laboratory equipment	5							+							
17	Biotechnological bases for the processing of non-traditional raw materials	The goal of studying the discipline is to develop students' theoretical knowledge and practical skills in the technology of processing unconventional raw materials and their application in various sectors of the food industry. The chemical composition, nutritional and biological value, as well as the functional and technological properties of unconventional raw materials are studied. The use of	5												+		

		such raw materials in the production of flour-based confectionery and meat products is evaluated. Modern waste-free technologies based on the use of unconventional raw materials in food production are analyzed.															
18	Biotechnological bases for the processing of vegetable raw materials	The purpose of studying the discipline: the formation of knowledge about the modern processing of plant raw materials used in biotechnological production. Generalization of modern ideas about the selection of raw materials, substrates, as well as biotechnological processes occurring in the production of food. Analysis of the main prospects for the use of biotechnological methods in the processing of plant raw materials. The use of modern methods of analysis in assessing the properties, composition, nutritional and biological value of plant raw materials.										+				
19	Biotechnological equipment	The objective of the course is to study the requirements for biotechnological production equipment, its classification, design, and principles of operation. The course covers technological equipment for the processing, storage, and conversion of biological raw materials, including fermenters, separators, autoclaves, filters, and aeration tanks. It examines the structural features, operational characteristics, and the selection of optimal equipment for various biotechnological processes.	5													+	
20	Biotechnology fermentation production	The objective of the course is to develop students' knowledge of the fermentation system, as well as the chemical, microbiological, colloidal, biochemical, and thermophysical processes occurring at different stages of fermentation production. The course includes the study of various products based on the metabolism of microorganisms' cells capable of carrying out different types of fermentation with food products. It also involves the analysis of ways to improve biotechnological production processes based on fermentation processes.	5										+				
21	Biotechnology of microorganisms	The purpose of studying of the discipline: to gain knowledge about the principles and features of microbiological processes, methods for obtaining highly productive industrial strains of	5						+								

		microorganisms, their cultivation and storage. The study of the technology of microbial synthesis of target products, the development of methods for the production of fermented milk products, microbial protein, organic acids, microbial polysaccharides and neutral products. Understanding the principle of ensuring the industrial safety of industrial strains.															
22	Biotechnology of national foods	The purpose of studying the discipline: the formation of students' knowledge about national food products and skills in the use of starter cultures in the biotechnology of the production of biological products. Implementation of the practical selection of microorganisms for the preparation of starter cultures. Mastering the methods of obtaining national food products: kymyran, koumiss, ayran, shubat and shalap and conducting quality control of products, technological process. Consideration of issues of storage of finished products.	5												+		
23	Biotechnology of plants	The objective of the course is to study the theoretical foundations and methodological principles of culturing isolated plant cells, tissues, and organs on artificial nutrient media under aseptic conditions. Mastering the methods and technology for creating new forms, lines, and hybrids of plants. Developing plant lines resistant to abiotic and biotic environmental factors. Acquiring methods for assessing and preserving plant biodiversity, maintaining healthy planting material, and obtaining secondary metabolites from plants.	5							+							
24	Food hygiene	The purpose of studying the discipline is to develop students' knowledge in the field of hygienic assurance of food safety and quality, the development and implementation of hygienic standards, as well as the acquisition of control methods. The course includes the analysis of problems related to diet-related diseases and preventive measures to avoid them. Special attention is given to the use of artificial intelligence for monitoring, analyzing, and improving food hygiene, as well as for the prevention of diseases associated with dietary and sanitary norm violations.	5							+							
25	Food	The purpose of studying of the discipline: generalization of issues	5							+							

	microbiology	of general microbiology and microbiology of food production. Obtaining modern ideas about conditionally pathogenic microorganisms, sanitary and microbiological studies of food products and their laboratory diagnostics. Acquisition of skills in conducting microbiological control of products and their production processes. Identification of microorganisms, preparation of nutrient media, assessment of biosafety of products of biotechnological industries.															
26	Fundamentals of genetic engineering	The purpose of studying the discipline is to explore a set of molecular-genetic methods that allow the creation of artificial genetic programs (recombinant DNA), which helps form an understanding of the targeted design of genetically modified organisms. The course covers molecular diagnostics, Ex vivo and in vivo gene therapy, as well as DNA sequencing and amplification.	5									+					
27	Fundamentals of Scientific Research in Biotechnology	The purpose of studying of the discipline: the formation of knowledge about modern methods and stages of scientific research in biotechnology. Generalization of knowledge and ideas about the features of planning and organization of the experiment, technical preparation of production, conducting scientific research. Mastering the latest methods of biotechnological research, analyzing the results of a scientific experiment using statistical calculations and formulating the conclusions of a scientific study.	5				+										
28	General and molecular genetics	The purpose of studying the discipline: mastering the issues of genetic origin, formation and development of living cells. Formation of knowledge about the material foundations of heredity and the interaction of non-allelic genes. Analysis and development of methods of crossing over and variability of hereditary material. Study of methods of mutational variability, genetic ontogenesis and populations. Mastering methods of sex determination and their genetic development.	5						+								
29	Genetically modified organisms and	The purpose of studying the discipline is to develop a systematic understanding among students of the production and use of genetically modified organisms (GMOs), as well as the biosafety of	5									+					

	biosecurity	food raw materials and food products. Special attention is given to the construction of recombinant DNA, issues related to the safety of GMO use, and international and national regulations in this field. In addition, students will acquire methods of monitoring and regulating activities associated with the production and application of GMOs.														
30	Methodology of biotechnological research	The purpose of studying the discipline is to enable students to master the principles of planning and conducting scientific research, as well as presenting its results in the form of scientific and technical documentation. The course focuses on developing knowledge of the ethical and aesthetic foundations of the methodology, the ability to formulate the relevance of the topic, and analyze the scientific novelty of the research. Special attention is given to summarizing information on patent searches and processing scientific data on technologies in the field of biotechnology.	5							+						
31	Molecular biology of the cell	The purpose of studying the discipline: formation of ideas about the basic mechanisms of molecular systems that control biological processes and modern methods of molecular biology. The study of the properties of biological molecular systems. Mastering the basic properties and functions of proteins and chromatin. Application of knowledge of molecular genetic processes in the production use of bioagents to obtain valuable products and implement targeted transformations.	5						+							
32	Physiology of nutrition and nutritionology	The objective of the discipline is to study the functional, metabolic, and hygienic aspects of the interaction between nutrients and their impact on the human body. The course covers food selection processes, evaluation of nutritional and energy value, and the provision of essential nutrients and energy in accordance with the physiological needs of the body. Special attention is given to the application of nutritional recommendations in practical activities and the analysis of key areas of government policy in the field of nutrition.	5							+						
33	Processes and	The purpose of studying the discipline is to study the technological	5												+	

	vehicles are in a biotechnology	processes and machine-apparatus schemes of biotechnological production, and to acquire up-to-date knowledge on the theoretical foundations of the design and construction of equipment used in the biotechnology industry. The course covers rational types of technological processes, their optimal parameters, as well as ways to intensify existing processes and improve the equipment used in the field of biotechnology.														
34	Technical microbiology	The purpose of studying the discipline: mastering the most important microbiological processes for obtaining valuable life products by industrial means. Consideration of the issues of creating highly effective bacterial biological products based on associative microorganisms of complex action, the role of microorganisms in production processes. Mastering of industrial microbiological processes, methods of cultivation of microorganisms, simple and differential methods of coloring. Analysis of issues of sanitary and microbiological control of food products.	5							+						
35	Technology of cultivation of biotechnological objects	The goal of studying the discipline to develop knowledge about the main technological methods and cultivation conditions of biological objects in production processes. Various types of substrates used for cultivating bio-objects are examined. The principles of selecting bio-objects, including model and basic microorganisms as well as microbial strains used in biotechnology, are studied. Current scientific perspectives on plants as sources of biologically active substances and on animal cell cultures used for the production of biologically active compounds are analyzed.	5						+							
36	Theoretical bases of raw materials and products of biotechnological production	The objective of the course is to master the issues of integrated and efficient raw material processing that ensure the quality and compliance of products in biotechnological industries. To form knowledge about the challenges and prospects of applying biotechnological processes in the food industry. To explore the principles of organization, structure, and functional elements of biotechnological production, as well as its key stages. To acquire methods and techniques for managing biotechnological processes	5									+				

		in the production of high-quality, biologically complete products based on the rational use of resources.															
37	Wine production biotechnology and winemaking	The objective of the course is to develop knowledge and skills regarding the physicochemical, kinetic, biochemical, and microbiological properties of various types of wines, their role in human nutrition and vital activities, as well as methods and tools for assessing the quality of wines. The course covers the classification of wines and the specifics of their production technology, diseases, faults (defects), and deficiencies in wines, biochemical processes occurring in grape must during fermentation, aging, and long-term storage of wine, as well as the utilization of winemaking by-products.	5										+				
		Cycle of profile disciplines University component															
38	Objects of biotechnology	The objective of studying the discipline is to enhance knowledge about biological objects used in biotechnology and the fundamental principles of their creation. It includes familiarization with the structural-functional organization of organisms and the principles for selecting objects for industrial use. The course also covers the acquisition of technical skills and methods for cultivating biological objects on nutrient media, as well as obtaining modified bio-objects.	5							+							
39	Industrial biotechnology	The objective of the discipline is to acquire knowledge about the organization of biotechnological production, the evaluation of production efficiency of various cultivation methods, and the criteria for selecting and assessing methods necessary for obtaining a specific target product. The course covers the basic principles of operation of laboratory and industrial fermenters, as well as the biotechnological production of microbial protein, primary and secondary metabolites.	5										+				
		Cycle of profile disciplines Elective component															
40	Biotechnology of protein	The objective of studying the discipline is to acquire knowledge about the technology of producing various microbial synthesis	5										+				

	substances	products using protein-carbohydrate raw materials. The course covers primary and secondary metabolites, biotechnological equipment and industrial products, biosynthesis, microbial protein production from lower alcohols, technology and production of feed biomass from hydrocarbon raw materials, as well as the production of protein substances from carbohydrate raw materials.														
41	Biotechnology of starter cultures	The objective of studying the discipline is to acquire practical skills in studying the stability of starter cultures for the production of bioproducts. The course examines the role of probiotic starters in shaping the quality of dairy products, meat products, and bakery goods, the rationale for selecting probiotic cultures, the study and selection of the optimal nutrient medium, as well as methods for determining technological parameters.										+				
42	Microbiological production of biologically active substances	The goal of studying the discipline: to acquire theoretical knowledge in the field of microbiological production of biologically active substances (BAS) and to apply this knowledge in practical activities. The discipline covers the production of microbial biomass and products of microbiological synthesis, the principles of designing technological schemes for the production of biopreparations based on BAS, as well as issues of control and safety. Special attention is given to familiarizing with the regulatory framework governing the application of BAS.	5										+			
43	Modern methods of biotechnology	The goal of studying the discipline is to master the basic principles of biophysical, molecular-genetic, and immunological methods, as well as information technologies, including the application of artificial intelligence for processing and analyzing data used in biotechnology. Conducting research on membrane structures, protein isolation and purification, nucleic acid extraction, and immunological methods using modern digital technologies and artificial intelligence algorithms to enhance the accuracy and efficiency of analysis.									+					
44	Design of biotechnological	The objective of the discipline is to develop knowledge and practical skills in the design of pilot and industrial installations for	5												+	

	enterprises	biotechnological food industry enterprises, as well as the ability to select and rationally integrate equipment into technological lines. The course covers modern methods of designing enterprises in the industry, ways to reduce project timelines, and improve work quality in the design and reconstruction of biotechnological enterprises.															
45	Technochemical control of biotechnological production facilities	The purpose of studying the discipline: formation of ideas about the specifics of technochemical control in biotechnological industries. Organization and planning of biotechnological productions. Determination of ash content, minerals and chlorides, and acidity. Determination of the chemical composition of the energy value of food products by the calculation method. Scheme of technochemical control of production processes. Control of physical and chemical parameters.	5														+
46	Control and estimation of biotechnological productions	The objective of the discipline is to acquire knowledge and skills in monitoring and assessing the effectiveness of biotechnological processes, mastering quality control methods at all stages of production, and developing the ability to apply modern analytical and diagnostic technologies to ensure safety and high-quality standards in biotechnological production.	5														+
47	Biotechnology of meat and meat products	The objective of the course is to develop knowledge about the biotechnological processes used in the production of meat products, mastering methods of biotechnological impact on raw materials to improve the quality, safety, and nutritional value of meat products. The course also aims to develop the ability to design innovative technologies and optimize production processes in the meat industry, taking into account modern trends and food safety requirements.	5											+			
48	Biotechnology of cheese and whey products	The goal of studying the discipline to acquire the knowledge necessary for production and technological activities in the field of cheese production and whey processing products. The discipline covers the classification of bacterial starters used in cheesemaking, as well as the ability to select cultures for starters. Special attention	5												+		

		is given to mastering modern methods of producing fermented dairy products and processed cheeses, as well as generalizing biotechnological methods for obtaining condensed and dry products from whey.														
49	Biotechnology of canning production	The objective of studying the discipline is to acquire knowledge in the development of effective biotechnological methods for producing high-quality canned products and processing agricultural raw materials, with a focus on in-depth study of quality preservation for both finished products and raw materials. The course covers the preparation of raw materials for canning, studies biotechnological methods of food preservation, systematizes the main biotechnological processes in canning production, and includes the mastering of microbiological methods used in the canning industry.	5											+		
50	Design of processing plants	The objective of the course is to develop knowledge of the methodology of the design process and the procedure for carrying out design activities at processing industry enterprises. The course covers methods for calculating core technological equipment used in production processes and introduces the principles of planning workshops and industrial facilities. Additionally, it examines the requirements for production and auxiliary premises at processing sites.	5												+	
51	Microbiological synthesis of processing plants	The objective of the discipline is to form theoretical knowledge about the use of biotechnology methods for the production of various microbial synthesis products. The systematization of biotechnological techniques for processing raw materials in the field of enzymatic and microbial bioconversion technology. Application of methods for cultivating, isolating, and inoculating technological strains. Mastering methods for producing microbial fats, products of microbiological synthesis, and biomass. Developing a scheme for obtaining the target product of microbial synthesis (dairy products, brewing, bakery production).	5									+				
52	Biotechnology of specialized food	The objective of the course is to acquire knowledge on the development of specialized food products and their storage	5											+		

	products	technology. Mastering the ability to differentiate between the concepts of targeted functional nutrition, individual nutrition, balanced nutrition, and functional nutrition. Studying the theoretical foundations of the production of combined products, their quality, and safety. Considering the issues of children's nutrition and dietary plans for workers in harmful industries.															
53	Metrology, standardization and certification	The purpose of studying the discipline: is to gain knowledge in the field of metrology, standardization and certification necessary to solve the problems of metrological and regulatory support of production, testing, operation and disposal of products. An idea of the basics of metrology, standardization and certification, metrological support and regulatory and technical documentation. Mastering methods for determining the quality indicators of measuring instruments and products.	5														+
54	Biotechnology of bakery production	The objective of studying the discipline is to learn the fundamental biotechnological processes used in bread making, including fermentation and the use of microorganisms, to master methods of developing and optimizing biotechnological processes to improve the quality of bakery products, and to develop skills in selecting and using biologically active substances, such as starters, yeast, and enzymes, to enhance the efficiency of the bakery production.	5											+			
55	Nanobiotechnology	The objective of the course is to master the biotechnological and molecular-biological principles, methods, and techniques for working with atoms and molecules to solve nanotechnology problems. The course covers the current concepts in the field of bionanomaterials, bionanoenergetics, molecular complexes, biomolecular sensing, and self-replication. It also includes mastering analytical methods such as mass spectrometry, microscopy, and nuclear magnetic resonance.	5								+						
56	Standardization and confirmation of conformity	The aim of the discipline is to study the fundamentals of developing regulatory documents (standards, instructions, rules) and technical regulations that govern the quality and safety of products, as well as the application of international and national standards. The course	5														+

		covers methods of control and analysis of production processes and product conformity assessment. Particular attention is paid to the requirements for products, production processes, and laboratory research that ensure food safety.															
57	Offal biotechnology	The objective of the course is to form knowledge about biotechnological processes for processing animal by-products, mastering methods for using them to produce high-quality, safe, and nutritious products. The development of biotechnological processes aimed at the effective use of by-products in the food industry and other sectors.	5										+			
58	Biotechnology of milk and dairy products	The objective of studying the discipline is to explore modern aspects of the biotechnological production of milk and dairy products. The course covers the classification and characteristics of microorganisms used in the production of fermented dairy products and cheeses, the biochemical processes involved in production, methods for obtaining fermented dairy products, as well as the analysis of quality control and the biotechnological process of milk and dairy product manufacturing.	5											+		
59	Enzyme preparations of the food industry	The objective of the course is to develop knowledge about the role of enzyme preparations in the food industry and to master methods for their application in optimizing technological processes, improving product quality, and extending shelf life. The course fosters skills in selecting, producing, and implementing enzymes across various sectors of the food industry. Special attention is given to the development of innovative technologies using enzyme preparations and the analysis of their impact on production efficiency and food safety.	5									+				
60	Food additives and biologically active substances	The objective of the course is to develop knowledge about types of food additives, biologically active substances, and their impact on production, as well as to study additives that slow down microbiological and oxidative spoilage of food raw materials and finished products. The course systematically covers technological and biologically active additives, and also includes mastering the	5										+			

		technology for producing biologically active substances through microbial synthesis, as well as from animal and plant cells.														
61	Biotechnology of flour confectionery products	The objective of the course is to develop knowledge about the biochemical and microbiological processes involved in the production of flour-based confectionery products. Special attention is given to the development of technologies based on biotechnological approaches aimed at improving the texture, aroma, and nutritional value of the products. The course also explores the use of natural starters and yeasts to enhance the taste and extend the shelf life of finished confectionery items.	5										+			
62	Ecology and biodiversity	The objective of the course is to acquire basic knowledge about the concepts of biodiversity and master methods for analyzing it at different levels of biosphere organization. The course covers the principles of monitoring ecosystem stability and biodiversity conservation, as well as studying general trends in changes and existing threats. Additionally, it explores protected natural areas and the provisions of the Convention on Biological Diversity.	5								+					
63	Environmental biotechnology	The objective of the course is to acquire knowledge about the main environmental problems and to master biotechnological methods for addressing them, including waste processing, water purification, and pollution elimination. The course focuses on learning approaches for obtaining environmentally friendly energy, as well as methods of bioremediation and bioindication of pollution in aquatic systems. It also covers composting and biodegradation processes of plant raw materials, particularly straw.	5								+					
		Minor														
64	Introduction to Artificial Intelligence	The discipline is aimed at studying the basic concepts, methods and technologies used in modern artificial intelligence systems. The course covers artificial neural networks, machine learning, deep learning, as well as applied algorithms and models used in various fields such as computer vision, natural language processing, robotics, and game art. At the end of the course, students are able to analyze and solve problems using artificial intelligence methods	5				+									

65	Development of artificial neural networks	The discipline focuses on the study of methods for creating and training neural networks, which are mathematical models that mimic the work of the human brain. During the course of studying this discipline, students will learn about various types of neural networks, their structures and learning algorithms. Upon completion of the course, students will be able to create, train and apply neural networks to solve various tasks in the field of artificial intelligence and machine learning.	5				+									
66	Artificial intelligence in the management of object	The discipline studies the basic concepts and principles of artificial intelligence systems, as well as their application in object management. Methods and technologies of artificial intelligence for effective management of objects. Upon completion of the course, students gain the skills and knowledge necessary for successful management of facilities using	5				+									

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

Learning Outcomes (LO) Number	Planned learning outcomes for the module	Assessment technologies (tools)	Methods of learning and teaching
LO_{GED1}	Shows a civic position based on a deep understanding and scientific analysis of the main stages, patterns and peculiarities of the historical development of Kazakhstan. Uses methods and techniques of historical description to analyze the causes and consequences of events in the modern history of Kazakhstan. Evaluates the surrounding reality on the basis of worldview positions formed by knowledge of the fundamentals of philosophy, which provide scientific understanding and study of the natural and social world by methods of scientific and philosophical cognition. Builds a personal educational trajectory throughout his life for self-development and career growth, focusing on a healthy lifestyle to ensure full-fledged social and professional activities through methods and means of physical education.	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_{GED2}	Uses scientific methods and research techniques of a specific science, as well as the entire social and political cluster.	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_{GED3}	He is able to classify software, use it for its intended purpose, restructure and interpret it as necessary, as well as manage software products developed by himself. He engages in oral and written communication in	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	Practice-oriented method, demonstration, interactive method, problem-based method, methods of

	Kazakh, Russian and a foreign language to solve problems of interpersonal, intercultural and industrial communication. Develops the ability for interpersonal social and professional communication in the state, Russian and foreign languages of academic texts, taking into account stylistic features.	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.	programmed learning, online courses, etc.
LO1	Demonstrates general knowledge and understanding of facts, phenomena, theories and complex dependencies in the field of economics, law, the peculiarities of interaction between nature and society to ensure the safety of life	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	Applies theoretical knowledge and practical skills in the organization of biotechnological production to increase the efficiency of production of biotechnological products and solve practical problems.	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	Demonstrates knowledge of the main trends in biotechnology, both for production and scientific research.	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, LO6	Applies the basics and modern biotechnological methods for scientific research using exact and applied sciences in the field of key areas of biotechnology in order to organize biotechnological production. Masters basic knowledge in the field of AI, uses AI tools to solve applied problems.	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), 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.)	Interactive lecture, demonstration of software solutions, demonstration, research method, practice-oriented method, project method, process modeling, case method, flip class, etc.
LO7	Demonstrates knowledge in the field of technological processes and devices of biotechnological industries and uses knowledge of financial literacy and security to make informed financial decisions in professional activities.	Case assignment, laboratory work, practical work, project work, project protection, laboratory report protection, process modeling, presentation, essay, abstract, report, message, tasting analysis and its interpretation, technological product map, formulation and calculation of nutritional value, safety analysis of additives (according to standards).	Interactive lecture, modeling, research method, working with databases, project work, flip class, analysis of scientific publications, working with nanoobjects (virtually), case method, presentation, heuristic method, "hung group" method, etc.
LO8	It diagnoses biotechnological processes at all stages of food production in order to increase their efficiency, uses modern methods of microbiological and enzymatic processing, develops formulations and technological maps of products, analyzes quality, safety and nutritional value indicators, and designs products for functional and specialized purposes in accordance with regulatory requirements.	Case study, situational tasks, laboratory work, practical work, technological product map, calculation of raw materials and nutritional value, formulation development, modeling of the biotechnological process, tasting and sensory analysis, presentation, essay, abstract, report, message, oral interview, mini-survey, role-playing game (technologist, supervisor, expert)	Case analysis, discussion, visualization lecture, feedback lecture, etc.
LO9	Diagnoses biotechnological processes at all stages of food production in order to optimize them and increase efficiency. It diagnoses the quality and activity of the starter cultures, enzymes and probiotics used, as well as evaluates the effectiveness of methods of preserving and enriching products using microbiological and enzymatic	Testing, control work, practical work, computational and graphical work, solving situational problems, project work, modeling of technological processes, drawings and diagrams of devices, analysis of production flows, construction of a technological scheme, preparation of a business plan, financial	Lectures with case analysis from real production, practice-oriented method, practical exercises using production samples (cheeses, starter cultures, enzymes, etc.)

	technologies.	calculation, presentation, essay, abstract, report, oral interview, role-playing game (engineer, ecologist, economist, technologist).	
LO10	Applies knowledge of the measures necessary to ensure quality control and standardization of biotechnological industries. Develops practical skills in conducting production and pre-graduate control in a real enterprise. Summarizes the professional experience gained during practice and demonstrates willingness to perform qualifying work.	Testing, control work, practical work, analysis of regulatory documentation (GOST, TU, ST RK), preparation of conformity assessment documentation, preparation of quality control schemes, analysis of techno-chemical indicators, charting deviations and permissible standards, work with technical regulations, presentation, essay, abstract, report, oral interview, round table, role-playing game (quality expert, supervisor, certification auditor).	Interactive lecture, analysis of regulatory documents, case method, practice-oriented method, development of control schemes, work with technical regulations, presentation, checklist, group work.
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/thesis project or take a comprehensive oral/written exam, report defense, thesis/thesis project defense, etc.	Free discussion, group work with illustrative material, brainstorming, etc.

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
Cheese production No. 263 dated December 26, 2019 (updated No. 100 dated 05/30/2023)	Chief Microbiologist	LF 2: Participate in the production process	Task 1: Control of the production process	RO8 – Participates in the production process of biotechnological enterprises, developing technological solutions for processing raw materials to improve the efficiency of food products.

10 Graduate model

GRADUATE MODEL			
Professional standar Cheese production	Competencies (soft skills, digital skills)		
	Attributes of a graduate	Knowledge	Skills
	Graduate attributes (developed based on competencies and learning outcomes): He is able to interact socially on the basis of accepted moral and legal norms in society, and is ready to maintain partnerships. He possesses an integral system of scientific knowledge about the world around him, is able to navigate the values of life and culture. He is able to acquire new knowledge using information technology. Uses skills of working with laboratory equipment and instruments to solve practical problems in the field of biotechnology. Uses biotechnological methods, technological techniques and equipment for further personal and professional development. Organizes and conducts experiments using knowledge with various objects of biotechnology. It is able to control the technological process of obtaining biotechnological products based on various raw materials and processes of isolation and purification of finished products. Monitors and evaluates compliance with the safety of finished products at biotechnological enterprises. He knows the principles of building technological schemes and technological documentation. Analyzes modern achievements in the field of biotechnology and new directions in the development of the biotechnology industry.	1. Regulatory documentation. 2. Technological processes and production modes. 3. Prospects for the technical development of the enterprise. 4. The current system of state certification and certification of products.	1. Participate in the development of sound technological schemes for processing raw materials aimed at ensuring stable and high-quality products. 2. To carry out input control of incoming raw materials and auxiliary materials. 3. To monitor compliance with technological discipline in accordance with the production operations requirements of the approved technological instructions. 4. Monitor compliance with the applicable instructions for the storage of raw materials, supplies and finished products in the workshops and warehouses of the enterprise. 5. Monitor compliance with the consumption rates of raw materials and materials, carrying out control work to reduce consumption rates, identify additional reserves for saving raw materials and material resources. 6. Keep laboratory logs and monitor the correctness of shop logs. 7. To make a final decision on the acceptance of finished products or on their classification as defective.
	Professional skills (hard skills)		
	Participates in the development of sound technological schemes for processing biotechnological raw materials aimed at ensuring stable and high-quality products. Performs standard calculations and design of individual stages of technological processes and methods of quality control, standardization in biotechnological industries, taking into account the influence of parameters on product output		

Типтік оқу жоспары / Типичный учебный план / Typical curriculum
ББББ 6В05112 Биотехнология / ОП 6В05112 Биотехнология / EP 6B05112 Biotechnology

Модуль № / № модуля / Module №	Пәннің № / № дисциплины / Discipline №	ОҚУ ПӘНДЕРІНІҢ АТАУЫ НАИМЕНОВАНИЕ УЧЕБНЫХ ДИСЦИПЛИН NAME OF TEACHING DISCIPLINES	Оқу пәнінің циклы мен үлгесі (компонент таңдау компонент / Цикл учебных дисциплин (общий/ вариативный компонент / Educational discipline cycle (component/ component choice)	Оқу пәнінің 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)	Барлық сағат / Всего часов / Total hours	Аудиториялық жұмыс Аудиторные занятия Classroom hours				ОБЖӨ/ СРОП/ IWST	БАӨЖ/ СРО/ IWS	Семестр бойынша бөлу / Распределение по семестрам / Distribution by semesters								Оқыту тілін көрсете отырып, білім беру бағдарламасы бойынша оқыту тілінде оқытуға тіл дайындығына талаптар Язык обучения (для программы технического и профессионального образования на языке обучения, на русском языке, на английском языке) Language of education (for trilingual education program - in the language learning in the second language, in English)
									Барлық сағат / Всего часов / Total hours	Оның ішінде / в том числе / including						1 КУРС		2 КУРС		3 КУРС		4 КУРС		
										ДТ / ЛЗ / Lec	СТС / СЗЗ / SPI	ЗС / ЛР / Lc				1 Академиялық кезең / Academic period	2 Академиялық кезең / Academic period	3 Академиялық кезең / Academic period	4 Академиялық кезең / Academic period	5 Академиялық кезең / Academic period	6 Академиялық кезең / Academic period	7 Академиялық кезең / Academic period	8 Академиялық кезең / Academic period	
																Семестрдағы апталар саны. Неделя 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								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Модуль / Module № 1	Ақпараттық-коммуникативтік / Информационно-коммуникативный / Information and communication																							
	1	Шетел тілі Иностранный язык Foreign language	ЖБП (МК) ООД (ОК) GED (CC)	IYa 1104-25 (1) IYa 1104-25 (1) IYa 1104-25 (1)	1	5		150	45		45		15	90	0 + 3 + 0								Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	2	Қазақ (Орыс) тілі Казахский (Русский) язык Kazakh (Russian) language	ЖБП (МК) ООД (ОК) GED (CC)	K(R)Ya 1105-25 (1) K(R)Ya 1105-25 (1) K(R)Ya 1105-25 (1)	1	5		150	45		45		15	90	0 + 3 + 0								Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	3	Шетел тілі Иностранный язык Foreign language	ЖБП (МК) ООД (ОК) GED (CC)	IYa 1104-25 (2) IYa 1104-25 (2) IYa 1104-25(2)	2	5		150	45		45		15	90		0 + 3 + 0							Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	4	Қазақ (Орыс) тілі Казахский (Русский) язык Kazakh (Russian) language	ЖБП (МК) ООД (ОК) GED (CC)	K(R)Ya 1105-25 (2) K(R)Ya 1105-25 (2) K(R)Ya 1105-25 (2)	2	5		150	45		45		15	90		0 + 3 + 0							Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	5	Ақпараттық-коммуникациялық технологиялар Информационно-коммуникационные технологии Information and communication technologies	ЖБП (МК) ООД (ОК) GED (CC)	IKT 1108-25 IKT 1108-25 IKT 1108-25	2	5		150	45	15		30	15	90		1 + 0 + 2							Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
Барлығы модуль бойынша / Итого по модулю / Total for module						25		750	225	15	180	30	75	450										
Модуль / Module № 2	Өздігінен білім алу және жеке тұлғаны дамыту / Самообразования и развития личности / Self-education and personal development																							
	1	Қазақстан тарихы История Казахстана History of Kazakhstan	ЖБП (МК) ООД (ОК) GED (CC)	IK 1101-25 IK 1101-25 IK 1101-25	1	5		150	45	30	15		15	90	2 + 1 + 0								Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	2	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CC)	FK 1106-25 (1) FK 1106-25 (1) FK 1106-25 (1)	1	2		60	30		30			30	0 + 2 + 0								Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	3	Экономика, кәсіпкерлік, құқық және қаржылық сауаттылық модулі (экономика және кәсіпкерліктің негіздері, құқық негіздері және сыбайлас жемқорлыққа қарсы мәдениет, қаржылық сауаттылық негіздері) Модуль экономики, предпринимательства, права и финансовой грамотности (основы экономики и предпринимательства, основы права и антикоррупционная культура, основы финансовой грамотности) Module of economics, entrepreneurship, law and financial literacy (fundamentals of economics and entrepreneurship, basics of law and anti-corruption culture, basics of financial literacy)	ЖБП (ЖК) ООД (ВК) GED (UC)	MEPPFG 1107-25 MEPPFG 1107-25 MEPPFG 1107-25	2	5		150	45	15	30		15	90		1 + 2 + 0							Білім алушының таңдауы бойынша По выбору обучающегося By student's option	
	4	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CC)	FK 1106-25 (2) FK 1106-25 (2) FK 1106-25 (2)	2	2		60	30		30			30		0 + 2 + 0							Білім алушының таңдауы бойынша По выбору обучающегося By student's option	

	5	Әлеуметтік-саясаттану білім модулі (әлеуметтану, саясаттану, мәдениеттану психология) Модуль социально-политических знаний (политология, социология, культурология психология) Module of socio-political knowledge (political science, sociology, cultural studies, psychology)	ЖБП (МК) ООД (ОК) GED (CC)	MSPZ 2103-25 MSPZ 2103-25 MSPZ 2103-25	3	8		240	120	60	60		15	105			4 + 4 + 0						Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	6	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CC)	FK 1106-25 (3) FK 1106-25 (3) FK 1106-25 (3)	3	2		60	30		30			30			0 + 2 + 0						Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	7	Философия Философия Philosophy	ЖБП (МК) ООД (ОК) GED (CC)	Fil 2102-25 Fil 2102-25 Fil 2102-25	4	5		150	45	30	15		15	90				2 + 1 + 0					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	8	Дене шынықтыру Физическая культура Physical Culture	ЖБП (МК) ООД (ОК) GED (CC)	FK 1106-25 (4) FK 1106-25 (4) FK 1106-25 (4)	4	2		60	30		30			30				0 + 2 + 0					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
Барлығы модуль бойынша / Итого по модулю / Total for module						**31**		**930**	**375**	**135**	**240**	**0**	**60**	**495**									
Модуль / Module № 3	**Жаратылыстану ғылымдары / Естественные науки / Natural sciences**																						
	1	Жоғары математика Высшая математика Higher mathematics	БП (ЖК) БД (ВК) BD (UC)	Vmat 1201-25 Vmat 1201-25 Vmat 1201-25	1	5		150	45	15	30		15	90	1 + 2 + 0								Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	2	Физикалық және коллоидтық химия Физическая и коллоидная химия Physical and colloidal chemistry	БП (ЖК) БД (ВК) BD (UC)	FKH 1202-25 FKH 1202-25 FKH 1202-25	1	4		120	45	15	15	15	15	60	1 + 1 + 1								Білім алушының таңдауы бойынша По выбору обучающегося By student's option
Барлығы модуль бойынша / Итого по модулю / Total for module						**9**		**270**	**90**	**30**	**45**	**15**	**30**	**150**									
Модуль / Module № 4	**Биотехнологияның теориялық негіздері / Теоретические основы биотехнологии / Theoretical basis of biotechnology**																						
	1	Тағам микробиологиясы Пищевая микробиология Food microbiology	БП (ТК) БД (КВ) BD (EC)	PM 1201-25 PM 1201-25 PM 1201-25	1	4		120	45	15		30	15	60	1 + 0 + 2								Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	2	Техникалық микробиология Техническая микробиология Technical microbiology		TM 1201-25 TM 1201-25 TM 1201-25																			
	3	Биотехнологияға кіріспе Введение в биотехнологию Introduction to biotechnology	БП (ЖК) БД (ВК) BD (UC)	VB 2204-25 VB 2204-25 VB 2204-25	3	5		150	45	15	30		15	90			1 + 2 + 0						Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	4	Өндірістік практика I Производственная практика I Industrial practice I	БП (ЖК) БД (ВК) BD (UC)	PP 1-25 (B) PP 1-25 (B) PP 1-25 (B)	4	5		150	0									5 апта недель weeks					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	5	Тамақтану гигиенасы Гигиена питания Food hygiene	БП (ТК) БД (КВ) BD (EC)	GP 2205-25 GP 2205-25 GP 2205-25	4	5		150	45	15	30		15	90				1 + 2 + 0					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	6	Тамақтану физиологиясы және нутрициология Физиология питания и нутрициология Physiology of nutrition and nutritionology		FPN 2205-25 FPN 2205-25 FPN 2205-25																			
	7	Биотехнологиядағы ғылыми зерттеулердің негіздері Основы научных исследований в биотехнологии Fundamentals of Scientific Research in Biotechnology	БП (ТК) БД (КВ) BD (EC)	ONIB 2206-25 ONIB 2206-25 ONIB 2206-25	4	5		150	45	15	30		15	90				1 + 2 + 0					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	8	Биотехнологиялық зерттеу әдістемесі Методология биотехнологических исследований Methodology of biotechnological research		MBI 2206-25 MBI 2206-25 MBI 2206-25																			
	9	Өсімдік биотехнологиясы Биотехнология растений Biotechnology of plants	БП (ТК) БД (КВ) BD (EC)	BR 3210-25 BR 3210-25 BR 3210-25	5	5		150	45	15	15	15	15	90					1 + 1 + 1				Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	10	Жануарлар биотехнологиясы Биотехнология животных Animal biotechnology		BZh 3210-25 BZh 3210-25 BZh 3210-25																			

	11	Биотехнология нысандары Объекты биотехнологии Objects of biotechnology	БеП (ЖК) ПД (ВК) PD (UC)	OB 3301-25 OB 3301-25 OB 3301-25	5	5		150	45	15	30		15	90					1 + 2 + 0				Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	12	Объектілерді басқарудағы жасанды интеллект Искусственный интеллект в управлении объектами Artificial intelligence in the management of object	БеП (ТК) ПД (КВ) PD (EC)	IIUO 3302-25 IIUO 3302-25 IIUO 3302-25	6	5		150	45	15	30		15	90						1 + 2 + 0			Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	13	Биотехнологиядағы заманауи әдістер Современные методы в биотехнологии Modern methods of biotechnology		SMB 3302-25 SMB 3302-25 SMB 3302-25																			
	14	Нанобиотехнология Нанобиотехнология Nanobiotechnology		NBt 3302-25 NBt 3302-25 NBt 3302-25																			
	15	Экология және биоалуантүрлілік Экология и биоразнообразие Ecology and biodiversity	БеП (ТК) ПД (КВ) PD (EC)	EB 4311-25 EB 4311-25 EB 4311-25	8	5		150	45	15	30		15	90								1 + 2 + 0	Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	16	Экологиялық биотехнология Экологическая биотехнология Environmental biotechnology		EBt 4311-25 EBt 4311-25 EBt 4311-25																			
Барлығы модуль бойынша / Итого по модулю / Total for module						**44**		**1320**	**360**	**120**	**195**	**45**	**120**	**690**									
Модуль / Module № 5		**Молекулалық биология / Молекулярная биология / Molecular biology**																					
	1	Биохимия Биохимия Biochemistry	БП (ЖК) БД (ВК) BD (UC)	Bh 1203-25 Bh 1203-25 Bh 1203-25	2	6		180	60	15	30	15	15	105		1 + 2 + 1							Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	2	Оқу практикасы Учебная практика Educational practice	БП (ЖК) БД (ВК) BD (UC)	UP 25 (B) UP 25 (B) UP 25 (B)	2	2		60	0							2 апта недель weeks							Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	3	Жалпы және молекулалық генетика Общая и молекулярная генетика General and molecular genetics	БП (ТК) БД (КВ) BD (EC)	OMG 2202-25 OMG 2202-25 OMG 2202-25	3	5		150	45	15	30		15	90			1 + 2 + 0						Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	4	Жасушаның молекулалық биологиясы Молекулярная биология клетки Molecular biology of the cell		MBK 2202-25 MBK 2202-25 MBK 2202-25																			
	5	Микроорганизмдер биотехнологиясы Биотехнология микроорганизмов Biotechnology of microorganisms	БП (ТК) БД (КВ) BD (EC)	BM 2203-25 BM 2203-25 BM 2203-25	3	5		150	45	15	15	15	15	90			1 + 1 + 1						Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	6	Биотехнологиялық нысаналарды өсіру технологиясы Технология культивирования биотехнологических объектов Technology of cultivation of biotechnological objects		TKBO 2203-25 TKBO 2203-25 TKBO 2203-25																			
Барлығы модуль бойынша / Итого по модулю / Total for module						**18**		**540**	**150**	**45**	**75**	**30**	**45**	**285**									
		Қолданбалы биотехнология / Прикладная биотехнология / Applied biotechnology																					
	1	Биотехнологиялық өндіріс шикізаттары мен өнімдерінің теориялық негіздері Теоретические основы сырья и продуктов биотехнологических производств Theoretical bases of raw materials and products of biotechnological production	БП (ТК) БД (КВ) BD (EC)	TOSPBP 2204-25 TOSPBP 2204-25 TOSPBP 2204-25	3	5		150	45	15	30		15	90			1 + 2 + 0						Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	2	Өсімдік шикізатын өңдеудің биотехнологиялық негіздері Биотехнологические основы переработки растительного сырья Biotechnological bases for the processing of vegetable raw materials		BOPRS 2204-25 BOPRS 2204-25 BOPRS 2204-25																			
	3	Тағамдық биотехнология Пищевая биотехнология Food biotechnology	БП (ЖК) БД (ВК) BD (UC)	PB 3206-25 PB 3206-25 PB 3206-25	5	5		150	45	15	15	15	15	90					1 + 1 + 1				Білім алушының таңдауы бойынша По выбору обучающегося By student's option

Модуль / Module № 6

4	Ұлттық тағам өнімдерінің биотехнологиясы Биотехнология национальных пищевых продуктов Biotechnology of national foods	БП (ТК) БД (КВ) BD (EC)	BNPP 3208-25 BNPP 3208-25 BNPP 3208-25	5	5		150	45	15	30		15	90					1 + 2 + 0				Білім алушының таңдауы бойынша По выбору обучающегося By student's option
5	Дәстүрлі емес шикізатты өңдеудің биотехнологиялық негіздері Биотехнологические основы переработки нетрадиционного сырья Biotechnological bases for the processing of non-traditional raw materials		BOPNS 3208-25 BOPNS 3208-25 BOPNS 3208-25																			
6	Гендік инженерия негіздері Основы генной инженерии Fundamentals of genetic engineering	БП (ТК) БД (КВ) BD (EC)	OGI 3209-25 OGI 3209-25 OGI 3209-25	5	5		150	45	15	30		15	90					1 + 2 + 0				Білім алушының таңдауы бойынша По выбору обучающегося By student's option
7	Генетикалық түрлендірілген организмдер және биоқауіпсіздік Генно-модифицированные организмы и биобезопасность Genetically modified organisms and biosecurity		GMOB 3209-25 GMOB 3209-25 GMOB 3209-25																			
8	Ашыту өндірісінің биотехнологиясы Биотехнология бродильных производств Biotechnology fermentation production	БП (ТК) БД (КВ) BD (EC)	BBP 3211-25 BBP 3211-25 BBP 3211-25	5	5		150	45	15	15	15	15	90					1 + 1 + 1				Білім алушының таңдауы бойынша По выбору обучающегося By student's option
9	Шарап және шарап жасау өндірісінің биотехнологиясы Биотехнология производства вина и виноделие Wine production biotechnology and winemaking		BPVV 3211-25 BPVV 3211-25 BPVV 3211-25																			
10	Жасанды нейрондық желілерді әзірлеу Разработка искусственных нейронных сетей Development of artificial neural networks		RINS 3211-25 RINS 3211-25 RINS 3211-25																			
11	Өндірістік биотехнология Промышленная биотехнология Industrial biotechnology	БеП (ЖК) ПД (ВК) PD (UC)	PB 3302-25 PB 3302-25 PB 3302-25	6	5		150	45	15	30		15	90						1 + 2 + 0			Білім алушының таңдауы бойынша По выбору обучающегося By student's option
12	Өндірістік практика II Производственная практика II Industrial practice II	БеП (ЖК) ПД (ВК) PD (UC)	PP 2-25 (B) PP 2-25 (B) PP 2-25 (B)	6	5		150	0											5 апта недель weeks			Білім алушының таңдауы бойынша По выбору обучающегося By student's option
13	Тағамдық қоспалар және биологиялық белсенді заттар Пищевые добавки и биологически активные вещества Food additives and biologically active substances	БеП (ТК) ПД (КВ) PD (EC)	PDBAV 3303-25 PDBAV 3303-25 PDBAV 3303-25	6	5		150	45	15	30		15	90						1 + 2 + 0			Білім алушының таңдауы бойынша По выбору обучающегося By student's option
14	Биологиялық белсенді заттардың микробиологиялық өндірісі Микробиологическое производство биологически активных веществ Microbiological production of biologically active substances		MPBAV 3303-25 MPBAV 3303-25 MPBAV 3303-25																			
15	Мамандандырылған тамақ өнімдерінің биотехнологиясы Биотехнология специализированных продуктов питания Biotechnology of specialized food products	БеП (ТК) ПД (КВ) PD (EC)	BSPP 4304-25 BSPP 4304-25 BSPP 4304-25	7	5		150	45	15	30		15	90							1 + 2 + 0		Білім алушының таңдауы бойынша По выбору обучающегося By student's option
16	Консерві өндірісінің биотехнологиясы Биотехнология консервного производства Biotechnology of canning production		BKP 4304-25 BKP 4304-25 BKP 4304-25																			

17	Нан өнімдерінің биотехнологиясы Биотехнология хлебопекарного производства Biotechnology of bakery production	БеП (ТК) ПД (КВ) PD (EC)	BHP 4305-25 BHP 4305-25 BHP 4305-25	7	5		150	45	15	15	15	15	90							1 - 1 - 1		Білім алушының таңдауы бойынша По выбору обучающегося By student's option
18	Ұнннан жасалған кондитерлік өнімдердің биотехнологиясы Биотехнология мучных кондитерских изделий Biotechnology of flour confectionery products		BMKI 4305-25 BMKI 4305-25 BMKI 4305-25																				
19	Сүт және сүт өнімдерінің биотехнологиясы Биотехнология молока и молочных продуктов Biotechnology of milk and dairy products	БеП (ТК) ПД (КВ) PD (EC)	BMMP 4306-25 BMMP 4306-25 BMMP 4306-25	7	5		150	45	15	15	15	15	90							1 - 1 - 1		Білім алушының таңдауы бойынша По выбору обучающегося By student's option
20	Ірімшік және сарысуды қайта өңдеу өнімдерінің биотехнологиясы Биотехнология сыра и продуктов переработки сыворотки Biotechnology of cheese and whey products		BSPPS 4306-25 BSPPS 4306-25 BSPPS 4306-25																				
21	Тағам өнеркәсібінің ферменттік препараттары Ферментные препараты пищевой промышленности Enzyme preparations of the food industry	БеП (ТК) ПД (КВ) PD (EC)	FPPP 4307-25 FPPP 4307-25 FPPP 4307-25	7	5		150	45	15	15	15	15	90							1 - 1 - 1		Білім алушының таңдауы бойынша По выбору обучающегося By student's option
22	Ашытқы дақылдарының биотехнологиясы Биотехнология заквасочных культур Biotechnology of starter cultures		BZK 4307-25 BZK 4307-25 BZK 4307-25																				
23	Ақуыз заттардың биотехнологиясы Биотехнология белковых веществ Biotechnology of protein substances	БеП (ТК) ПД (КВ) PD (EC)	BBV 4308-25 BBV 4308-25 BBV 4308-25	7	5		150	45	15	30		15	90							1 - 2 - 0		Білім алушының таңдауы бойынша По выбору обучающегося By student's option
24	Қайта өңдеу өндірістерінің микробиологиялық синтезі Микробиологический синтез перерабатывающих производств Microbiological synthesis of processing plants		MSPP 4308-25 MSPP 4308-25 MSPP 4308-25																				
25	Ет және ет өнімдерінің биотехнологиясы Биотехнология мяса и мясных продуктов Biotechnology of meat and meat products	БеП (ТК) ПД (КВ) PD (EC)	BMMP 4309-25 BMMP 4309-25 BMMP 4309-25	7	5		150	45	15	15	15	15	90							1 - 1 - 1		Білім алушының таңдауы бойынша По выбору обучающегося By student's option
26	Субөнімдердің биотехнологиясы Биотехнология субпродуктов Offal biotechnology		BS 4309-25 BS 4309-25 BS 4309-25																				
Барлығы модуль бойынша / Итого по модулю / Total for module					**70**		**2100**	**585**	**195**	**300**	**90**	**195**	**1170**										
Технологиялық / Технологический / Technological																							
1	Кәсіпорындағы экономика және жоспарлау Экономика и планирование на предприятии Economics and enterprise planning	БП (ЖК) БД (ВК) BD (UC)	EPP 2205-25 EPP 2205-25 EPP 2205-25	4	3		90	30	15	15		15	45				1 - 1 - 0					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
2	Жасанды интеллектке кіріспе Введение в Искусственный интеллект Introduction to Artificial Intelligence	БП (ТК) БД (КВ) BD (EC)	VII 2207-25 VII 2207-25 VII 2207-25	4	5		150	45	15	30		15	90				1 - 2 - 0					Білім алушының таңдауы бойынша По выбору обучающегося By student's option
3	Биотехнологиядағы үрдістер мен жабдықтар Процессы и аппараты в биотехнологии Processes and vehicles are in a biotechnology		PAB 2207-25 PAB 2207-25 PAB 2207-25																				
4	Биотехнологиялық жабдықтар Биотехнологическое оборудование Biotechnological equipment		BtO 2207-25 BtO 2207-25 BtO 2207-25																				
5	Тұрақты даму, экология және тіршілік қауіпсіздігі Устойчивое развитие, экология и безопасность жизнедеятельности Sustainable development, ecology and life safety	БП (ЖК) БД (ВК) BD (UC)	UREBZh 3207-25 UREBZh 3207-25 UREBZh 3207-25	6	5		150	45	30	15		15	90						2 + 1 + 0			Білім алушының таңдауы бойынша По выбору обучающегося By student's option

Модуль / Module № 7	6	Метрология, стандарттау және сертификаттау Метрология, стандартизация и сертификация Metrology, standardization and certification	БеП (ТК) ПД (КВ) PD (EC)	MSS 3301-25 MSS 3301-25 MSS 3301-25	6	5		150	45	15	30		15	90						1 + 2 + 0			Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	7	Стандарттау және сәйкестікті растау Стандартизация и подтверждение соответствия Standardization and confirmation of conformity		SPS 3301-25 SPS 3301-25 SPS 3301-25																			
	8	Диплом алдындағы практика Өндірістік практика Преддипломная практика Производственная практика Pre-graduate practice / Industrial practice	БеП (ЖК) ПД (ВК) PD (UC)	PDP PP 25 (B) PDP PP 25 (B) PDP PP 25 (B)	8	7		210	0													7 апта недель / weeks	Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	9	Биотехнологиялық өндірістерді техохимиялық бақылау Технохимический контроль биотехнологических производств Technochemical control of biotechnological production facilities	БеП (ТК) ПД (КВ) PD (EC)	THKBP 4310-25 THKBP 4310-25 THKBP 4310-25	8	5		150	45	15	30		15	90								1 + 2 + 0	Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	10	Биотехнологиялық өндірісті бақылау және бағалау Контроль и оценка биотехнологических производств Control and estimation of biotechnological productions		KOBP 4310-25 KOBP 4310-25 KOBP 4310-25																			
	11	Қайта өңдеу кәсіпорындарын жобалау Проектирование предприятий перерабатывающих производств Design of processing plants	БеП (ТК) ПД (КВ) PD (EC)	PPPP 4312-25 PPPP 4312-25 PPPP 4312-25	8	5		150	45	15	30		15	90								1 + 2 + 0	Білім алушының таңдауы бойынша По выбору обучающегося By student's option
	12	Биотехнологиялық кәсіпорындарды жобалау Проектирование биотехнологических предприятий Design of biotechnological enterprises		PBP 4312-25 PBP 4312-25 PBP 4312-25																			
Барлығы модуль бойынша / Итого по модулю / Total for module						**35**		**1050**	**255**	**105**	**150**	**0**	**90**	**495**									
Модуль / Module №	**Қорытынды аттестаттау / Итоговая аттестация / Final assessment**																						
	1	Қорытынды аттестаттау Итоговая аттестация Final assessment			8	8		240														8 апта недель / weeks	
Барлығы модуль бойынша / Итого по модулю / Total for module						**8**		**240**	**0**	**0**	**0**	**0**	**0**	**0**									
БАРЛЫҒЫ МОДУЛЬДАР БОЙЫНША / ИТОГО ПО МОДУЛЯМ / TOTAL FOR MODULES						**240**		**7200**	**2040**	**645**	**1185**	**210**	**615**	**3735**									

РЕЦЕНЗИЯ

на образовательную программу бакалавриата «6В05112 – Биотехнология»
по направлению подготовки «6В051 - Биологические и смежные науки»
АО «Казахский университет технологии и бизнеса имени К.Кулажанова»

2025-2026 учебный год

Образовательная программа «6В05112 – Биотехнология» разработана в соответствии с требованиями Государственного общеобязательного стандарта высшего и послевузовского образования, утвержденный приказом Министра науки и высшего образования Республики Казахстан от 20 июля 2022 года № 2.

Цель образовательной программы направлена на комплексную подготовку квалифицированных и конкурентоспособных бакалавров, способных применять современные экспериментальные методы работы с биологическими объектами и использовать современное оборудование в условиях модернизации биотехнологических производств.

Описание образовательной программы включает информацию о сферах, объектах и функциях профессиональной деятельности выпускников, а также о формируемых компетенциях, необходимых для успешного освоения программы и дальнейшей профессиональной деятельности.

Паспорт образовательной программы включает квалификационные характеристики выпускника, в котором указывается присваемая степень – бакалавр естествознания по образовательной программе 6В05112 – «Биотехнология».

Содержание образовательной программы включает учебный план, формируемые компетенции, циклы обучения (ООД, БД, ПД) и компоненты (ОК, ВК, КВ), а также матрицу достижимости результатов обучения, методы обучения и технологии их оценивания.

Учебные планы обеспечивают логическую последовательность освоения модулей образовательной программы, способствующих развитию необходимых компетенций, и включают информацию об общей трудоемкости дисциплин (модулей). Общий объем учебной нагрузки составляет не менее 240 академических кредитов, включая все виды профессиональной практики (учебную, производственную и преддипломную), а так же будет применены модули искусственного интелекта при составлении рабочих учебных программ.

Описание дисциплин охватывает актуальные вопросы фундаментального и

прикладного характера в области биотехнологии, отвечающие современным научным и практическим требованиям.

Анализ рабочих программ модулей (дисциплин) образовательной программы показывает, что их содержание соответствует компетентностной модели выпускника и включает различные методы обучения, такие как дискуссии, разбор практических ситуаций и другие активные формы работы.

Проведенный анализ подтвердил, что программа охватывает основные требования к формированию общекультурных, цифровых и профессиональных компетенций выпускника. Преимуществами программы являются участие квалифицированного профессорско-преподавательского состава, специализация которого соответствует профилю преподаваемых дисциплин, а также наличие учебно-лабораторной базы, обеспечивающей проведение учебно-методической работы и лабораторных исследований.

Образовательная программа «6B05112 – Биотехнология» соответствует заявленному уровню подготовки, а также современным требованиям к специалистам, востребованным в промышленности, лабораториях и научно-исследовательских организациях.

Образовательная программа 6B05112 – «Биотехнология» рекомендуется к использованию в учебном процессе.

Рецензент:

кандидат биологических наук,
и.о. доцента кафедры биотехнологии
и микробиологии Евразийского национального
университета им. Л.Н. Гумилёва **Сагындыков У.З.**

САРАПШЫ ПІКІРІ

«6B05112 – Биотехнология» білім беру бағдарламасына
6B051 – «Биологиялық және сабақтас ғылымдар» бағыты бойынша
«Қ.Құлажанов атындағы Қазақ технология және бизнес университеті» АҚ

2025-2026 оқу жылына арналған

Білім беру бағдарламасының жалпы сипаттамасы:

6B05112 – «Биотехнология» білім беру бағдарламасы Қазақстан Республикасы Ғылым және жоғары білім министрінің 2022 жылғы 20 шілдедегі № 2 бұйрығымен бекітілген жоғары және жоғары оқу орнынан кейінгі білім берудің Мемлекеттік жалпыға міндетті стандартының талаптарына сәйкес әзірленген.

Білім беру бағдарламасының сипаттамасы түлектердің кәсіби қызмет салалары, объектілері мен функциялары туралы мәліметтерді, сондай-ақ бағдарламаны сәтті меңгеру және одан әрі кәсіби қызмет үшін қажетті құзыреттерді қамтиды. Білім беру бағдарламасының паспорты түлектің біліктілік сипаттамаларын, соның ішінде 6B05112 – «Биотехнология» бағыты бойынша табиғи ғылымдар бакалавры дәрежесін қамтиды. Бағдарлама ҚРҰС және ҚРС кәсіби қызметін реттейтін нормативтік құқықтық актілерге, сондай-ақ биотехнологиялық өндіріс саласындағы еңбек функцияларымен келісілген оқу нәтижелеріне сәйкес келеді. Ол ғылыми-зерттеу, ұйымдастырушылық-басқарушылық және өндірістік-техникалық қызметті қамти отырып, еңбек нарығында сұранысқа ие білікті мамандарды даярлауды қамтамасыз етеді.

Білім беру бағдарламасының құрылымын сипаттау және бағалау

Білім беру бағдарламасының мазмұны оқу жоспарын, қалыптастырылатын құзыреттерді, оқу циклдерін (ЖОБ/БД/ПД) және олардың құрамдас бөліктерін (ЖК/ТК/ҚБ), оқу нәтижелеріне қол жеткізу матрицасын, сондай-ақ оқыту әдістері мен оларды бағалау технологияларын қамтиды.

Оқу жоспарлары қажетті құзыреттерді қалыптастыруды қамтамасыз ететін модульдерді меңгерудің логикалық реттілігін көрсетеді және пәндердің (модульдердің) жалпы еңбек сыйымдылығы туралы ақпаратты қамтиды. Жалпы игеру көлемі кемінде 240 академиялық кредитті құрайды, оған барлық кәсіби практика түрлері (оқу, өндірістік және дипломалды) кіреді. Қосымша, жұмыс оқу бағдарламаларын әзірлеу кезінде жасанды интеллект модульдерін қолдану жоспарлануда.

Жалпы қорытынды

Білім беру бағдарламасының модульдік (пәндік) жұмыс бағдарламаларын талдау олардың мазмұны түлектің құзыреттілік моделіне сәйкес келетінін және оқытудың әртүрлі әдістерін, соның ішінде пікірталастарды, нақты жағдайларды талдауды және басқа да белсенді формаларды қолдануды көрсететінін растайды. Талдау нәтижелері бағдарламаның түлектің жалпы мәдени, цифрлық және кәсіби құзыреттерін қалыптастыруға қойылатын негізгі талаптарды қамтитынын көрсетті.

Білім беру бағдарламасының басым жақтарына оқытылатын пәндер профиліне сәйкес келетін жоғары білікті профессорлық-оқытушылық құрамның болуы, сондай-ақ оқу-әдістемелік жұмыстар мен зертханалық сабақтарды жүргізуді қамтамасыз ететін оқу-зертханалық базаның болуы жатады.

Білім беру бағдарламасын пайдалану немесе жетілдіру бойынша ұсыныстар

Ұсынылған 6В05112 – «Биотехнология» білім беру бағдарламасы дайындықтың мәлімделген деңгейіне және өнеркәсіптік кәсіпорындар, зертханалар мен ғылыми-зерттеу ұйымдары үшін мамандар даярлауға қойылатын заманауи талаптарға сәйкес келеді.

Осы бағыттағы мамандардың сұранысын талдау негізінде «Биотехнологиялық жабдықтар» пәнін оқу бағдарламасына енгізу, сондай-ақ оны оқыту барысында әдістемелік нұсқауларды нығайту ұсынылады.

6В05112 – «Биотехнология» білім беру бағдарламасын оқу процесінде пайдалануға ұсынамыз.

Рецензент:
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қолын растаймын
Әкімшілік департаменті

"С.СЕЙФУЛЛИН АТЫНДАҒЫ ҚАЗАҚ АГРОТЕХНИКАЛЫҚ ЗЕРТТЕУ УНИВЕРСИТЕТІ" КЕАҚ
НАО "КАЗАХСКИЙ АГРОТЕХНИЧЕСКИЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИМЕНИ С. СЕЙФУЛЛИНА"
ӘКІМШІЛІК ДЕПАРТАМЕНТІ