The list of academic disciplines of the university component

6B05 - Natural Sciences, Mathematics and Statistics
(Code and classification of the field of education)

6B051 - Biological and related sciences
(Code and classification of the direction of training)

0510
(Code in the International Standard Classification of Education)

B050 - Biological and related sciences
(Code and classification of the educational program group)

6B05102 - Biotechnology
(Code and name of the educational program)

bachelor
(Level of preparation)

set of 2023

Семей 2023

Developed
By the Academic Committee of the OP
The head of the AK Nurymkhan Gulnur
OP Manager Jumazhanova Madina

Reviewed
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Chairman of the Commission on Quality Assurance Abdilova G.B.

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Approved
at the meeting of the Academic Council of the University
Protocol № 1 "01" of September 2023
Chairman of the Academic Council of the University Orynbekov D.R.

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines
Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline

The integrated discipline includes the main issues and principles in the field of fundamentals of law and anti- corruption culture, economics, entrepreneurship and leadership, ecology and life safety. Features of the use of regulatory legal acts, the ability to use the business, ethical, social, economic, entrepreneurial and environmental standards of society. Specifics of environmental-legal, economic, entrepreneurial relations, leadership qualities and principles of combating corruption.

Purpose of studying of the discipline

It consists in studying the basic patterns of the functioning of living organisms, the biosphere as a whole and the mechanisms of their sustainable development under the conditions of anthropogenic impact and emergency situations; in understanding the concept of corruption, the legitimacy of the fight against it, the content of the state penal policy; in the formation of students` basic fundamental stable knowledge on the basics of economic theory, in instilling the skills and abilities of economic thinking; in introducing students to the theory and practice of entrepreneurship, to the basics of creating their own business; in the formation of theoretical knowledge and practical skills for the development and improvement of leadership qualities.

Learning Outcomes

ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.

Learning outcomes by discipline

1. analyzes the issues of safety and conservation of the natural environment as the most important priorities of life;
2. demonstrates knowledge of the fundamentals of nature management and sustainable development, assesses the impact of man-made systems on the environment;
3. shows knowledge of the main regulatory legal acts of the Republic of Kazakhstan, their understanding and application;
4. shows knowledge of the patterns of development of economic processes, clearly formulates his own position, finds and clearly sets out arguments in its defense;
5. is able to characterize the types of entrepreneurial activity and the entrepreneurial environment, draw up a business plan, create an entrepreneurial structure and organize its activities;
6. knows the fundamental provisions about the role of leadership in managing large and small social groups.

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP Economics of enterprise

Introduction to the profession

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline

The discipline studies the importance of biotechnology for the development of society, the objects of biotechnology and their definitions, the history of the formation of biotechnology, food biotechnology and its formation, the professional activity of a graduate biotechnologist of the food industry, the food industry and the prospects for its development related to biotechnology, the use of microorganisms in food biotechnology, promising biotechnological objects, introduction to genetic engineering, fundamentals of bioenergetics, ecological biotechnology, functional foods.

Purpose of studying of the discipline

The purpose of mastering the discipline "Introduction to the profession" is to develop students` skills to use a set of scientific knowledge about the achievements of fundamental sciences to solve biotechnological problems in human economic activity.

Learning Outcomes

ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process
ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms
ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology

Learning outcomes by discipline

1. Conduct research and analysis of living systems, process the results of biological research by mathematical methods;
2. Evaluate your abilities and mastering the basic educational program in biotechnology, choose the means of developing these abilities;
3. Identify promising areas for the development of biotechnology.

Prerequisites

School course

Postrequisites

Fundamentals of biotechnology Objects of biotechnology

Mathematics

Discipline cycle	Basic disciplines

Course	1
Credits count	5
Knowledge control form	Examination

Short description of discipline
The purpose of this course is to provide students with fundamental training in mathematics. The course is aimed at forming a sufficiently high culture of mathematical thinking among students and developing the ability to creatively approach problem solving. In addition to studying the fundamental foundations of higher mathematics (elements of analytical geometry, linear algebra, mathematical analysis, differential equations), the course assumes consideration of various applications of mathematics to solving production problems from the field of professional specialization.

Purpose of studying of the discipline
creation of the basis for the development of logical thinking and mathematical culture. Formation of basic knowledge and acquisition of basic skills of using mathematical apparatus for solving theoretical and applied problems, as well as the necessary level of mathematical training for mastering other applied disciplines studied within a specific profile; skills of working with special mathematical literature

Learning Outcomes
ON3 Apply the fundamental laws of physics, elements of linear algebra, differential and integral calculus in mathematical prob-lems of physics and mathematical methods for describing the physical processes occurring in nature, including in the body of living beings

Learning outcomes by discipline
1. Selects methods of mathematical analysis and modeling, theoretical and experimental research of applied problems
2. Uses mathematical symbolism to express quantitative and qualitative relations of objects
3. Applies methods of visual graphical representation of research result

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Physics

Discipline cycle	Basic disciplines
Course	1
Credits count	3
Knowledge control form	Examination

Short description of discipline
In process of studying this discipline, students get acquainted with the basic laws, concepts of all sections of physics. Physics is an area of experimental science, performing laboratory work and tasks, students are convinced of unity of the theory and practice of experiments. Students have the opportunity to gain knowledge on the subject in any area of their specialty.

Purpose of studying of the discipline
Formation of ideas about the role of experimental and theoretical methods of cognition of the surrounding world, development of skills for independent solving of physical problems, motivation to study modern scientific literature.

Learning Outcomes
ON3 Apply the fundamental laws of physics, elements of linear algebra, differential and integral calculus in mathematical prob-lems of physics and mathematical methods for describing the physical processes occurring in nature, including in the body of living beings

Learning outcomes by discipline
1. Assesses the degree of reliability of the results obtained using experimental research methods;
2. Uses various physical concepts, laws, theories in practice;
3. Applies knowledge of the basic laws of physics in solving professional problems.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP

Training practice

Discipline cycle	Basic disciplines
Course	1
Credits count	2
Knowledge control form	Total mark on practice

Short description of discipline
Deepening and consolidating the acquired theoretical knowledge obtained in the study of general engineering disciplines, the first skills of research, business correspondence skills, the acquisition of practical skills and work skills in accordance with the specialty of study. Familiarization with the organization of work and the structure of enterprises, gives clear ideas about the nature of the upcoming work activity. There is a psychological and professional adaptation of the student to production.

Purpose of studying of the discipline

Learning Outcomes
ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process
ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms
ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology

Learning outcomes by discipline
1. Explain the main objects, methods and principles of organizing biotechnological production;
2. Demonstrate basic ideas about the diversity of biotechnological objects, know the principles of the structural and functional organization of biological objects;
3. Determine possible ways of biosynthesis of key ingredients and target products to select the optimal conditions for the biotechnological process.
Prerequisites
School course
Postrequisites
Production practice I

World of Abai

Discipline cycle	Basic disciplines
Course	2
Credits count	3
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying historical facts, the philosophical and artistic foundations of the works of Abay Kunanbaev, Shakarim Kudaiberdiev, which form worldview and aesthetic values, the student`s ability to express his opinion, practical skills and perception of such human qualities as morality, honesty, artistic character. The genius of the writers of Kazakh literature and the role of M. Auezov in the study and popularization of Abai`s heritage, the significance of his works for history, literature and science are determined.
Purpose of studying of the discipline
Formation of the meaning of philosophical and ideological being, understanding of the problems raised in the works of Abai Kunanbayuly, Shakarim Kudaiberdiuly, Mukhtar Auezov and application of the acquired knowledge in the practice of everyday life.
Learning Outcomes
ON1 Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society.
Learning outcomes by discipline
1. Analyzes the philosophical and artistic foundations of works, historical facts related to the creative heritage of Abai Kunanbayev, Shakarim Kudaiberdiyev, Mukhtar Auezov
2. Uses in practice the humanistic ideas of Abai`s philosophical and artistic works
3. Assesses the place and significance of Abai`s works in the history of literature and science
Prerequisites
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)
Postrequisites
Basic and profile disciplines of the EP

Objects of biotechnology

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline "Objects of Biotechnology" studies the levels of organization and properties of living systems (cells, microorganisms, plants, animals), structural and functional features of the organization of plant and animal cells, cell cultures of plants and animals, tissues and organs of plants and animals. The discipline provides for the study of methods for cultivating biological objects on nutrient media, the basic requirements and principles for the selection of biotechnologically significant organisms, and methods for their storage are outlined.
Purpose of studying of the discipline
The purpose of this course is to gain knowledge by students: this discipline aims to create a theoretical base, familiarize students with the main objects of biotechnology, their morphology, growth, reproduction and nutrition.
Learning Outcomes
ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process
ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms
ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology
Learning outcomes by discipline
1. Analyze practically useful properties of biotechnology objects;
2. Evaluate the cultivation conditions and cell growth dynamics under which the maximum production of biomass and (or) the target product can be achieved;
3. Determine the choice of types of fermentation systems depending on the individual characteristics of the cells and production goals.
Prerequisites
Food Microbiology
Postrequisites
Fundamentals of biotechnology Cell biotechnology Microbiological control of biotechnological productions

Chemistry

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying the basic concepts and laws of chemistry, classical and quantum-mechanical ideas about the structure of the atom and chemical bonds; consideration of periodic laws and structure of the periodic system of chemical elements, types of chemical bonds; mastering the laws of thermodynamics, chemical kinetics and chemical equilibrium, corrosion of metals, ways of expressing the concentration of solutions; promote the ability to apply the knowledge gained in practice, to solve problems in professional training.

Purpose of studying of the discipline
Familiarization of students with modern ideas about the structure of substances, with the basic theories of chemical processes, with the properties of catalytic and complex systems, as well as with the properties of elements. Knowledge of the basic theory of chemical processes necessary in the study and deeper understanding of all subsequent special disciplines, also give students scientific and practical training in the basics of analytical chemistry.

Learning Outcomes
ON4 Apply the basic stoichiometric laws of chemistry in solving computational problems, patterns of different types of reactions, calculate the energy characteristics of chemical processes and the number of components of solutions of a given concentration

Learning outcomes by discipline
1. possess fundamental chemical concepts, theories, laws and patterns.
2. describe the main methods of scientific knowledge used in chemistry, such as observation, description, measurement, experiments.
3. be able to give quantitative estimates and make calculations using chemical formulas and equations.

Prerequisites
School course

Postrequisites
Biochemistry

Biochemistry

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at studying the laws of the main biochemical processes, determining the relationship between the functions of biomolecules and the structure involved in the reactions of cellular metabolism; studying the main classes of biological substances (structure, properties and mechanism of their functioning), biological and physico-chemical properties of natural compounds, the main pathways of metabolism, the relationship of regulatory mechanisms, metabolic processes; understanding the essence of the mutual transformations of substances in various technological processing.

Purpose of studying of the discipline
cognition of the molecular foundations of life, its main task is to clarify the relationship between the biological function and the molecular structure of substances of living nature

Learning Outcomes
ON4 Apply the basic stoichiometric laws of chemistry in solving computational problems, patterns of different types of reactions, calculate the energy characteristics of chemical processes and the number of components of solutions of a given concentration
ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms

Learning outcomes by discipline
1. Knows the classification, structure, biological role and metabolic pathways of the main biomolecules that make up animal and plant cells, methods of storing and transmitting genetic information, principles of energy transformation in biological systems, basic methods of synthesis of biologically active substances derived from secondary metabolites, their use in industry and medicine, environmental problems in technologies for the synthesis of these substances and the possibility of waste disposal during their production;
2. Is able to solve problems and issues related to the establishment of the amino acid sequence of protein structures, the active center of enzymes, the biological action of coenzymes and other biomolecules;
3. Has the skills of synthesis, separation and identification of biologically active compounds;
4. Is able to use the accumulated and acquired knowledge to solve theoretical and practical problems.

Prerequisites
Chemistry

Postrequisites
Basic and profile disciplines of the EP

Fundamentals of biotechnology

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies typical techniques for cultivating microorganisms, animal and plant cells; stages of biotechnological processes

and principles of their implementation; methods for designing producers; cell engineering methods; typical schemes of processes for obtaining isolation, purification and testing of biologically active substances; current state and prospects for the development of biotechnology; feasibility study of the availability of raw materials, manufacturability of industrial strains of microorganisms, target products, asepticity and scaling.

Purpose of studying of the discipline

The purpose of this course is to study the technological methods of obtaining modified biological objects in order to give them new properties and / or the ability to produce new substances.

Learning Outcomes

ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process

ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms

ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology

ON8 Is Able to carry out the technological process of biotechnological production and processing of industrial waste in accordance with the requirements of the international standard for environmental management

Learning outcomes by discipline

1. Determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select the optimal conditions for the biotechnological process;

2. Manage individual stages of the processes for obtaining biomass, amino acids, enzymes, antibiotics, bacterial preparations, the processes of isolation, purification and testing of biologically active substances;

3. Highlight modern requirements for biotechnological products; fundamentals of solving theoretical and applied problems of biotechnology; prospects for the development of biotechnology.

Prerequisites

Objects of biotechnology

Postrequisites

Industrial biotechnology Food Biotechnology Biotechnology of dairy production and processing of secondary raw materials

Production practice I

Discipline cycle	Basic disciplines
Course	2
Credits count	5
Knowledge control form	Total mark on practice

Short description of discipline

Acquaintance with the structure of the enterprise, the raw materials supply area, with the range of products, technological equipment and technological processes; with the organization of labor in workshops and at individual workplaces. To study biotechnological production and materials from raw materials to finished products; To clarify the concept of the division of labor processes into preparatory, basic, auxiliary, indicate which tariff categories are divided into work in the workshop.

Purpose of studying of the discipline

Learning Outcomes

ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process

ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms

ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology

Learning outcomes by discipline

1. Manage the individual stages of the processes for obtaining biomass, amino acids, enzymes, antibiotics, bacterial preparations, the processes of isolation, purification and testing of biologically active substances;

2. Describe the main biotechnological production processes at this enterprise;

3. Demonstrate knowledge of the technological processes for the production of biotechnological products, their methods and processing modes, as well as monitor and analyze the production processes, storage of raw materials and finished products.

Prerequisites

Training practice

Postrequisites

Production practice II

Methods of food analysis

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Examination

Short description of discipline

Studies methods for determining the quality indicators of raw materials and food products; sampling of raw materials and products and their preparation for analysis; methods of isolation and concentration; methods for determining moisture in food products; methods for determining the acidity of food products; refractometric methods for food analysis; functional and technological properties; food safety; physical and chemical methods in assessing the quality of raw materials and finished products.

Purpose of studying of the discipline
Learning Outcomes
ON4 Apply the basic stoichiometric laws of chemistry in solving computational problems, patterns of different types of reactions, calculate the energy characteristics of chemical processes and the number of components of solutions of a given concentration
ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms
ON10 Determine the order of organization, planning and carrying out research work using modern research, educa-tional and information technologies, and is able to select me-thods of analysis depending on the object and the task
Learning outcomes by discipline
1. Determine research methods and be able to independently assess the quality of food raw materials, semi-finished products and finished products;
2. Use physical, chemical, physicochemical and biological methods as a tool in professional activities;
3. Assess the compliance of product information with the requirements of regulatory documentation.
Prerequisites
Industrial biotechnology Food Biotechnology Food Microbiology
Postrequisites
Biotechnology of industrial waste processing Standardization, certification and technical measurements

Production practice II

Discipline cycle	Basic disciplines
Course	3
Credits count	5
Knowledge control form	Total mark on practice

Short description of discipline
Acquaintance with production, technology, water, heat and power supply of the enterprise.
Study of enterprise documentation and their translation into a foreign language . Communication during the practice between students and the head in a foreign language. Writing one of the sections of the practice report in a foreign language.

Purpose of studying of the discipline
The purpose of the internship is to consolidate professional competence, acquire practical skills and professional experience.
Learning Outcomes
ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process
ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology
ON8 Is Able to carry out the technological process of biotechnological production and processing of industrial waste in accordance with the requirements of the international standard for environmental management
Learning outcomes by discipline
1. Be able to calculate the consumption rates of raw materials, draw up technological schemes for food production, and also assess the quality of raw materials and finished products of food production;
2. Organize biotechnological production and manage production processes;
3. Analyze and put into practice legislative, regulatory and scientific and methodological documents.
Prerequisites
Production practice I
Postrequisites
Production practice III

Standardization, certification and technical measurements

Discipline cycle	Basic disciplines
Course	4
Credits count	5
Knowledge control form	Examination

Short description of discipline
The discipline studies the state system of standards, standardization of measuring instruments and methods, the metrological service of the PK, standardization of units of measurements, classification of methods and measuring instruments, control of compliance with standards and their distribution, in the preparation of requirements and rules for products, in production, application and safety of products for manufacturers and consumers; assess the quality of raw materials and finished products of food production; develop regulatory documentation.
Purpose of studying of the discipline
Learning Outcomes
ON8 Is Able to carry out the technological process of biotechnological production and processing of industrial waste in accordance with the requirements of the international standard for environmental management
ON9 Design enterprises of biotechnological production in accordance with the requirements of SNR and others regulations using of elements of CAD, engineering graphics and ways to ensure economic efficiency of production
Learning outcomes by discipline
1. Assess the quality of raw materials and finished products of food production, develop regulatory documentation;
2. Prepare instruments and equipment for analysis;
3. Calculate measurement results.

Prerequisites
Physics
Postrequisites
Final examination

Ecological biotechnology

Discipline cycle	Profiling discipline
Course	4
Credits count	6
Knowledge control form	Examination

Short description of discipline
The discipline studies the main characteristics of wastewater; aerobic water purification processes; the main environmental problems associated with pollution of domestic and industrial wastewater; elevated concentrations of radionuclides and heavy metals in the air, water bodies and soils, territories of the Republic of Kazakhstan; homogeneous reactors; industrial, agricultural and domestic effluents, their quality assessment criteria and composition; fixed biofilm reactors.
Purpose of studying of the discipline
Learning Outcomes
ON5 To analyze the main processes and phenomena occurring in animate and inanimate nature and determine the principles of the structural and functional organization of biological objects, possible ways of biosynthesis of key ingredients and target products to select optimal conditions for the biotechnological process
ON6 Explain morphophysiological, biochemical, molecular genetic features of the functioning of biological objects in the field, laboratory and industrial conditions and perform qualitative and quantitative analyses using physico-chemical and microbiological methods in the cultivation of individual cells of microorganisms
ON7 Apply microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology
ON8 Is Able to carry out the technological process of biotechnological production and processing of industrial waste in accordance with the requirements of the international standard for environmental management
Learning outcomes by discipline
1. Carry out the technological process of biotechnological production and processing of industrial waste in accordance with the requirements of the international standard for environmental management;
2. Justify the choice and use of microorganisms, plants or animals as objects for scientific research and practical purposes used in various fields of biotechnology;
3. Apply the acquired knowledge to develop strategies for solving specific environmental problems.
Prerequisites
Fundamentals of biotechnology Objects of biotechnology Biotechnology equipment
Postrequisites
Final examination