NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

6B05 - Natural Sciences, Mathematics and Statistics
(Code and classifcation of the feld of education)

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

0510
(Code in the International Standard Classifcation of Education)

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

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

Bachelor
(Level of preparation)

Semey

Educational program

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)

Semey 2023

PREFACE

Developed

The educational program 6B05102 - Biotechnology in the direction of preparation 6B051 - Biological and related sciences on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
Head of the Academic Committee	Nurymkhan Gulnur	Dean of the Faculty of «Engineering and Technology»	
Educational program manager	Jumazhanova Madina	Acting Associate Professor of the Department of «Food Production «Technology and Biotechnology», PhD	
Member of the AC	Kakimova Zhainagul	Head of the Department of «Food Production Technology and Biotechnology», Candidate of Engineering Sciences	
Member of the AC	Mirasheva Gulmira	Associate professor of the Department of «Food Production Technology and Biotechnology», Candidate of Engineering Sciences	
Member of the AC	Sailaubaev Askar	Director of LLP «Vostok-Milk Corporation»	
Member of the AC	Kalieva Zulfiya	Technologist LLP «Aser»	
Member of the AC	Zidakhin Diana	«6B05102 - Biotechnology» EP, student of group BT-101	
Member of the AC	Tleugali Zhamila	«6B05102 - Biotechnology» EP, student of group BT-002	

Reviewing

Full name of the reviewer	Position, place of work	Signature
Sembayeva Shynar	Technologist of LLP «Vostok-Milk Corporation»	

Reviewed

At the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4/6 «10» April 2023
Chairman of the Commission on Quality Assurance Abdilova G.B.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

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.

Content

1.Introduction

1.1.General data

The educational program 6B05102 “Biotechnology”, implemented by the Shakarim University of Semey, Faculty of Engineering and Technology, Department of "Biotechnology and standardization " for the group of educational programs 6B050 “Biological and related sciences” - was developed taking into account the needs of the regional labor market.

The educational program regulates the objectives, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of graduate training in this area of training and contains characteristics of the program and direc-tions of the graduate’s professional activities, learning outcomes and acquired competencies, or-ganization of the educational process, -pechivuyu quality training students.

The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of bachelors is the mastering by students of at least 205 credits of theoretical training, as well as at least 27 credits of practical training, 8 credits of final certification.

A total of 240 credits.

1.3.Typical study duration: 4 years.

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Preparation of competitive specialists in the labor market for the implementation of biotechnological processes with biological objects of microbial, plant, animal origin for the purpose of its use in food and processing production
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B05 - Natural Sciences, Mathematics and Statistics
Code and classification of the direction of training	6B051 - Biological and related sciences
Code in the International Standard Classification of Education	0510
Code and classification of the educational program group	B050 - Biological and related sciences
Code and name of the educational program	6B05102 - Biotechnology
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Natural Science on the educational program 6B05102 Biotechnology
Name of the profession / list of positions of a specialist	- the engineer-technologist (technologist); - quality engineer; - engineer - laboratory assistant; - production Preparation Engineer; - laboratory assistant in production laboratories; - laboratory assistant in research, design, technology, design or-ganizations; - technician-technologist; - technician-laboratory assistant
OQF qualification level (industry qualification framework)	6
Area of professional activity	Processing industry, agriculture
Object of professional activity	- Manufacturing enterprises and laboratories of the food and processing, microbial industry; - Agricultural enterprises; - Breeding stations; - Environmental services and organizations; - Sanitary-epidemiological station; - Laboratories for quality control and product safety.
Types of professional activity	Settlement and design; Organizational and managerial; Production and technology. Service and operational Breeding
Graduate Model	Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society; Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language; Apply the fundamental laws of physics, elements of linear algebra, differential and integral calculus in mathematical problems of physics and mathematical methods for describing the physical processes

	occurring in nature, including in the body of living beings; 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; 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; 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; Use microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology; 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; 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; Determine the order of organization, planning and carrying out research work using modern research, educational and information technologies, and is able to select methods of analysis depending on the object and the task; Use information resources to search and store information, work with spreadsheets, organize data, work with databases.

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29890 (3012785)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline

Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

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.

Prerequisites

School course

Postrequisites

Foreign language

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29891 (3012788)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at deepening the acquired knowledge of students in the framework of the school curriculum, as well as the use of language and speech means based on a full understanding of vocabulary and grammatical system of knowledge; the formation of socio-humanitarian worldview of students within the framework of the national idea of spiritual revival; free expression of mobile thought as a means of speech communication and in the process of communication; awareness of the national culture of the people, the ability to distinguish features of national cognition.

Purpose of studying of the discipline

Forms through phraseological units the recognition of national culture, its meaning as a linguistic unit related to spiritual culture; skills of identifying facts of national and cultural significance in the formation of Kazakh phraseology.

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.

Prerequisites

School course

Postrequisites

Kazakh language

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines

Discipline component	University component
SubjectID	29894 (3012875)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP Economics of enterprise

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29893 (3012789)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; for teaching students practical mastery of the Russian language in various areas of communication and various situations, mastering the specifics of functional semantic types and genres of functional styles of speech, enriching the vocabulary with special vocabulary, forming and improving the skills of monologue and dialogic speech.

Purpose of studying of the discipline
The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

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.

Prerequisites
School course

Postrequisites
Russian language

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29694 (3012781)

Course	1
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, preparing students for participation in mass sports competitions; forms motivational and value attitudes towards physical culture and the need for systematic physical exercises and sports; gives basic knowledge about the use of physical culture and sports in the development of vital physical qualities.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
School course

Postrequisites
Physical Culture

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29914 (3012787)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at expanding language literacy, free communication with the environment and mental and ideological skills of the student, understanding the role of language in the process of mastering world- class knowledge through the formation of a future specialist`s worldview based on national consciousness and cultural code, improving the knowledge of the state language by future specialists, increasing the scope of use of the Kazakh language by specialists.

Purpose of studying of the discipline
Ensuring high- quality mastery of the Kazakh language as a means of social, intercultural, professional communication through the formation of communicative competencies at all levels of language use.

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.

Prerequisites
Kazakh language

Postrequisites
Basic and profile disciplines of the EP

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29905 (3012786)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and

communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline

Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

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.

Prerequisites

Foreign language

Postrequisites

Basic and profile disciplines of the EP

History of Kazakhstan

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29918 (3012871)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Qualification examination

Short description of discipline

The main stages of the history of Kazakhstan are studied with: nomadic statehood, Turkic civilization, the era of colonialism, the Soviet period, independence. The driving forces, trends, patterns of historical development are analyzed; problems: ethnogenesis of the Kazakh people, the formation of statehood, national liberation movements, demographic development. The skills of analyzing historical events and facts, working with historical literature are being formed.

Purpose of studying of the discipline

The purpose of the discipline is to provide objective knowledge about the main stages of the development of the history of Kazakhstan from ancient times to the present.

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.

Prerequisites

School course

Postrequisites

Philosophy

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29922 (3012873)
Course	1
Term	2
Credits count	8
Lections	30hours
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	55hours
Independent work of the student	110hours
Total	240hours
Knowledge control form	Examination

Short description of discipline

The module of socio-political knowledge involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; generality of the methodology of learning, result-oriented; unified system representation of the typology of learning

outcomes as formed abilities.

Purpose of studying of the discipline

Formation of social and humanitarian worldview of students in the context of solving the problems of modernization of public consciousness, defined by the state program "Looking into the Future: Modernization of Public Consciousness".

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.

Prerequisites

School course

Postrequisites

Philosophy

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29916 (3012790)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; to teach the scientific style of speech as a language of specialty, the creation of secondary texts, the formation of skills for the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication, instilling the skills of speech etiquette, business rhetoric.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

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.

Prerequisites

Russian language

Postrequisites

Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29902 (3012782)
Course	1
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, the ability to exercise control and self-control in the process of classes, gaining knowledge on health promotion, hardening and increasing the body`s resistance to the effects of adverse factors of labor activity, mastering methods of selection of physical exercises and sports.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites

Physical Culture

Postrequisites
Physical Culture

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29942 (3012784)
Course	2
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; increasing the level of physical fitness and developing physical qualities; mastering the technique of sports; education of discipline, collectivism, comradely mutual assistance; education of mental stability, development and improvement of basic motor qualities - endurance, strength, speed, dexterity, flexibility.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
Physical Culture

Postrequisites
Physical Culture

World of Abai

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29964 (3012863)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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.

Prerequisites
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites
Basic and profile disciplines of the EP

Information and communication technology

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29967 (3012874)
Course	2
Term	2
Credits count	5

Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at mastering the conceptual foundations of the architecture of computer systems, operating systems and networks by students; formation of the ability to critically understand the role and signifcance of modern information and communication technologies in the era of digital globalization, new "digital" thinking, knowledge about the concepts of developing network and web applications, skills in using modern information and communication technologies in various felds of professional activity, scientifc and practical work, for self-educational and other purposes.

Purpose of studying of the discipline
Formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies

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.

Prerequisites
School course Foreign language

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29966 (3012783)
Course	2
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; acquisition of versatile abilities and skills for the development of physical abilities, socio-cultural experience and socio-cultural values of physical culture and sports; development of communication skills, thinking, self-development, the formation of experience in the implementation of sports and recreational and training programs.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
Physical Culture

Postrequisites
Physical Culture

Philosophy

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29985 (3012797)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at developing students` openness of consciousness, understanding their own national code and self-consciousness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, a holistic view of philosophy as a special form of understanding the world, mastering key worldview concepts, as well as the development and strengthening of the values of tolerance, intercultural dialogue and a culture of peace.

Purpose of studying of the discipline

Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities.

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.

Prerequisites

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites

Basic and profile disciplines of the EP

Module 2. language training

English for Academic purposes

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29954 (3012799)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

In the course of studying the discipline, the specifics of written and oral communication, academic communication, linguistic features of analytical speech works, scientific style, academic reading, oral forms of analytical communication, stages of preparation of analytical speech works, technical design of scientific text, academic writing, technique of scientific research are studied. Information is analyzed, texts are refereed and annotated; reference materials, including Internet resources, are used.

Purpose of studying of the discipline

To form skills of students of foreign language communicative competence to communicate effectively in an academic environment

Learning Outcomes

ON2 Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language

Prerequisites

Foreign language Kazakh language Russian language

Postrequisites

Fundamentals of biotechnological production Industrial biotechnology

Professionally-oriented foreign

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29953 (3012798)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

In the course of studying the discipline, professional terminology, special professionally-oriented material and its use in professional situations are studied. Orientation in texts in Kazakh, Russian and English, monologue statements of professional content. The connection of professional Kazakh, Russian and English languages with the disciplines of the specialty. The purpose of teaching a professionally oriented language is to integrate it with special disciplines in order to form professionally significant personality qualities and gain professional knowledge.

Purpose of studying of the discipline

Preparing students for communication in oral and written forms, both in professional and social spheres of communication, mastering communicative competence, to teach them to use professional Kazakh/ Russian/ English in various fields of professional activity, scientific and practical work.

Learning Outcomes

ON2 Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language

Prerequisites

Foreign language Kazakh language Russian language

Postrequisites

Fundamentals of biotechnology Industrial biotechnology

Work with professional – oriented text

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29956 (3012800)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the specifics of oral and written speech in the areas of professional, scientific, social and political communication; main provisions of lectures, conversations, reports; make a clear, logically structured report on professional topics; understand and perceive the stylistic features of the vocabulary of the English language in the field of professional communication; texts of different genres and be able to analyze them and can use information in communication.

Purpose of studying of the discipline

To training professional – oriented foreign-language communication developing personal qualities of the student, knowledge of culture of the country of the learned language and acquisition of special skills.

Learning Outcomes

ON2 Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language

Prerequisites

Foreign language Kazakh language Russian language

Postrequisites

Fundamentals of biotechnological production Industrial biotechnology

Module 3. Natural Sciences

Mathematics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29895 (3012794)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Physics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29896 (3012795)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29952 (3012796)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

School course

Postrequisites

Biochemistry

Module 4. Biotechnology of living systems

Introduction to the profession

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29897 (3012866)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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

Prerequisites

School course

Postrequisites

Fundamentals of biotechnology Objects of biotechnology

Microbiology and biotechnology in the meat and milk industries

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29933 (3012810)
Course	1
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the influence of microorganisms on the technological processes of processing and storage of meat and dairy products. Methods of microbiological research of meat and dairy products. Indication and identification of pathogenic microorganisms transmitted to humans through meat and dairy products. Methods of microbiological control of the production of agricultural products. Evaluation of the quality of meat and dairy products by microbiological indicators.

Purpose of studying of the discipline

Received by a student knowledge of the subject area of activity specialist food industry.

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

Prerequisites

School course

Postrequisites

Expertise of food products Safety of food products Microbiological bases of biotechnological production

Food Microbiology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29938 (3012867)
Course	1
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the methods and means of sterilization, methods for preparing preparations of microorganisms, cultivating microorganisms, the technique of inoculating microorganisms on nutrient media, the morphology of filamentous fungi, yeasts, bacteria, cultural and physiological and biochemical characteristics of bacteria, the isolation of a pure culture of lactic acid bacteria, methods of quantitative accounting of microorganisms, study of indoor air microflora, sanitary and bacteriological analysis of water, sanitary and microbiological analysis of soil, characterization of bacteria that cause food spoilage, microbiological analysis of food products.

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

Prerequisites

School course

Postrequisites

Cell biotechnology Fundamentals of Biotechnology of microorganisms Methods of food analysis Microbiological control of biotechnological productions

Food Microbiology and sanitary hygiene

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29925 (3012809)
Course	1
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline «Food Microbiology and Sanitary Hygiene» studies sanitary indicative microorganisms, sanitary and microbiological control of food production, the principles of microbiological control, methods of disinfecting objects from microorganisms, industrial sanitation, biological properties and vital processes of microorganisms used in the production of alcohol, wine, beer, production of yeast, bakery, lactic acid products, food spoilage agents, sanitary and microbiological examination of food products, sanitary and bacteriological control of household items and personnel hands.

Purpose of studying of the discipline

Gaining knowledge to the subject area specialist food industry activity, the ability to practically apply the knowledge in their future activities

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

Prerequisites

School course

Postrequisites

Modern methods of creation of industrial strains of microorganisms Expertise of food products Safety of food products Microbiological bases of biotechnological production

Training practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29923 (3012791)
Course	1
Term	2
Credits count	2
Study practics	60hours
Total	60hours
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

Prerequisites

School course

Postrequisites

Production practice I

General and molecular genetics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29961 (3012813)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies genetic engineering; medical genetics; human genetics; population genetics; developmental genetics; principles and mechanisms of gene action regulation; the structure and function of the gene; mutation types of mutations; mutation process; non-nuclear inheritance; linked inheritance and crossing over; gender- linked inheritance; types of interaction of non- allelic genes: complementary action of genes, epistasis, polymerism; chromosomal gender determination and inheritance of gender-linked traits.

Purpose of studying of the discipline

Patterns of inheritance of signs of, cytological basis of heredity.

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

Prerequisites
School course

Postrequisites
Cell biotechnology

Objects of biotechnology

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29957 (3012802)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites
Food Microbiology

Postrequisites
Fundamentals of biotechnology Cell biotechnology Microbiological control of biotechnological productions

Physiology of nutrition

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29959 (3012812)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the role of nutrition in the functioning of the main systems of the human body and the assessment of the nutritional status of the body; daily energy consumption; basic metabolic processes in the body; the concept of diet; physiological significance, composition, nutritional and energy value of various food products; daily norm of human need for nutrients; principles and norms of rational balanced nutrition for various population groups.

Purpose of studying of the discipline
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
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
Prerequisites
School course
Postrequisites
Fundamentals of biotechnological production Biotechnology for the production of national dairy products Biotechnology fermentation production

Plant physiology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29958 (3012811)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the general patterns of vital activity of plant organisms, the processes of absorption of mineral substances and water by plant organisms, the processes of growth and development, flowering and fruiting, nutrition, respiration, biosynthesis and accumulation of various substances. Techniques and methods for increasing the overall productivity of plant organisms, nutritional value, technological quality of their tissues and organs; the latest developments and achievements in the field of plant physiology.
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
Prerequisites
School course
Postrequisites
Bioengineering Plant cell culture

Bioengineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29971 (3012804)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the application of methods and concepts of biology (and, secondly, computer science and mathematics, chemistry, physics) to solve actual problems associated with the sciences of living organisms, using synthetic and analytical methodologies of engineering; the latest research methods used to solve bioengineering problems; Bioengineering for the development

and study of the application of living organisms mainly uses the rapidly developing field of molecular biology.

Purpose of studying of the discipline

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
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
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

Prerequisites

Food Microbiology and sanitary hygiene

Postrequisites

Fundamentals of biotechnological production Industrial biotechnology Microbiological bases of biotechnological production

Biochemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29984 (3012864)
Course	2
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

Chemistry

Postrequisites

Basic and profile disciplines of the EP

Cell biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29969 (3012803)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the theoretical foundations of cellular biotechnology; genomics, proteomics and bioinformatics; structural, functional and comparative genomics as the basis for the creation of genetically engineered structures at the cellular level; proteome of various types of organisms, its functional organization and regulation; bioinformatics in planning, organization and implementation of biotechnological tasks; characterization of cells cultured in vitro; nutrient media and cultivation conditions; cell culture in the production of biologically active compounds.
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
Prerequisites
Objects of biotechnology
Postrequisites
Food Biotechnology Methods of food analysis Microbiological control of biotechnological productions

Plant cell culture

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29972 (3012805)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the growth of cells in culture; dedifferentiation and callus formation; cell culture biology; culturing cells in a liquid medium; nutrient media; principles and methods of cultivation of plant cells; clonal micropropagation of plants; obtaining secondary metabolites using plant cell and tissue culture; preservation of the gene pool of higher plants in collections and cryobanks; the use of cell culture to solve theoretical problems of plant biology.
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
Prerequisites
Plant physiology
Postrequisites
Phytohormones in biotechnology Biotechnology of phototrophic microorganisms

Fundamentals of biotechnology

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29968 (3012801)
Course	2
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

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

Prerequisites
Objects of biotechnology

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

Fundamentals of Biotechnology of microorganisms

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29973 (3012806)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the history of development, goals and objectives of biotechnology; fundamentals of microbiological biotechnology; development prospects; main directions of biotechnology; the concept of "autoselection" and "population stability"; methods of creation and the problem of preserving the valuable properties of industrial strains of microorganisms; modern methods of storage of strains of microorganisms; biotechnological processes: systematization, stage and principles of implementation; cultivation of microorganisms, formulation of a nutrient medium for the cultivation of microorganisms.

Purpose of studying of the discipline
Getting the students knowledge of the aims and objectives of biotechnology, principles and features of microbiological processes, methods of obtaining highly industrial strains of microorganisms, methods of cultivation and storage. To introduce industrial production of antibiotics, enzymes, amino acids, polysaccharides, organic acids and neutral products, bacterial plant protection products and fertilizers, protein, single-celled organisms, etc.

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

Prerequisites
Objects of biotechnology Food Microbiology

Postrequisites
Fundamentals of scientific research Ecological biotechnology Microbiological control of biotechnological productions

Commodity Basics

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	29977 (3012808)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the systematization of goods using classification and coding methods; assortment management of the organization; the fundamental characteristics of the goods that make up its use value, as well as their possible changes at all stages of the distribution of goods; merchandising characteristics of specific goods; needs and requirements for the quality of goods; commodity analysis and examination of goods; consumer properties of goods; indicators of the quality of goods; appraisal activity in merchandising.

Purpose of studying of the discipline

Study theoretical assumptions common to all goods irrespective of their classes, subclasses and groups, the acquisition of the primary skills to use certain techniques and merchandising, to determine the basic characteristics of the goods, learn to assess and maintain the quality in the production stages, product distribution and use.

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
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Food Microbiology and sanitary hygiene

Postrequisites

Expertise of food products Safety of food products The methodology of research work

Production practice I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29983 (3012848)
Course	2
Term	2
Credits count	5
Working practice	150hours
Total	150hours
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

Prerequisites

Training practice

Postrequisites

Production practice II

Modern methods of creation of industrial strains of microorganisms

Discipline cycle	Basic disciplines

Discipline component	Electives
SubjectID	29976 (3012807)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the regulation of metabolism in a microbial cell, the induction and repression of enzyme synthesis, the regulation and proteolysis of metabolism, methods for isolating mutants and mutagenesis, hybridization of eukaryotic microorganisms, genetic engineering of industrially important microorganisms, and the construction of strains of human interferon producers. expression of foreign genes in microorganisms, conjugation and plasmids in bacteria, vector molecules, protoplast fusion, construction of strains producing primary metabolites.

Purpose of studying of the discipline

Gaining knowledge in the field of modern methods for the creation of industrial strains of microorganisms, the application of acquired knowledge in practice.

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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

Selection of industrial strains of microorganisms Microorganisms of fermentative productions

Animal biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29988 (3012815)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies cloning techniques; structure of animal genes; genetic transformation of embryonic and somatic cells of animals; methods of artificial insemination; obtaining transgenic animals; production of allopheneic animals (genetic chimeras) and issues of cryopreservation of sex and germ cells; general biological foundations of animal biotechnology; approaches to cellular and embryological engineering; principles of cloning and genetic transformation of somatic cells; understanding of the application of biotechnological methods in the science and practice of animal husbandry.

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

Prerequisites

Bioengineering

Postrequisites
Medical and veterinary biotechnology Biotechnology for the production of national dairy products

Plant biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29987 (3012814)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the diversity of biotechnological processes; main directions of biotechnology; plant biotechnology, its specifics; prospects for the development of biotechnology, cultivated plant cells as an object of biotechnology; theoretical and methodological principles of cultivation of plant cells; nutrition of cultured cells; general characteristics of nutrient media; application of fundamental biological knowledge in practical activities aimed at the production of drugs, enzymes, proteins, dyes, aromatic substances, vitamins and a number of biologically active compounds.
Purpose of studying of the discipline
The lighting of the current state of knowledge about the biology of cultured plant cells as an object of biotechnology and all the main areas of biotechnology.
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
Prerequisites
Fundamentals of biotechnology Objects of biotechnology Cell biotechnology
Postrequisites
Fundamentals of scientific research Ecological biotechnology

Phytohormones in biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29989 (3012816)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the main types of plant phytohormones, as well as biotechnological methods for their production; plant hormonal system; synthetic regulators of plant development and growth; synthetic regulators (growth substances) and phytohormones in plant biotechnology; biotechnological methods for obtaining phytoregulators and phytohormones; genetic and environmental safety of the use of growth regulators; general features of the action of phytohormones; classification of phytohormones; auxins; content and distribution in plants; chemical structure of auxins; auxin metabolism.
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

Prerequisites

Plant cell culture Plant physiology

Postrequisites

The methodology of research work Biotechnology of phototrophic microorganisms

Module 5. Organization of biotechnological production

Safety of food products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30009 (3012824)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the basics of security and its types; product quality indicators; improving product quality; methods for analyzing data on product quality; hygienic requirements for the quality and safety of food raw materials and food products; quality and safety of raw materials and food products; basic scientific and practical provisions of food security; requirements for ensuring the quality and safety of food products, materials and products; international aspects of food security.

Purpose of studying of the discipline

Formation of knowledge on the main provisions of methods of planning, organization and carrying out of tests and controls on the processing of test results for later use knowledge in solving organizational, methodological and technical issues of research, attributive and product control tests in various industries under trial operation, in landfills, PA production facilities and design research organizations.

Learning Outcomes

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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

The methodology of research work Research work on the specialty

Industrial biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30005 (3012819)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the typical scheme and main stages of biotechnological productions; fermentation process: main characteristics; mathematical models of the kinetics of fermentation processes; continuous cultivation of microorganisms; control of technological regimes of periodic and semi-periodic fermentation processes; biocatalysis and biotransformation; sorption methods for the isolation of biosynthesis products; membrane methods in biotechnology; main sources of biogenic elements; generalized technological scheme of the process of microbial synthesis; equipment for cultivating microorganisms.

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
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
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

Prerequisites

Bioengineering

Postrequisites

Modern technologies of use of biologically active substances in bioindustry

Fundamentals of biotechnological production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30004 (3012818)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the rate and peculiarity of metabolism in microbial cells, examples (the ability to synthesize secondary metabolites, doubling time, the ability to regulate the rate of metabolic reactions); the use of different strains of microorganisms depending on the type of bioproduction; metabolism of biological objects, requirements for the use of raw materials (substrates) for biotechnological production; the importance of microorganisms as objects of biotechnological production; typical scheme and main stages of biotechnological productions.

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

Prerequisites

Bioengineering Microbiology and biotechnology in the meat and milk industries

Postrequisites

Biotechnology fermentation production Probiotic biotechnology Microorganisms of fermentative productions

Food Biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30007 (3012822)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the basics of food biotechnology; microbiological production of biologically active substances and preparations; chemical composition of food products; requirements for raw materials and auxiliary materials; the use of yeast, mold fungi and bacteria in food production; alcohol production; brewing; wine production; bakery production; starch technology; fruit processing technology; genetically modified products; technology of sausage products; confectionery technology.

Purpose of studying of the discipline
To familiarize students with the peculiarities of biological processes in cells of various groups of microorganisms that underlie food production.
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
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
Prerequisites
Fundamentals of biotechnology Objects of biotechnology
Postrequisites
Methods of food analysis Fundamentals of scientific research

Industrial biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	29241 (3012817)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the areas of application of products of biotechnological industries; biological objects - a component of biotechnological production; mass transfer characteristics of fermentation equipment; methods of long- term storage of microbial cultures; models of biotechnological process control; biopesticides and soil fertilizers; models of biotechnological process control; fundamentals of modern immunobiotechnology; hardware design of the processes of isolation and purification of products of microbial synthesis; technological bioenergy; obtaining ethanol as a fuel.
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
Prerequisites
Fundamentals of biotechnology
Postrequisites
Biotechnology of industrial waste processing Ecological biotechnology Biotechnology of dairy production and processing of secondary raw materials Microbiological control of biotechnological productions

Expertise of food products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30008 (3012823)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline

The discipline studies commodity expertise of food products; theoretical foundations for the examination of food products; examination of low-quality and dangerous food products; veterinary and sanitary examination of food products; fundamental documents regulating the conduct of examinations, the structure of the expert opinion; sanitary and epidemiological examination of food products; biological value of food; principles, methods and equipment of food biotechnology; contamination of food raw materials and food products with xenobiotics and pollutants of chemical origin.

Purpose of studying of the discipline

Learning Outcomes

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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

The methodology of research work Research work on the specialty Microorganisms of fermentative productions

Microbiological control of biotechnological productions

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30181 (3012857)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the characteristics of the main microorganisms- contaminants of sanitary- indicative microorganisms and biotechnological industries; on the safety of biotechnological production of food products and food raw materials; methods of sterilization, disinfection and preservation used in the food industry; ways to ensure the sterility of microbiological production; the role of the microflora of air, water, soil in the contamination of food products with foreign microorganisms and the spread of infectious diseases; sanitary and hygienic requirements for production processes and industrial equipment; risk analysis systems.

Purpose of studying of the discipline

To form the student`s knowledge about the safety of biotechnological production of food raw materials and food products.

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

Prerequisites

Food Biotechnology Food Microbiology

Postrequisites

Final examination

Microorganisms of fermentative productions

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29997 (3012859)
Course	3
Term	2
Credits count	5
Lections	15hours

Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In the module are the General characteristics of fermentation and its types, the main characteristics of the industries based on the use of microorganisms, the basic principles governing the growth and reproduction of yeast and other cultures of micro-organisms: stages of development and methods of cultivation; relationships of microorganisms; The characteristics of the enzymes used in the fermentation industries, their properties and classification. The fundamentals of alcoholic fermentation: the structure, chemical composition of the yeast cell; characteristics and race of yeast used in fermentation industries, as well as chemical reactions underlying alcoholic fermentation.

Purpose of studying of the discipline
The purpose of the module is to familiarize students with the technology of fermentation, methods and processes of processing various types of raw materials into fermentation products.

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

Prerequisites
Modern methods of creation of industrial strains of microorganisms

Postrequisites
Design of fermentation enterprises

Functional starter cultures in food industry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29998 (3012858)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the selection of starter crops; identification of microorganisms using genotypic methods; the history of the development of taxonomy, the problem of the spread of resistance to antibiotics in industrial strains; application of cultures of yeast and filamentous fungi in the food industry, biotechnology of starter cultures; the use of denitrifying microorganisms and nitrites in the food industry, the formation of aromatic compounds by starter cultures, the role of oxygen in the vital activity of starter cultures; starter cultures are bacteriocin producers.

Purpose of studying of the discipline
Getting knowledge of the subject area of activity specialist food industry, the ability to practically apply the knowledge in their future activities.

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

Final examination

Biotechnology fermentation production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30186 (3012846)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies the general characteristics of fermentation and its types; the main characteristics of industries based on the use of microorganisms; the main patterns of reproduction and growth of yeast and other cultures of microorganisms; characteristics of enzymes used in fermentation industries; outlined the basics of alcoholic fermentation; yeast in fermentation industries; malt production technology; calculation of the yield of finished malt from barley in terms of dry and air-dry matter.

Purpose of studying of the discipline

Learning Outcomes

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

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

Prerequisites

Fundamentals of biotechnological production Industrial biotechnology

Postrequisites

Design of fermentation enterprises Probiotic biotechnology

Biotechnology of dairy production and processing of secondary raw materials

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30184 (3012844)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies the composition and properties of milk - as an object for biotechnological processes; bacterial preparations for fermented dairy products; classification of microorganisms used in the production of dairy products; selection of bacterial preparations; formation of bacterial starter cultures; preparation and use of bacterial preparations in production conditions; technologies of dairy products; dairy products; products made from skimmed milk, buttermilk and whey; recycled drinks; protein products from secondary raw materials.

Purpose of studying of the discipline

Mastering theoretical knowledge and practical skills in biotechnology of dairy products production and processing of secondary raw materials by students

Learning Outcomes

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
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

Prerequisites
Industrial biotechnology Food Biotechnology

Postrequisites
Final examination

Biotechnology for the production of national dairy products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30185 (3012845)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Studying the state and prospects for the development of the dairy industry; history, sanitary and hygienic requirements for obtaining high-quality milk; the procedure for its primary processing and storage; the composition and properties of milk of farm animals, as well as the factors that determine them; technological processes for the production of national dairy products; fermented milk products, oils, cheeses, canned milk, ice cream, baby food and secondary dairy raw materials.

Purpose of studying of the discipline

Learning Outcomes
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
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

Prerequisites
Fundamentals of biotechnological production Technological equipment of enterprises of meat and dairy industry

Postrequisites
Designing of the enterprises of meat and milk industry

Cost management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30187 (3012870)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The purpose of the course «Cost Management» is the formation of students` competencies in cost management, the ability to conduct analytical work in the field of cost management. This discipline is aimed at forming students with a set of necessary theoretical knowledge to understand the essence of costs and the basics of their management, as well as practical skills necessary for the purposes of strategic cost management.

Purpose of studying of the discipline
To reveal the problems in the field of organization, planning and management of production in a market economy in order to reduce

costs.

Learning Outcomes

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

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Biotechnology of industrial waste processing

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30197 (3012820)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies environmental pollution and scientific and technological progress; types of pollution and their characteristics; creation of non-waste and low-waste industries as a way to solve the problems of technogenic pollution; natural, biogeochemical and technogenic flows (cycles) of individual elements; bioremediation, biostimulation and bioaugmentation are the main directions in the use of biological objects for the decomposition of organic substances; pathways and sources of technogenic pollutants into soil, water and atmosphere.

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

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

Prerequisites

Fundamentals of biotechnology Industrial biotechnology

Postrequisites

Final examination

Biotechnology of phototrophic microorganisms

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30191 (3012849)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies phototrophic microorganisms, their role in nature and human life; the possibility of using microalgae in mass cultivation to obtain biologically active substances, to study the mechanisms and productivity of photosynthesis of various groups of phototrophic organisms; the role of phototrophic microorganisms in the development of photobiotechnology, namely, obtaining dietary supplements based on microalgae; the role of phototrophic microorganisms in biotechnological production, methods for isolating

promising strains and methods for their cultivation.

Purpose of studying of the discipline

Getting the students knowledge of phototrophic microorganisms and producing the desired products using microalgae and cyanobacteria.

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

Prerequisites

Modern methods of creation of industrial strains of microorganisms Microorganisms of fermentative productions

Postrequisites

Final examination

Yeast and micromycetes in industrial biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30202 (3012826)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the yeast cell, cytology; yeast cell components; cytological features of yeast in different growth conditions; morphology and asexual reproduction; yeast micromorphology; cell cycle; sexual reproduction and yeast life cycles; ascomycete yeast, basidiomycete yeast; features of metabolism; distribution of yeast fungi in nature; industrial use of yeast; yeast as pathogens of human diseases; yeast systematization.

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

Prerequisites

Fundamentals of biotechnological production Biotechnology fermentation production Microorganisms of fermentative productions

Postrequisites

Final examination

Use o f enzyme preparations in food production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27229 (3012825)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	40hours

Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The discipline studies general information about enzymes; groups of enzyme preparations used in the food industry; the use of enzyme preparations in the dairy industry; the use of enzyme activity values to assess the quality of milk; enzymes in the meat industry of the food industry; the use of enzymes in baking; the use of enzyme preparations in the brewing industry and in the starch industry; the use of enzyme preparations in the production of fruit and berry and grape juices, wines and soft drinks.

Purpose of studying of the discipline
Preparation of knowledge, skills andskills for the preparation and use of enzyme preparations in food production.

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

Prerequisites
Fundamentals of biotechnology Objects of biotechnology Industrial biotechnology Food Biotechnology

Postrequisites
Final examination

Probiotic biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30196 (3012850)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The discipline studies probiotics, prebiotics and synbiotics, metabolite, lactulose- containing and combined probiotic preparations; creation of new bacterial preparations based on probiotic bacteria; with the technology of obtaining probiotic preparations, with the development of new types of biologically active substances and products for food and medical and preventive purposes; functional products in the modern structure of nutrition; selection criteria for lactic acid bacteria; prebiotics; rationale for the choice of starter cultures.

Purpose of studying of the discipline
Development of new types of biologically active substances and food products and therapeutic and prophylactic purposes

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

Prerequisites
Modern methods of creation of industrial strains of microorganisms

Postrequisites
Final examination

Selection of industrial strains of microorganisms

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30203 (3012821)
Course	4
Term	1

Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the role of starter cultures in biotechnological processes; obtaining pure cultures of starter microorganisms, modern methods of their selection and principles of selecting strains for the preparation of bacterial starter cultures that provide active biotechnological processes for food production; the history of the emergence and development prospects of microbiological production; ways to improve the production- valuable properties of starter microflora; quality control of bacterial starter cultures; methods and features of the technology of industrial cultivation of microorganisms; eukaryotic cell structure.

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

Prerequisites

Modern methods of creation of industrial strains of microorganisms Microorganisms of fermentative productions

Postrequisites

Final examination

Ecological biotechnology

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30198 (3012843)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
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

Prerequisites

Fundamentals of biotechnology Objects of biotechnology Biotechnology equipment

Postrequisites

Final examination

Module 6. Design of enterprises of biotechnological production

Engineering Graphics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29965 (3012865)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this discipline, the rules of execution and design of graphic works are studied; the problems of geometric and projection drawing are solved; the rules for the use of conditional graphic designations when performing drawings and diagrams are studied. Students, studying this discipline, acquire the skills of making images of parts using views, sections and sections, making sketches and working drawings, assembly drawings; drawing sizes and position numbers, drawing up specifications.

Purpose of studying of the discipline
the basic rules of execution and registration of design documentation are studied. Full mastery of the drawing as a means of expressing technical thought and
production documents, as well as the acquisition of stable drawing skills are achieved as a result of mastering the entire complex of technical disciplines of the relevant profile, supported by the practice of course and diploma design

Learning Outcomes
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

Prerequisites
School course

Postrequisites
CAD Designing of the enterprises biotechnological production

Computer graphics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29962 (3012835)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies a brief history of computer graphics; areas of application of computer graphics; basic concepts of computer graphics; software and hardware used; principles of representation of graphic information in a computer; graphic file formats; devices for input and output of graphic information; graphics adapters and monitors; scanners and digitizers; plotters and printers; review of computer editors and graphic programs; vector graphic editors; raster graphic editors.

Purpose of studying of the discipline

Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
School course

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Descriptive geometry and drawing

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29963 (3012836)
Course	2
Term	1
Credits count	5

Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this discipline, the theory of drawing construction is studied; positional tasks; rules for drawing up and reading drawings; ways to convert a complex drawing, curved surfaces, views, sections, cuts, welding, soldering, threads and threaded connections, adhesive, slotted and keyed connections, sketches; gear wheels; working and assembly drawings; the main provisions of the USDD, which establish interrelated provisions and rules for the development, circulation and execution of design documentation.

Purpose of studying of the discipline
Teaching descriptive geometry is the acquisition of knowledge by students, ensuring the development of their spatial representation and imagination, constructive-geometrical thinking, the ability to analyze and synthesize the spatial forms and their relations on the basis of graphic models of space, practically implemented in the form of certain specific drawings of spatial objects.

Learning Outcomes
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

Prerequisites
School course

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Biotechnology equipment

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29990 (3012837)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies equipment for the preparation of semi-finished products and raw materials; general information about devices and machines for food production; engineering problems of food production and machine-hardware options for their solution; equipment for carrying out mass transfer and thermal processes in the processing of semi- finished products and raw materials; equipment for microbiological processes; equipment for electrophysical processing of raw materials and semi- finished products; equipment for mechanization of finishing operations.

Purpose of studying of the discipline
Getting the students basic knowledge in the field of design and operation of biotechnological machines and devices that specialist (bachelor) will be able to apply in their future practice when working in their specialty.

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

Prerequisites
Fundamentals of biotechnology

Postrequisites
CAD Designing of the enterprises biotechnological production

Processes and devices of food manufactures

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29992 (3012839)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours

Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the foundations of the theory of similarity; general principles for calculating technological processes and food production equipment; mechanical processes; hydromechanical processes; basics of modeling of technological processes and apparatuses of food production; characterization of heterogeneous systems; separation of gas heterogeneous systems; fundamentals of kinetics and dynamics of technological processes; calculations of hydromechanical and mechanical processes, machines, devices; modern problems of mechanical and hydromechanical processes and devices.

Purpose of studying of the discipline
Getting basic knowledge in the field of technological processes and engineering calculations of devices and machines.

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

Prerequisites
Bioengineering

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Technological equipment of enterprises of meat and dairy industry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29991 (3012838)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the concept of technological equipment, classification, basic parameters; the speed of kinetics and movement of the product in the equipment; milk sterilization equipment; butter production equipment; equipment for the production of ice cream; cheese production equipment; technology features and equipment classification; equipment for the production of cottage cheese; technological calculations of equipment for the production of protein dairy products; equipment for bottling milk.

Purpose of studying of the discipline
Getting the students basic knowledge in the field of design and operation of biotechnological machines and devices that specialist (bachelor) will be able to apply in their future practice when working in their specialty.

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

Prerequisites
Bioengineering

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Production practice II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30180 (3012847)
Course	3
Term	2
Credits count	5
Working practice II	150hours
Total	150hours
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
Prerequisites
Production practice I
Postrequisites
Production practice III

Organization and planning of production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30188 (3012869)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline «Organization and production planning» gives different ideas about the basics of organization, industrial production planning, methods of evaluating its effective activities. As well as the analysis and forecast of production risks and losses of the enterprise, including ways to eliminate them as soon as possible. Students will gain knowledge and skills in the field of implementation, organization and planning of industrial production of the enterprise.
Purpose of studying of the discipline
The purpose of studying the discipline "Organization and planning of production" is to study the theoretical and methodological foundations of the organization and planning of production and production infrastructure at enterprises.
Learning Outcomes
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
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Standardization, certification and technical measurements

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30190 (3012851)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

Physics

Postrequisites

Final examination

Economics of enterprise

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30189 (3012868)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

At the present stage of economic reforms, significant changes are taking place in the economy, especially at the microeconomic level: the nature and methods of economic activity of enterprises are changing. This course studies in detail the resources of the enterprise, the efficiency of their use, profitability and the main technical and economic indicators of the functioning of the enterprise. In addition, methods of stimulating labor resources, in order to optimize the production capacity and capital of the enterprise.

Purpose of studying of the discipline

The purpose of studying the discipline "Enterprise Economics" is to develop students` economic thinking based on the study of the economic mechanism of the enterprise in market conditions, providing deep theoretical knowledge and practical experience in the field of economics and organization of the enterprise and the use of technological equipment.

Learning Outcomes

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

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Biotechnological waste recycling food production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30195 (3012860)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies low-waste technologies; general principles for creating resource-saving technologies; limitations of technogenic development of the economy; characterization and classification of waste; general methods and principles of solid waste disposal; recycling of agricultural waste; general methods and principles of gaseous waste disposal; chemicals used in food production, disposal of residual substances in septic tanks, reuse of water resources opens up great opportunities for the food industry .; biotechnology in waste processing.

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

Prerequisites

Fundamentals of biotechnology Objects of biotechnology

Postrequisites

Final examination

Design of fermentation enterprises

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30201 (3012840)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies the structure of fermentation enterprises; factors regulating the location of fermentation enterprises, requirements for production buildings of fermentation production; feasibility study of construction; fundamentals of designing food industry enterprises; industrial transport; design of air conditioning systems in industrial premises; calculation of raw materials and substantiation of the range; the current state of the enterprises of the fermentation industry for the production of alcohol, alcoholic beverages, baker`s yeast, malt and the prospects for its development.

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Biotechnology fermentation production Microorganisms of fermentative productions

Postrequisites

Final examination

Designing of the enterprises of meat and milk industry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30200 (3012841)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

Studying the structure of meat and dairy industry enterprises; requirements for industrial buildings; feasibility study of construction; basics of designing enterprises of the meat and dairy industry; calculation of raw materials and substantiation of the assortment; schedule of organization of technological processes; calculation of the areas of production shops; layout of technological equipment; the current state of the enterprises of the meat and dairy industry and the prospects for its development; the state and prospects for the development of the production of sausages, meat semi-finished products of fermented milk products.

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
Microbiology and biotechnology in the meat and milk industries Technological equipment of enterprises of meat and dairy industry
Postrequisites
Final examination

CAD Designing of the enterprises biotechnological production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30199 (3012842)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Learns the basics of designing biotechnological enterprises for the production of food products; design principles for individual industries and the relationship between them, the technological structure of the enterprise, the composition and types of projects, the feasibility study of design, the principles of reconstruction of industries. Enterprise design using CAD; schedule of organization of technological processes; grocery calculation of a dairy plant; grocery calculation of the cheese-making plant; assortment selection; calculation and selection of technological equipment.
Purpose of studying of the discipline
Obtaining knowledge with the subject area of a food industry specialist, the ability to practically apply the knowledge gained in work on term and diploma projects.
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases
Prerequisites
Industrial biotechnology Food Biotechnology Biotechnology equipment
Postrequisites
Final examination

Modern problems of biosafety in food and industrial production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30192 (3012862)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the concept of biosafety in food production; hazardous biological organisms and their products; biotechnology and biosafety; stability of biosafety in bioengineering; creation of genetically modified organisms; biological, ecological, economic, food and other security; the main constituents of food products and their properties, structure, classification and changes in their production process; biosafety in tissue, cellular and organogenic biotechnologies.
Purpose of studying of the discipline
Study of topical issues in food and industrial production, identification of modern problems, in solving which methods and approaches of traditional and modern biotechnology can be used.
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

Prerequisites
Expertise of food products Safety of food products

Postrequisites
Final examination

Modern technologies of use of biologically active substances in bioindustry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30194 (3012861)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the classification of enzymes, hormones and vitamins; catalysis and activation energy; regulation of metabolism; the mechanism of action of enzymes and hormones; sources and uses of enzymes; production of vitamins; technology for isolation and purification of enzymatic preparations; immobilized enzymes; cell immobilization; industrial processes using enzymes and cells; enzyme immobilization methods; application of biologically active substances in the microbiological, food and medical industries; ecological and genetic safety of biologically active substances.

Purpose of studying of the discipline
Getting the students knowledge of the subject area of activity specialist food industry.

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

Prerequisites
Fundamentals of biotechnological production Industrial biotechnology

Postrequisites
Final examination

Prediploma practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30205 (3012853)
Course	4
Term	2
Credits count	15
Undergraduate practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline
Selection and study of material for use and interpretation in their thesis (project). Acquaintance with the peculiarities of the production of the enterprise, its organization, research for the practical part of the thesis (project), systematization of the results obtained.

Purpose of studying of the discipline

Learning Outcomes
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
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

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Production practice III

Postrequisites

Final examination

Production practice III

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30204 (3012852)
Course	4
Term	2
Credits count	15
Working practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline

Acquaintance with the features of the production of the enterprise, its organization. Design of the main workshops, auxiliary, technological schemes of products and the general plan of the enterprise. Water, heat and power supply of the enterprise. Communication during the practice between students and the head in a foreign language. Writing a Biotechnology Part of a Practice Report in a Foreign Language.

Purpose of studying of the discipline

Learning Outcomes

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
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
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Production practice II

Postrequisites

Prediploma practice

Module 7. Research and protection of intellectual property

Microbiological bases of biotechnological production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29999 (3012855)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studies the structure of the cell, the chemical composition of cells, the role of water in life processes, metabolism and enzymatic processes, enzymes and coenzymes, the kinetics of enzymatic reactions, the most important energy processes, the biosynthesis of proteins and nucleic acids, the principles of regulation of metabolism, the cultivation of microorganisms, optimal cultivation conditions, growth and reproduction, cultivation methods, basics of microbiological production, raw materials, technological equipment, stages of the technological process.

Purpose of studying of the discipline

Have an idea about the features of metabolic and biosynthetic capabilities of microorganisms, the principles of regulation of metabolism of microorganisms at the genetic and biochemical level, the laws of growth of the microorganism, the influence of external conditions on the growth and biosynthesis of primary and secondary metabolites.

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

Prerequisites

Food Microbiology and sanitary hygiene

Postrequisites

Yeast and micromycetes in industrial biotechnology Probiotic biotechnology Microorganisms of fermentative productions

Scientific basis of food production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29993 (3012854)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studying ways to control technological processes in order to obtain finished food products of high quality; biochemical, physical and chemical processes occurring in products during their processing; methods of research of technological processes of production, raw materials and finished products; methods and principles of conservation; technological properties of food products; emulsion and foam structures; adhesive properties of food products; hydrolysis of disaccharides and polysaccharides.

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
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Fundamentals of biotechnology Food Microbiology

Postrequisites

Fundamentals of scientific research Biotechnology of dairy production and processing of secondary raw materials

Modern directions the development of food biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30001 (3012856)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

He studies the directions and stages of modern biotechnology. Development trend of food and industrial biotechnology. Processes for obtaining substances and compounds useful for humans with the help of microbial, animal, plant cells; biotechnological processes used

in various areas of the food industry, and their role in the formation of consumer properties of food products; today`s achievements in food biotechnology and the main trends in its development.

Purpose of studying of the discipline

The acquisition of theoretical knowledge and development of skills and abilities in the field of modern food biotechnology.

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
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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

Functional starter cultures in food industry Modern technologies of use of biologically active substances in bioindustry Modern problems of biosafety in food and industrial production

Intellectual property in quality management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30179 (3012831)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studies the protection of intellectual property and copyright; the volume and composition of intangible assets of enterprises, their condition and development; innovative activity of enterprises; improving the qualification level of personnel; accounting for rationalization proposals and inventions in the course of production; intellectual property in quality management; intellectual goods, intellectual property; objects of industrial property and its types; objects of industrial property; documents certifying authorship.

Purpose of studying of the discipline

The acquisition of knowledgein the field ofintellectual propertyandthe rules of registrationof patent documents.

Learning Outcomes

ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Fundamentals of biotechnological production Safety of food products

Postrequisites

Standardization, certification and technical measurements

Medical and veterinary biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30178 (3012830)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studies the stages of development of medical and veterinary biotechnology; basic approaches to the creation of biotechnological pharmaceutical and veterinary preparations; objects of medical and veterinary biotechnology; preclinical and clinical trials of medicines;

biotechnology of immunogens and vaccines; genetic engineering microbiological production; immunobiotechnology; immunological diagnostic systems; modern biotechnologies in animal husbandry; transgenic animals; methods of obtaining and prospects for use; study of the basics of feeding laboratory animals.

Purpose of studying of the discipline

Getting the students knowledge of the aims and objectives of the medical and veterinary biotechnology, research on natural compounds that control the level of the body`s defenses against infection, malignancy and other diseases.

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

ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Bioengineering General and molecular genetics Animal biotechnology

Postrequisites

Selection of industrial strains of microorganisms

Methods of food analysis

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30010 (3012828)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

Industrial biotechnology Food Biotechnology Food Microbiology

Postrequisites

Biotechnology of industrial waste processing Standardization, certification and technical measurements

Patent engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30177 (3012829)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
The discipline studies the fundamentals of the legislation of foreign countries and the Republic of Kazakhstan in the field of protection of objects of intellectual (industrial) property; the essence of the system of patenting industrial property objects; legal documentation of the Republic of Kazakhstan on the protection of intellectual property; features and structure of patent documentation; the structure of the description of the invention; the essence of the system of patenting industrial property objects; INID codes for identifying bibliographic data in the specification; features of text construction; composition of an application for an object of industrial property.

Purpose of studying of the discipline
The acquisition of knowledgein the field ofintellectual propertyandthe rules of registrationof patent documents.

Learning Outcomes
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
Food Biotechnology

Postrequisites
Final examination

The methodology of research work

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	29996 (3012832)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the main stages of research work; methods of theoretical research; methodological foundations of scientific knowledge; search and processing of scientific information and registration of the results of experimental studies; issues of modeling in scientific research; methods of selection and objectives of the direction of scientific research; search, accumulation and processing of scientific information; theoretical and experimental research; processing the results of experimental studies; structure and concept of master`s thesis.

Purpose of studying of the discipline
To learn the system and methods of producing the specific methods of scientific knowledge and its presentation in forms appropriate requests of the scientific community.

Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
Bioengineering Fundamentals of biotechnological production Safety of food products

Postrequisites
Yeast and micromycetes in industrial biotechnology Probiotic biotechnology

Research work on the specialty

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30183 (3012834)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the planning of scientific research; formulation of the problem; scientific research methods; conducting empirical or theoretical research; evaluation of the result, conclusions, prospects; development of regulatory and technical documentation for processes and products, practical work on the creation of new food products; selection and justification of the research topic; analysis of the main results and provisions; evaluation of their effectiveness in the framework of the study; planning and conducting experimental research on the problem.

Purpose of studying of the discipline
Mastering the rules of scientific research and the processing of their results.
Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases
Prerequisites
Bioengineering Fundamentals of biotechnological production Safety of food products
Postrequisites
Yeast and micromycetes in industrial biotechnology Probiotic biotechnology

Fundamentals of scientific research

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30182 (3012833)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Studying research activities and its features; stages of research activities; information resources of research activities; bibliographic information and forms of its existence; information retrieval strategies; results of research activities; research presentation forms; master`s thesis: purpose, tasks, structure; methodological basis of scientific knowledge; methods of theoretical and empirical research; methods of the metatheoretical level; elements of the theory and methodology of scientific and technical creativity.
Purpose of studying of the discipline
Getting knowledge of the subject area of work engineer - an expert.
Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases
Prerequisites
Fundamentals of biotechnology
Postrequisites
Use o f enzyme preparations in food production Ecological biotechnology

Final examination

Writing and defending a graduation project or preparing and passing a comprehensive exam.

Diploma project

Credits count	8

Comprehensive exam

Credits count	8

4.Summary table on the scope of the educational program

«6B05102 - Biotechnology»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh language	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Russian language	GER/CC	1	5	150		45		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Kazakh language	GER/CC	2	5	150		45		35	70	Examination
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Russian language	GER/CC	2	5	150		45		35	70	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	15	30		35	70	Examination
Module 2. language training										
English for Academic purposes	BS/CCh	3	3	90		30		20	40	Examination
Professionally-oriented foreign	BS/CCh	3	3	90		30		20	40	Examination
Work with professional – oriented text	BS/CCh	3	3	90		30		20	40	Examination
Module 3. Natural Sciences										
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Physics	BS/US	1	3	90	15	15	0	20	40	Examination
Chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Module 4. Biotechnology of living systems										
Introduction to the profession	BS/US	1	3	90	15	15		20	40	Examination

Microbiology and biotechnology in the meat and milk industries	BS/CCh	2	5	150	15		30	35	70	Examination
Food Microbiology	BS/CCh	2	5	150	15		30	35	70	Examination
Food Microbiology and sanitary hygiene	BS/CCh	2	5	150	15		30	35	70	Examination
Training practice	BS/US	2	2	60						Total mark on practice
General and molecular genetics	BS/CCh	3	5	150	15		30	35	70	Examination
Objects of biotechnology	BS/US	3	5	150	15		30	35	70	Examination
Physiology of nutrition	BS/CCh	3	5	150	15		30	35	70	Examination
Plant physiology	BS/CCh	3	5	150	15		30	35	70	Examination
Bioengineering	BS/CCh	4	5	150	15	30		35	70	Examination
Biochemistry	BS/US	4	5	150	15		30	35	70	Examination
Cell biotechnology	BS/CCh	4	5	150	15	30		35	70	Examination
Plant cell culture	BS/CCh	4	5	150	15	30		35	70	Examination
Fundamentals of biotechnology	BS/US	4	5	150	15		30	35	70	Examination
Fundamentals of Biotechnology of microorganisms	BS/CCh	4	5	150	15	15	15	35	70	Examination
Commodity Basics	BS/CCh	4	5	150	15	15	15	35	70	Examination
Production practice I	BS/US	4	5	150						Total mark on practice
Modern methods of creation of industrial strains of microorganisms	BS/CCh	4	5	150	15	15	15	35	70	Examination
Animal biotechnology	BS/CCh	5	5	150	15	30		35	70	Examination
Plant biotechnology	BS/CCh	5	5	150	15	30		35	70	Examination
Phytohormones in biotechnology	BS/CCh	5	5	150	15	30		35	70	Examination
Module 5. Organization of biotechnological production										
Safety of food products	AS/CCh	5	5	150	15		30	35	70	Examination
Industrial biotechnology	AS/CCh	5	5	150	15	30		35	70	Examination
Fundamentals of biotechnological production	AS/CCh	5	5	150	15	30		35	70	Examination
Food Biotechnology	AS/CCh	5	5	150	15		30	35	70	Examination
Industrial biotechnology	AS/CCh	5	5	150	15	30		35	70	Examination
Expertise of food products	AS/CCh	5	5	150	15		30	35	70	Examination
Microbiological control of biotechnological productions	BS/CCh	6	5	150	15	15	15	35	70	Examination
Microorganisms of fermentative productions	BS/CCh	6	5	150	15	15	15	35	70	Examination
Functional starter cultures in food industry	BS/CCh	6	5	150	15	15	15	35	70	Examination
Biotechnology fermentation production	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Biotechnology of dairy production and processing of secondary raw materials	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project

Biotechnology for the production of national dairy products	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Cost management	BS/CCh	7	3	90	15	15		20	40	Examination
Biotechnology of industrial waste processing	AS/CCh	7	6	180	30	30		40	80	Examination
Biotechnology of phototrophic microorganisms	AS/CCh	7	6	180	15	30	15	40	80	Examination
Yeast and micromycetes in industrial biotechnology	AS/CCh	7	6	180	15	30	15	40	80	Examination
Use o f enzyme preparations in food production	AS/CCh	7	6	180	15	30	15	40	80	Examination
Probiotic biotechnology	AS/CCh	7	6	180	30	30		40	80	Examination
Selection of industrial strains of microorganisms	AS/CCh	7	6	180	30	30		40	80	Examination
Ecological biotechnology	AS/US	7	6	180	30	30		40	80	Examination
Module 6. Design of enterprises of biotechnological production										
Engineering Graphics	BS/CCh	3	5	150	15	30		35	70	Examination
Computer graphics	BS/CCh	3	5	150	15	30		35	70	Examination
Descriptive geometry and drawing	BS/CCh	3	5	150	15	30		35	70	Examination
Biotechnology equipment	BS/CCh	5	5	150	15	30		35	70	Examination
Processes and devices of food manufactures	BS/CCh	5	5	150	15	30		35	70	Examination
Technological equipment of enterprises of meat and dairy industry	BS/CCh	5	5	150	15	30		35	70	Examination
Production practice II	BS/US	6	5	150						Total mark on practice
Organization and planning of production	BS/CCh	7	3	90	15	15		20	40	Examination
Standardization, certification and technical measurements	BS/US	7	5	150	15	30		35	70	Examination
Economics of enterprise	BS/CCh	7	3	90	15	15		20	40	Examination
Biotechnological waste recycling food production	AS/CCh	7	5	150	15	30		35	70	Examination
Design of fermentation enterprises	AS/CCh	7	6	180	30	30		40	80	Examination and term work/Project
Designing of the enterprises of meat and milk industry	AS/CCh	7	6	180	30	30		40	80	Examination and term work/Project
CAD Designing of the enterprises biotechnological production	AS/CCh	7	6	180	30	30		40	80	Examination and term work/Project
Modern problems of biosafety in food and industrial production	AS/CCh	7	5	150	15	30		35	70	Examination
Modern technologies of use of biologically active substances in bioindustry	AS/CCh	7	5	150	15	30		35	70	Examination
Prediploma practice	AS/CCh	8	15	450						Total mark on practice
Production practice III	AS/CCh	8	15	450						Total mark on practice
Module 7. Research and protection of intellectual property										
Microbiological bases of biotechnological production	BS/CCh	5	5	150	15		30	35	70	Examination

Scientific basis of food production	BS/CCh	5	5	150	15		30	35	70	Examination
Modern directions the development of food biotechnology	BS/CCh	5	5	150	15		30	35	70	Examination
Intellectual property in quality management	BS/CCh	6	5	150	15	30		35	70	Examination
Medical and veterinary biotechnology	BS/CCh	6	5	150	15	30		35	70	Examination
Methods of food analysis	BS/US	6	5	150	15	15	15	35	70	Examination
Patent engineering	BS/CCh	6	5	150	15	30		35	70	Examination
The methodology of research work	AS/CCh	6	5	150	15		30	35	70	Examination
Research work on the specialty	AS/CCh	6	5	150	15		30	35	70	Examination
Fundamentals of scientific research	AS/CCh	6	5	150	15		30	35	70	Examination
Final examination										
Diploma project		8	8	240						
Comprehensive exam		8	8	240						

NJSC SHAKARIM UNIVERSITY OF SEMEY

EDUCATIONAL PROGRAM

6B05 - Natural Sciences, Mathematics and Statistics
(Code and classifcation of the feld of education)

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

0510
(Code in the International Standard Classifcation of Education)

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

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

Bachelor
(Level of preparation)

Semey

Educational program

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)

Semey 2023

PREFACE

Developed

The educational program 6B05102 - Biotechnology in the direction of preparation 6B051 - Biological and related sciences on the basis of the State Compulsory Standards of Higher and Postgraduate Education approved by the Order of the Ministry of Science and Higher Education of the Republic of Kazakhstan dated July 20, 2022 No 2 (as amended by the order) was developed by the Academic Committee dated 20.02.2023 No 66).

Members of the Academic Committee	Full name	Academic degree, academic title, position	Signature
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Educational program manager	Джумажанова Мадина Муратовна	Acting Associate Professor of the Department of «Food Production «Technology and Biotechnology», PhD	
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Reviewing

Full name of the reviewer	Position, place of work	Signature
Сембаева Шынар Тоқтауқызы	Technologist of LLP «Vostok-Milk Corporation»	

Reviewed

At the meeting of the Quality Assurance Commission of the Faculty of Engineering and Technology
Recommended for approval by the Academic Council of the University
Protocol № 4/6 «10» April 2023
Chairman of the Commission on Quality Assurance Abdilova G.B.

Approved at the meeting of the Academic Council of the University Protocol No. 8 "25" April 2023.

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.

Content

1.Introduction

1.1.General data

The educational program 6B05102 “Biotechnology”, implemented by the Shakarim University of Semey, Faculty of Engineering and Technology, Department of "Biotechnology and standardization " for the group of educational programs 6B050 “Biological and related sciences” - was developed taking into account the needs of the regional labor market.

The educational program regulates the objectives, expected results, content, conditions and technologies for the implementation of the educational process, assessment of the quality of graduate training in this area of training and contains characteristics of the program and direc-tions of the graduate’s professional activities, learning outcomes and acquired competencies, or-ganization of the educational process, -pechivuyu quality training students.

The educational program provides for the education of a student with special educational needs in the conditions of a higher educational institution, as well as his socialization and integration into society.

1.2.Completion criteria

The main criterion for the completion of the educational process for the preparation of bachelors is the mastering by students of at least 205 credits of theoretical training, as well as at least 27 credits of practical training, 8 credits of final certification.

A total of 240 credits.

1.3.Typical study duration: 4 years.

2.PASSPORT OF THE EDUCATIONAL PROGRAM

2.1.EP purpose	Preparation of competitive specialists in the labor market for the implementation of biotechnological processes with biological objects of microbial, plant, animal origin for the purpose of its use in food and processing production
2.2.Map of the training profile within the educational program	
Code and classification of the field of education	6B05 - Natural Sciences, Mathematics and Statistics
Code and classification of the direction of training	6B051 - Biological and related sciences
Code in the International Standard Classification of Education	0510
Code and classification of the educational program group	B050 - Biological and related sciences
Code and name of the educational program	6B05102 - Biotechnology
2.3.Qualification characteristics of the graduate	
Degree awarded / qualification	Bachelor of Natural Science on the educational program 6B05102 Biotechnology
Name of the profession / list of positions of a specialist	- the engineer-technologist (technologist); - quality engineer; - engineer - laboratory assistant; - production Preparation Engineer; - laboratory assistant in production laboratories; - laboratory assistant in research, design, technology, design or-ganizations; - technician-technologist; - technician-laboratory assistant
OQF qualification level (industry qualification framework)	6
Area of professional activity	Processing industry, agriculture
Object of professional activity	- Manufacturing enterprises and laboratories of the food and processing, microbial industry; - Agricultural enterprises; - Breeding stations; - Environmental services and organizations; - Sanitary-epidemiological station; - Laboratories for quality control and product safety.
Types of professional activity	Settlement and design; Organizational and managerial; Production and technology. Service and operational Breeding
Graduate Model	Demonstrate socio-cultural, economic, legal, environmental knowledge, communication skills, apply information technology, taking into account modern trends in the development of society; Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language; Apply the fundamental laws of physics, elements of linear algebra, differential and integral calculus in mathematical problems of physics and mathematical methods for describing the physical processes

	occurring in nature, including in the body of living beings; 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; 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; 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; Use microorganisms, plants or animals as objects for scientific research and practical purposes applied in various fields of biotechnology; 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; 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; Determine the order of organization, planning and carrying out research work using modern research, educational and information technologies, and is able to select methods of analysis depending on the object and the task; Use information resources to search and store information, work with spreadsheets, organize data, work with databases.

3.Modules and content of the educational program

Module 1. Fundamentals of social and humanitarian knowledge

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29890 (3012785)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline

Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

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.

Prerequisites

School course

Postrequisites

Foreign language

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29891 (3012788)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at deepening the acquired knowledge of students in the framework of the school curriculum, as well as the use of language and speech means based on a full understanding of vocabulary and grammatical system of knowledge; the formation of socio-humanitarian worldview of students within the framework of the national idea of spiritual revival; free expression of mobile thought as a means of speech communication and in the process of communication; awareness of the national culture of the people, the ability to distinguish features of national cognition.

Purpose of studying of the discipline

Forms through phraseological units the recognition of national culture, its meaning as a linguistic unit related to spiritual culture; skills of identifying facts of national and cultural significance in the formation of Kazakh phraseology.

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.

Prerequisites

School course

Postrequisites

Kazakh language

Bases of economics, law and ecological knowledge

Discipline cycle	General educational disciplines

Discipline component	University component
SubjectID	29894 (3012875)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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.

Prerequisites
School course

Postrequisites
Basic and profile disciplines of the EP Economics of enterprise

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29893 (3012789)
Course	1
Term	1
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; for teaching students practical mastery of the Russian language in various areas of communication and various situations, mastering the specifics of functional semantic types and genres of functional styles of speech, enriching the vocabulary with special vocabulary, forming and improving the skills of monologue and dialogic speech.

Purpose of studying of the discipline
The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

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.

Prerequisites
School course

Postrequisites
Russian language

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29694 (3012781)

Course	1
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, preparing students for participation in mass sports competitions; forms motivational and value attitudes towards physical culture and the need for systematic physical exercises and sports; gives basic knowledge about the use of physical culture and sports in the development of vital physical qualities.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
School course

Postrequisites
Physical Culture

Kazakh language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29914 (3012787)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at expanding language literacy, free communication with the environment and mental and ideological skills of the student, understanding the role of language in the process of mastering world- class knowledge through the formation of a future specialist`s worldview based on national consciousness and cultural code, improving the knowledge of the state language by future specialists, increasing the scope of use of the Kazakh language by specialists.

Purpose of studying of the discipline
Ensuring high- quality mastery of the Kazakh language as a means of social, intercultural, professional communication through the formation of communicative competencies at all levels of language use.

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.

Prerequisites
Kazakh language

Postrequisites
Basic and profile disciplines of the EP

Foreign language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29905 (3012786)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The content of the discipline «Foreign language» assumes the formation of students`linguo- cultural, socio- cultural, cognitive and

communicative competencies at B2 level. The discipline is aimed at deep and extended study of productive and receptive language material. As a result, the student must be able to understand all types of speech activity in accordance with the requirements of B2 level and master the subject content of the discipline and speech.

Purpose of studying of the discipline

Formation of linguo- culturological, socio- cultural, cognitive and communicative competence of students in the process of foreign language education at the B2 level, pan-European competence. Depending on the level of training, the student at the time of completing the course reaches the level B2 of the pan-European competence, if the language level of the student at the start is higher than the level B1 of the pan-European competence.

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.

Prerequisites

Foreign language

Postrequisites

Basic and profile disciplines of the EP

History of Kazakhstan

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29918 (3012871)
Course	1
Term	2
Credits count	5
Lections	30hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Qualification examination

Short description of discipline

The main stages of the history of Kazakhstan are studied with: nomadic statehood, Turkic civilization, the era of colonialism, the Soviet period, independence. The driving forces, trends, patterns of historical development are analyzed; problems: ethnogenesis of the Kazakh people, the formation of statehood, national liberation movements, demographic development. The skills of analyzing historical events and facts, working with historical literature are being formed.

Purpose of studying of the discipline

The purpose of the discipline is to provide objective knowledge about the main stages of the development of the history of Kazakhstan from ancient times to the present.

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.

Prerequisites

School course

Postrequisites

Philosophy

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29922 (3012873)
Course	1
Term	2
Credits count	8
Lections	30hours
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	55hours
Independent work of the student	110hours
Total	240hours
Knowledge control form	Examination

Short description of discipline

The module of socio-political knowledge involves the study of four scientific disciplines – sociology, political science, cultural studies, psychology, each of which has its own subject, terminology and research methods. Interactions between these scientific disciplines are carried out on the basis of the principles of information complementarity; integrativity; methodological integrity of research approaches of these disciplines; generality of the methodology of learning, result-oriented; unified system representation of the typology of learning

outcomes as formed abilities.

Purpose of studying of the discipline

Formation of social and humanitarian worldview of students in the context of solving the problems of modernization of public consciousness, defined by the state program "Looking into the Future: Modernization of Public Consciousness".

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.

Prerequisites

School course

Postrequisites

Philosophy

Russian language

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29916 (3012790)
Course	1
Term	2
Credits count	5
Practical and seminar classes	45hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is intended for the development of the language personality of the student, who is able to carry out cognitive and communicative activities in Russian in the areas of interpersonal, social, professional, intercultural communication; to teach the scientific style of speech as a language of specialty, the creation of secondary texts, the formation of skills for the production of oral and written speech in accordance with the communicative goal and the professional sphere of communication, instilling the skills of speech etiquette, business rhetoric.

Purpose of studying of the discipline

The purpose of the program is to form the socio-humanitarian worldview of students in the context of the national idea of spiritual modernization, involving the development on the basis of national consciousness and cultural code of the qualities of internationalism, tolerant attitude to world cultures and languages as translators of world-class knowledge, advanced modern technologies, the use and transfer of which can ensure the modernization of the country and personal career growth of future specialists.

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.

Prerequisites

Russian language

Postrequisites

Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29902 (3012782)
Course	1
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline

It provides for the joint cooperation of a teacher and a student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline, the ability to exercise control and self-control in the process of classes, gaining knowledge on health promotion, hardening and increasing the body`s resistance to the effects of adverse factors of labor activity, mastering methods of selection of physical exercises and sports.

Purpose of studying of the discipline

The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites

Physical Culture

Postrequisites
Physical Culture

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29942 (3012784)
Course	2
Term	1
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; increasing the level of physical fitness and developing physical qualities; mastering the technique of sports; education of discipline, collectivism, comradely mutual assistance; education of mental stability, development and improvement of basic motor qualities - endurance, strength, speed, dexterity, flexibility.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
Physical Culture

Postrequisites
Physical Culture

World of Abai

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29964 (3012863)
Course	2
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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.

Prerequisites
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites
Basic and profile disciplines of the EP

Information and communication technology

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29967 (3012874)
Course	2
Term	2
Credits count	5

Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline is aimed at mastering the conceptual foundations of the architecture of computer systems, operating systems and networks by students; formation of the ability to critically understand the role and signifcance of modern information and communication technologies in the era of digital globalization, new "digital" thinking, knowledge about the concepts of developing network and web applications, skills in using modern information and communication technologies in various felds of professional activity, scientifc and practical work, for self-educational and other purposes.

Purpose of studying of the discipline
Formation of the ability to critically evaluate and analyze processes, methods of searching, storing and processing information, methods of collecting and transmitting information through digital technologies

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.

Prerequisites
School course Foreign language

Postrequisites
Basic and profile disciplines of the EP

Physical Culture

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29966 (3012783)
Course	2
Term	2
Credits count	2
Practical and seminar classes	60hours
Total	60hours
Knowledge control form	Differentiated attestation

Short description of discipline
Provides for the joint cooperation of the teacher and the student in the process of physical education throughout the training in the context of the requirements for the level of mastering the discipline; acquisition of versatile abilities and skills for the development of physical abilities, socio-cultural experience and socio-cultural values of physical culture and sports; development of communication skills, thinking, self-development, the formation of experience in the implementation of sports and recreational and training programs.

Purpose of studying of the discipline
The purpose of the program is the formation of social and personal competencies of students and the ability to purposefully use the means and methods of physical culture, ensuring the preservation, strengthening of health to prepare for professional activities; to the persistent transfer of physical exertion, neuropsychic stress and adverse factors in future work.

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.

Prerequisites
Physical Culture

Postrequisites
Physical Culture

Philosophy

Discipline cycle	General educational disciplines
Discipline component	Compulsory component
SubjectID	29985 (3012797)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline is aimed at developing students` openness of consciousness, understanding their own national code and self-consciousness, spiritual modernization, competitiveness, realism and pragmatism, independent critical thinking, the cult of knowledge and education, a holistic view of philosophy as a special form of understanding the world, mastering key worldview concepts, as well as the development and strengthening of the values of tolerance, intercultural dialogue and a culture of peace.

Purpose of studying of the discipline

Formation in students of a holistic view of philosophy as a special form of knowledge of the world, its main sections, problems and methods of studying them in the context of future professional activities.

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.

Prerequisites

The module of socio-political knowledge (sociology, political science, cultural studies, psychology)

Postrequisites

Basic and profile disciplines of the EP

Module 2. language training

English for Academic purposes

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29954 (3012799)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

In the course of studying the discipline, the specifics of written and oral communication, academic communication, linguistic features of analytical speech works, scientific style, academic reading, oral forms of analytical communication, stages of preparation of analytical speech works, technical design of scientific text, academic writing, technique of scientific research are studied. Information is analyzed, texts are refereed and annotated; reference materials, including Internet resources, are used.

Purpose of studying of the discipline

To form skills of students of foreign language communicative competence to communicate effectively in an academic environment

Learning Outcomes

ON2 Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language

Prerequisites

Foreign language Kazakh language Russian language

Postrequisites

Fundamentals of biotechnological production Industrial biotechnology

Professionally-oriented foreign

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29953 (3012798)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

In the course of studying the discipline, professional terminology, special professionally-oriented material and its use in professional situations are studied. Orientation in texts in Kazakh, Russian and English, monologue statements of professional content. The connection of professional Kazakh, Russian and English languages with the disciplines of the specialty. The purpose of teaching a professionally oriented language is to integrate it with special disciplines in order to form professionally significant personality qualities and gain professional knowledge.

Purpose of studying of the discipline

Preparing students for communication in oral and written forms, both in professional and social spheres of communication, mastering communicative competence, to teach them to use professional Kazakh/ Russian/ English in various fields of professional activity, scientific and practical work.

Learning Outcomes

ON2 Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language

Prerequisites

Foreign language Kazakh language Russian language

Postrequisites

Fundamentals of biotechnology Industrial biotechnology

Work with professional – oriented text

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29956 (3012800)
Course	2
Term	1
Credits count	3
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the specifics of oral and written speech in the areas of professional, scientific, social and political communication; main provisions of lectures, conversations, reports; make a clear, logically structured report on professional topics; understand and perceive the stylistic features of the vocabulary of the English language in the field of professional communication; texts of different genres and be able to analyze them and can use information in communication.

Purpose of studying of the discipline

To training professional – oriented foreign-language communication developing personal qualities of the student, knowledge of culture of the country of the learned language and acquisition of special skills.

Learning Outcomes

ON2 Analyze and critically comprehend socially and professionally significant experience, communicate effectively in an intercultural environment in oral and written form, including in a foreign language

Prerequisites

Foreign language Kazakh language Russian language

Postrequisites

Fundamentals of biotechnological production Industrial biotechnology

Module 3. Natural Sciences

Mathematics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29895 (3012794)
Course	1
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Physics

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29896 (3012795)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	0hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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

Prerequisites

School course

Postrequisites

Basic and profile disciplines of the EP

Chemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29952 (3012796)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

School course

Postrequisites

Biochemistry

Module 4. Biotechnology of living systems

Introduction to the profession

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29897 (3012866)
Course	1
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
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

Prerequisites

School course

Postrequisites

Fundamentals of biotechnology Objects of biotechnology

Microbiology and biotechnology in the meat and milk industries

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29933 (3012810)
Course	1
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the influence of microorganisms on the technological processes of processing and storage of meat and dairy products. Methods of microbiological research of meat and dairy products. Indication and identification of pathogenic microorganisms transmitted to humans through meat and dairy products. Methods of microbiological control of the production of agricultural products. Evaluation of the quality of meat and dairy products by microbiological indicators.

Purpose of studying of the discipline

Received by a student knowledge of the subject area of activity specialist food industry.

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

Prerequisites

School course

Postrequisites

Expertise of food products Safety of food products Microbiological bases of biotechnological production

Food Microbiology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29938 (3012867)
Course	1
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the methods and means of sterilization, methods for preparing preparations of microorganisms, cultivating microorganisms, the technique of inoculating microorganisms on nutrient media, the morphology of filamentous fungi, yeasts, bacteria, cultural and physiological and biochemical characteristics of bacteria, the isolation of a pure culture of lactic acid bacteria, methods of quantitative accounting of microorganisms, study of indoor air microflora, sanitary and bacteriological analysis of water, sanitary and microbiological analysis of soil, characterization of bacteria that cause food spoilage, microbiological analysis of food products.

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

Prerequisites

School course

Postrequisites

Cell biotechnology Fundamentals of Biotechnology of microorganisms Methods of food analysis Microbiological control of biotechnological productions

Food Microbiology and sanitary hygiene

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29925 (3012809)
Course	1
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline «Food Microbiology and Sanitary Hygiene» studies sanitary indicative microorganisms, sanitary and microbiological control of food production, the principles of microbiological control, methods of disinfecting objects from microorganisms, industrial sanitation, biological properties and vital processes of microorganisms used in the production of alcohol, wine, beer, production of yeast, bakery, lactic acid products, food spoilage agents, sanitary and microbiological examination of food products, sanitary and bacteriological control of household items and personnel hands.

Purpose of studying of the discipline

Gaining knowledge to the subject area specialist food industry activity, the ability to practically apply the knowledge in their future activities

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

Prerequisites

School course

Postrequisites

Modern methods of creation of industrial strains of microorganisms Expertise of food products Safety of food products Microbiological bases of biotechnological production

Training practice

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29923 (3012791)
Course	1
Term	2
Credits count	2
Study practics	60hours
Total	60hours
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

Prerequisites

School course

Postrequisites

Production practice I

General and molecular genetics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29961 (3012813)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies genetic engineering; medical genetics; human genetics; population genetics; developmental genetics; principles and mechanisms of gene action regulation; the structure and function of the gene; mutation types of mutations; mutation process; non-nuclear inheritance; linked inheritance and crossing over; gender- linked inheritance; types of interaction of non- allelic genes: complementary action of genes, epistasis, polymerism; chromosomal gender determination and inheritance of gender-linked traits.

Purpose of studying of the discipline

Patterns of inheritance of signs of, cytological basis of heredity.

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

Prerequisites
School course

Postrequisites
Cell biotechnology

Objects of biotechnology

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29957 (3012802)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites
Food Microbiology

Postrequisites
Fundamentals of biotechnology Cell biotechnology Microbiological control of biotechnological productions

Physiology of nutrition

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29959 (3012812)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the role of nutrition in the functioning of the main systems of the human body and the assessment of the nutritional status of the body; daily energy consumption; basic metabolic processes in the body; the concept of diet; physiological significance, composition, nutritional and energy value of various food products; daily norm of human need for nutrients; principles and norms of rational balanced nutrition for various population groups.

Purpose of studying of the discipline
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
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
Prerequisites
School course
Postrequisites
Fundamentals of biotechnological production Biotechnology for the production of national dairy products Biotechnology fermentation production

Plant physiology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29958 (3012811)
Course	2
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the general patterns of vital activity of plant organisms, the processes of absorption of mineral substances and water by plant organisms, the processes of growth and development, flowering and fruiting, nutrition, respiration, biosynthesis and accumulation of various substances. Techniques and methods for increasing the overall productivity of plant organisms, nutritional value, technological quality of their tissues and organs; the latest developments and achievements in the field of plant physiology.
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
Prerequisites
School course
Postrequisites
Bioengineering Plant cell culture

Bioengineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29971 (3012804)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the application of methods and concepts of biology (and, secondly, computer science and mathematics, chemistry, physics) to solve actual problems associated with the sciences of living organisms, using synthetic and analytical methodologies of engineering; the latest research methods used to solve bioengineering problems; Bioengineering for the development

and study of the application of living organisms mainly uses the rapidly developing field of molecular biology.

Purpose of studying of the discipline

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
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
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

Prerequisites

Food Microbiology and sanitary hygiene

Postrequisites

Fundamentals of biotechnological production Industrial biotechnology Microbiological bases of biotechnological production

Biochemistry

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29984 (3012864)
Course	2
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

Chemistry

Postrequisites

Basic and profile disciplines of the EP

Cell biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29969 (3012803)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the theoretical foundations of cellular biotechnology; genomics, proteomics and bioinformatics; structural, functional and comparative genomics as the basis for the creation of genetically engineered structures at the cellular level; proteome of various types of organisms, its functional organization and regulation; bioinformatics in planning, organization and implementation of biotechnological tasks; characterization of cells cultured in vitro; nutrient media and cultivation conditions; cell culture in the production of biologically active compounds.
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
Prerequisites
Objects of biotechnology
Postrequisites
Food Biotechnology Methods of food analysis Microbiological control of biotechnological productions

Plant cell culture

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29972 (3012805)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the growth of cells in culture; dedifferentiation and callus formation; cell culture biology; culturing cells in a liquid medium; nutrient media; principles and methods of cultivation of plant cells; clonal micropropagation of plants; obtaining secondary metabolites using plant cell and tissue culture; preservation of the gene pool of higher plants in collections and cryobanks; the use of cell culture to solve theoretical problems of plant biology.
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
Prerequisites
Plant physiology
Postrequisites
Phytohormones in biotechnology Biotechnology of phototrophic microorganisms

Fundamentals of biotechnology

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29968 (3012801)
Course	2
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

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

Prerequisites
Objects of biotechnology

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

Fundamentals of Biotechnology of microorganisms

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29973 (3012806)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the history of development, goals and objectives of biotechnology; fundamentals of microbiological biotechnology; development prospects; main directions of biotechnology; the concept of "autoselection" and "population stability"; methods of creation and the problem of preserving the valuable properties of industrial strains of microorganisms; modern methods of storage of strains of microorganisms; biotechnological processes: systematization, stage and principles of implementation; cultivation of microorganisms, formulation of a nutrient medium for the cultivation of microorganisms.

Purpose of studying of the discipline
Getting the students knowledge of the aims and objectives of biotechnology, principles and features of microbiological processes, methods of obtaining highly industrial strains of microorganisms, methods of cultivation and storage. To introduce industrial production of antibiotics, enzymes, amino acids, polysaccharides, organic acids and neutral products, bacterial plant protection products and fertilizers, protein, single-celled organisms, etc.

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

Prerequisites
Objects of biotechnology Food Microbiology

Postrequisites
Fundamentals of scientific research Ecological biotechnology Microbiological control of biotechnological productions

Commodity Basics

Discipline cycle	Basic disciplines
Discipline component	Electives

SubjectID	29977 (3012808)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the systematization of goods using classification and coding methods; assortment management of the organization; the fundamental characteristics of the goods that make up its use value, as well as their possible changes at all stages of the distribution of goods; merchandising characteristics of specific goods; needs and requirements for the quality of goods; commodity analysis and examination of goods; consumer properties of goods; indicators of the quality of goods; appraisal activity in merchandising.

Purpose of studying of the discipline

Study theoretical assumptions common to all goods irrespective of their classes, subclasses and groups, the acquisition of the primary skills to use certain techniques and merchandising, to determine the basic characteristics of the goods, learn to assess and maintain the quality in the production stages, product distribution and use.

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
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Food Microbiology and sanitary hygiene

Postrequisites

Expertise of food products Safety of food products The methodology of research work

Production practice I

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	29983 (3012848)
Course	2
Term	2
Credits count	5
Working practice	150hours
Total	150hours
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

Prerequisites

Training practice

Postrequisites

Production practice II

Modern methods of creation of industrial strains of microorganisms

Discipline cycle	Basic disciplines

Discipline component	Electives
SubjectID	29976 (3012807)
Course	2
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the regulation of metabolism in a microbial cell, the induction and repression of enzyme synthesis, the regulation and proteolysis of metabolism, methods for isolating mutants and mutagenesis, hybridization of eukaryotic microorganisms, genetic engineering of industrially important microorganisms, and the construction of strains of human interferon producers. expression of foreign genes in microorganisms, conjugation and plasmids in bacteria, vector molecules, protoplast fusion, construction of strains producing primary metabolites.

Purpose of studying of the discipline

Gaining knowledge in the field of modern methods for the creation of industrial strains of microorganisms, the application of acquired knowledge in practice.

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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

Selection of industrial strains of microorganisms Microorganisms of fermentative productions

Animal biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29988 (3012815)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies cloning techniques; structure of animal genes; genetic transformation of embryonic and somatic cells of animals; methods of artificial insemination; obtaining transgenic animals; production of allopheneic animals (genetic chimeras) and issues of cryopreservation of sex and germ cells; general biological foundations of animal biotechnology; approaches to cellular and embryological engineering; principles of cloning and genetic transformation of somatic cells; understanding of the application of biotechnological methods in the science and practice of animal husbandry.

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

Prerequisites

Bioengineering

Postrequisites
Medical and veterinary biotechnology Biotechnology for the production of national dairy products

Plant biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29987 (3012814)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the diversity of biotechnological processes; main directions of biotechnology; plant biotechnology, its specifics; prospects for the development of biotechnology, cultivated plant cells as an object of biotechnology; theoretical and methodological principles of cultivation of plant cells; nutrition of cultured cells; general characteristics of nutrient media; application of fundamental biological knowledge in practical activities aimed at the production of drugs, enzymes, proteins, dyes, aromatic substances, vitamins and a number of biologically active compounds.
Purpose of studying of the discipline
The lighting of the current state of knowledge about the biology of cultured plant cells as an object of biotechnology and all the main areas of biotechnology.
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
Prerequisites
Fundamentals of biotechnology Objects of biotechnology Cell biotechnology
Postrequisites
Fundamentals of scientific research Ecological biotechnology

Phytohormones in biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29989 (3012816)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the main types of plant phytohormones, as well as biotechnological methods for their production; plant hormonal system; synthetic regulators of plant development and growth; synthetic regulators (growth substances) and phytohormones in plant biotechnology; biotechnological methods for obtaining phytoregulators and phytohormones; genetic and environmental safety of the use of growth regulators; general features of the action of phytohormones; classification of phytohormones; auxins; content and distribution in plants; chemical structure of auxins; auxin metabolism.
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

Prerequisites

Plant cell culture Plant physiology

Postrequisites

The methodology of research work Biotechnology of phototrophic microorganisms

Module 5. Organization of biotechnological production

Safety of food products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30009 (3012824)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the basics of security and its types; product quality indicators; improving product quality; methods for analyzing data on product quality; hygienic requirements for the quality and safety of food raw materials and food products; quality and safety of raw materials and food products; basic scientific and practical provisions of food security; requirements for ensuring the quality and safety of food products, materials and products; international aspects of food security.

Purpose of studying of the discipline

Formation of knowledge on the main provisions of methods of planning, organization and carrying out of tests and controls on the processing of test results for later use knowledge in solving organizational, methodological and technical issues of research, attributive and product control tests in various industries under trial operation, in landfills, PA production facilities and design research organizations.

Learning Outcomes

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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

The methodology of research work Research work on the specialty

Industrial biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30005 (3012819)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the typical scheme and main stages of biotechnological productions; fermentation process: main characteristics; mathematical models of the kinetics of fermentation processes; continuous cultivation of microorganisms; control of technological regimes of periodic and semi-periodic fermentation processes; biocatalysis and biotransformation; sorption methods for the isolation of biosynthesis products; membrane methods in biotechnology; main sources of biogenic elements; generalized technological scheme of the process of microbial synthesis; equipment for cultivating microorganisms.

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
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
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

Prerequisites

Bioengineering

Postrequisites

Modern technologies of use of biologically active substances in bioindustry

Fundamentals of biotechnological production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30004 (3012818)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the rate and peculiarity of metabolism in microbial cells, examples (the ability to synthesize secondary metabolites, doubling time, the ability to regulate the rate of metabolic reactions); the use of different strains of microorganisms depending on the type of bioproduction; metabolism of biological objects, requirements for the use of raw materials (substrates) for biotechnological production; the importance of microorganisms as objects of biotechnological production; typical scheme and main stages of biotechnological productions.

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

Prerequisites

Bioengineering Microbiology and biotechnology in the meat and milk industries

Postrequisites

Biotechnology fermentation production Probiotic biotechnology Microorganisms of fermentative productions

Food Biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30007 (3012822)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the basics of food biotechnology; microbiological production of biologically active substances and preparations; chemical composition of food products; requirements for raw materials and auxiliary materials; the use of yeast, mold fungi and bacteria in food production; alcohol production; brewing; wine production; bakery production; starch technology; fruit processing technology; genetically modified products; technology of sausage products; confectionery technology.

Purpose of studying of the discipline
To familiarize students with the peculiarities of biological processes in cells of various groups of microorganisms that underlie food production.
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
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
Prerequisites
Fundamentals of biotechnology Objects of biotechnology
Postrequisites
Methods of food analysis Fundamentals of scientific research

Industrial biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	29241 (3012817)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the areas of application of products of biotechnological industries; biological objects - a component of biotechnological production; mass transfer characteristics of fermentation equipment; methods of long- term storage of microbial cultures; models of biotechnological process control; biopesticides and soil fertilizers; models of biotechnological process control; fundamentals of modern immunobiotechnology; hardware design of the processes of isolation and purification of products of microbial synthesis; technological bioenergy; obtaining ethanol as a fuel.
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
Prerequisites
Fundamentals of biotechnology
Postrequisites
Biotechnology of industrial waste processing Ecological biotechnology Biotechnology of dairy production and processing of secondary raw materials Microbiological control of biotechnological productions

Expertise of food products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30008 (3012823)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline

The discipline studies commodity expertise of food products; theoretical foundations for the examination of food products; examination of low-quality and dangerous food products; veterinary and sanitary examination of food products; fundamental documents regulating the conduct of examinations, the structure of the expert opinion; sanitary and epidemiological examination of food products; biological value of food; principles, methods and equipment of food biotechnology; contamination of food raw materials and food products with xenobiotics and pollutants of chemical origin.

Purpose of studying of the discipline

Learning Outcomes

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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

The methodology of research work Research work on the specialty Microorganisms of fermentative productions

Microbiological control of biotechnological productions

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30181 (3012857)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the characteristics of the main microorganisms- contaminants of sanitary- indicative microorganisms and biotechnological industries; on the safety of biotechnological production of food products and food raw materials; methods of sterilization, disinfection and preservation used in the food industry; ways to ensure the sterility of microbiological production; the role of the microflora of air, water, soil in the contamination of food products with foreign microorganisms and the spread of infectious diseases; sanitary and hygienic requirements for production processes and industrial equipment; risk analysis systems.

Purpose of studying of the discipline

To form the student`s knowledge about the safety of biotechnological production of food raw materials and food products.

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

Prerequisites

Food Biotechnology Food Microbiology

Postrequisites

Final examination

Microorganisms of fermentative productions

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29997 (3012859)
Course	3
Term	2
Credits count	5
Lections	15hours

Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In the module are the General characteristics of fermentation and its types, the main characteristics of the industries based on the use of microorganisms, the basic principles governing the growth and reproduction of yeast and other cultures of micro-organisms: stages of development and methods of cultivation; relationships of microorganisms; The characteristics of the enzymes used in the fermentation industries, their properties and classification. The fundamentals of alcoholic fermentation: the structure, chemical composition of the yeast cell; characteristics and race of yeast used in fermentation industries, as well as chemical reactions underlying alcoholic fermentation.

Purpose of studying of the discipline
The purpose of the module is to familiarize students with the technology of fermentation, methods and processes of processing various types of raw materials into fermentation products.

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

Prerequisites
Modern methods of creation of industrial strains of microorganisms

Postrequisites
Design of fermentation enterprises

Functional starter cultures in food industry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29998 (3012858)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the selection of starter crops; identification of microorganisms using genotypic methods; the history of the development of taxonomy, the problem of the spread of resistance to antibiotics in industrial strains; application of cultures of yeast and filamentous fungi in the food industry, biotechnology of starter cultures; the use of denitrifying microorganisms and nitrites in the food industry, the formation of aromatic compounds by starter cultures, the role of oxygen in the vital activity of starter cultures; starter cultures are bacteriocin producers.

Purpose of studying of the discipline
Getting knowledge of the subject area of activity specialist food industry, the ability to practically apply the knowledge in their future activities.

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

Final examination

Biotechnology fermentation production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30186 (3012846)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies the general characteristics of fermentation and its types; the main characteristics of industries based on the use of microorganisms; the main patterns of reproduction and growth of yeast and other cultures of microorganisms; characteristics of enzymes used in fermentation industries; outlined the basics of alcoholic fermentation; yeast in fermentation industries; malt production technology; calculation of the yield of finished malt from barley in terms of dry and air-dry matter.

Purpose of studying of the discipline

Learning Outcomes

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

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

Prerequisites

Fundamentals of biotechnological production Industrial biotechnology

Postrequisites

Design of fermentation enterprises Probiotic biotechnology

Biotechnology of dairy production and processing of secondary raw materials

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30184 (3012844)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies the composition and properties of milk - as an object for biotechnological processes; bacterial preparations for fermented dairy products; classification of microorganisms used in the production of dairy products; selection of bacterial preparations; formation of bacterial starter cultures; preparation and use of bacterial preparations in production conditions; technologies of dairy products; dairy products; products made from skimmed milk, buttermilk and whey; recycled drinks; protein products from secondary raw materials.

Purpose of studying of the discipline

Mastering theoretical knowledge and practical skills in biotechnology of dairy products production and processing of secondary raw materials by students

Learning Outcomes

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
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

Prerequisites
Industrial biotechnology Food Biotechnology

Postrequisites
Final examination

Biotechnology for the production of national dairy products

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30185 (3012845)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Studying the state and prospects for the development of the dairy industry; history, sanitary and hygienic requirements for obtaining high-quality milk; the procedure for its primary processing and storage; the composition and properties of milk of farm animals, as well as the factors that determine them; technological processes for the production of national dairy products; fermented milk products, oils, cheeses, canned milk, ice cream, baby food and secondary dairy raw materials.

Purpose of studying of the discipline

Learning Outcomes
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
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

Prerequisites
Fundamentals of biotechnological production Technological equipment of enterprises of meat and dairy industry

Postrequisites
Designing of the enterprises of meat and milk industry

Cost management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30187 (3012870)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The purpose of the course «Cost Management» is the formation of students` competencies in cost management, the ability to conduct analytical work in the field of cost management. This discipline is aimed at forming students with a set of necessary theoretical knowledge to understand the essence of costs and the basics of their management, as well as practical skills necessary for the purposes of strategic cost management.

Purpose of studying of the discipline
To reveal the problems in the field of organization, planning and management of production in a market economy in order to reduce

costs.

Learning Outcomes

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

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Biotechnology of industrial waste processing

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30197 (3012820)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies environmental pollution and scientific and technological progress; types of pollution and their characteristics; creation of non-waste and low-waste industries as a way to solve the problems of technogenic pollution; natural, biogeochemical and technogenic flows (cycles) of individual elements; bioremediation, biostimulation and bioaugmentation are the main directions in the use of biological objects for the decomposition of organic substances; pathways and sources of technogenic pollutants into soil, water and atmosphere.

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

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

Prerequisites

Fundamentals of biotechnology Industrial biotechnology

Postrequisites

Final examination

Biotechnology of phototrophic microorganisms

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30191 (3012849)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies phototrophic microorganisms, their role in nature and human life; the possibility of using microalgae in mass cultivation to obtain biologically active substances, to study the mechanisms and productivity of photosynthesis of various groups of phototrophic organisms; the role of phototrophic microorganisms in the development of photobiotechnology, namely, obtaining dietary supplements based on microalgae; the role of phototrophic microorganisms in biotechnological production, methods for isolating

promising strains and methods for their cultivation.

Purpose of studying of the discipline

Getting the students knowledge of phototrophic microorganisms and producing the desired products using microalgae and cyanobacteria.

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

Prerequisites

Modern methods of creation of industrial strains of microorganisms Microorganisms of fermentative productions

Postrequisites

Final examination

Yeast and micromycetes in industrial biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30202 (3012826)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the yeast cell, cytology; yeast cell components; cytological features of yeast in different growth conditions; morphology and asexual reproduction; yeast micromorphology; cell cycle; sexual reproduction and yeast life cycles; ascomycete yeast, basidiomycete yeast; features of metabolism; distribution of yeast fungi in nature; industrial use of yeast; yeast as pathogens of human diseases; yeast systematization.

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

Prerequisites

Fundamentals of biotechnological production Biotechnology fermentation production Microorganisms of fermentative productions

Postrequisites

Final examination

Use o f enzyme preparations in food production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	27229 (3012825)
Course	4
Term	1
Credits count	6
Lections	15hours
Practical and seminar classes	30hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	40hours

Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The discipline studies general information about enzymes; groups of enzyme preparations used in the food industry; the use of enzyme preparations in the dairy industry; the use of enzyme activity values to assess the quality of milk; enzymes in the meat industry of the food industry; the use of enzymes in baking; the use of enzyme preparations in the brewing industry and in the starch industry; the use of enzyme preparations in the production of fruit and berry and grape juices, wines and soft drinks.

Purpose of studying of the discipline
Preparation of knowledge, skills andskills for the preparation and use of enzyme preparations in food production.

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

Prerequisites
Fundamentals of biotechnology Objects of biotechnology Industrial biotechnology Food Biotechnology

Postrequisites
Final examination

Probiotic biotechnology

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30196 (3012850)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline
The discipline studies probiotics, prebiotics and synbiotics, metabolite, lactulose- containing and combined probiotic preparations; creation of new bacterial preparations based on probiotic bacteria; with the technology of obtaining probiotic preparations, with the development of new types of biologically active substances and products for food and medical and preventive purposes; functional products in the modern structure of nutrition; selection criteria for lactic acid bacteria; prebiotics; rationale for the choice of starter cultures.

Purpose of studying of the discipline
Development of new types of biologically active substances and food products and therapeutic and prophylactic purposes

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

Prerequisites
Modern methods of creation of industrial strains of microorganisms

Postrequisites
Final examination

Selection of industrial strains of microorganisms

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30203 (3012821)
Course	4
Term	1

Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination

Short description of discipline

The discipline studies the role of starter cultures in biotechnological processes; obtaining pure cultures of starter microorganisms, modern methods of their selection and principles of selecting strains for the preparation of bacterial starter cultures that provide active biotechnological processes for food production; the history of the emergence and development prospects of microbiological production; ways to improve the production- valuable properties of starter microflora; quality control of bacterial starter cultures; methods and features of the technology of industrial cultivation of microorganisms; eukaryotic cell structure.

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

Prerequisites

Modern methods of creation of industrial strains of microorganisms Microorganisms of fermentative productions

Postrequisites

Final examination

Ecological biotechnology

Discipline cycle	Profiling discipline
Discipline component	University component
SubjectID	30198 (3012843)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
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

Prerequisites

Fundamentals of biotechnology Objects of biotechnology Biotechnology equipment

Postrequisites

Final examination

Module 6. Design of enterprises of biotechnological production

Engineering Graphics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29965 (3012865)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this discipline, the rules of execution and design of graphic works are studied; the problems of geometric and projection drawing are solved; the rules for the use of conditional graphic designations when performing drawings and diagrams are studied. Students, studying this discipline, acquire the skills of making images of parts using views, sections and sections, making sketches and working drawings, assembly drawings; drawing sizes and position numbers, drawing up specifications.

Purpose of studying of the discipline
the basic rules of execution and registration of design documentation are studied. Full mastery of the drawing as a means of expressing technical thought and
production documents, as well as the acquisition of stable drawing skills are achieved as a result of mastering the entire complex of technical disciplines of the relevant profile, supported by the practice of course and diploma design

Learning Outcomes
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

Prerequisites
School course

Postrequisites
CAD Designing of the enterprises biotechnological production

Computer graphics

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29962 (3012835)
Course	2
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies a brief history of computer graphics; areas of application of computer graphics; basic concepts of computer graphics; software and hardware used; principles of representation of graphic information in a computer; graphic file formats; devices for input and output of graphic information; graphics adapters and monitors; scanners and digitizers; plotters and printers; review of computer editors and graphic programs; vector graphic editors; raster graphic editors.

Purpose of studying of the discipline

Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
School course

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Descriptive geometry and drawing

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29963 (3012836)
Course	2
Term	1
Credits count	5

Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
In this discipline, the theory of drawing construction is studied; positional tasks; rules for drawing up and reading drawings; ways to convert a complex drawing, curved surfaces, views, sections, cuts, welding, soldering, threads and threaded connections, adhesive, slotted and keyed connections, sketches; gear wheels; working and assembly drawings; the main provisions of the USDD, which establish interrelated provisions and rules for the development, circulation and execution of design documentation.

Purpose of studying of the discipline
Teaching descriptive geometry is the acquisition of knowledge by students, ensuring the development of their spatial representation and imagination, constructive-geometrical thinking, the ability to analyze and synthesize the spatial forms and their relations on the basis of graphic models of space, practically implemented in the form of certain specific drawings of spatial objects.

Learning Outcomes
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

Prerequisites
School course

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Biotechnology equipment

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29990 (3012837)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies equipment for the preparation of semi-finished products and raw materials; general information about devices and machines for food production; engineering problems of food production and machine-hardware options for their solution; equipment for carrying out mass transfer and thermal processes in the processing of semi- finished products and raw materials; equipment for microbiological processes; equipment for electrophysical processing of raw materials and semi- finished products; equipment for mechanization of finishing operations.

Purpose of studying of the discipline
Getting the students basic knowledge in the field of design and operation of biotechnological machines and devices that specialist (bachelor) will be able to apply in their future practice when working in their specialty.

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

Prerequisites
Fundamentals of biotechnology

Postrequisites
CAD Designing of the enterprises biotechnological production

Processes and devices of food manufactures

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29992 (3012839)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours

Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the foundations of the theory of similarity; general principles for calculating technological processes and food production equipment; mechanical processes; hydromechanical processes; basics of modeling of technological processes and apparatuses of food production; characterization of heterogeneous systems; separation of gas heterogeneous systems; fundamentals of kinetics and dynamics of technological processes; calculations of hydromechanical and mechanical processes, machines, devices; modern problems of mechanical and hydromechanical processes and devices.

Purpose of studying of the discipline
Getting basic knowledge in the field of technological processes and engineering calculations of devices and machines.

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

Prerequisites
Bioengineering

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Technological equipment of enterprises of meat and dairy industry

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29991 (3012838)
Course	3
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the concept of technological equipment, classification, basic parameters; the speed of kinetics and movement of the product in the equipment; milk sterilization equipment; butter production equipment; equipment for the production of ice cream; cheese production equipment; technology features and equipment classification; equipment for the production of cottage cheese; technological calculations of equipment for the production of protein dairy products; equipment for bottling milk.

Purpose of studying of the discipline
Getting the students basic knowledge in the field of design and operation of biotechnological machines and devices that specialist (bachelor) will be able to apply in their future practice when working in their specialty.

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

Prerequisites
Bioengineering

Postrequisites
Design of fermentation enterprises Designing of the enterprises of meat and milk industry

Production practice II

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30180 (3012847)
Course	3
Term	2
Credits count	5
Working practice II	150hours
Total	150hours
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
Prerequisites
Production practice I
Postrequisites
Production practice III

Organization and planning of production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30188 (3012869)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline
The discipline «Organization and production planning» gives different ideas about the basics of organization, industrial production planning, methods of evaluating its effective activities. As well as the analysis and forecast of production risks and losses of the enterprise, including ways to eliminate them as soon as possible. Students will gain knowledge and skills in the field of implementation, organization and planning of industrial production of the enterprise.
Purpose of studying of the discipline
The purpose of studying the discipline "Organization and planning of production" is to study the theoretical and methodological foundations of the organization and planning of production and production infrastructure at enterprises.
Learning Outcomes
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
Prerequisites
Bases of economics, law and ecological knowledge
Postrequisites
Final examination

Standardization, certification and technical measurements

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30190 (3012851)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

Physics

Postrequisites

Final examination

Economics of enterprise

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30189 (3012868)
Course	4
Term	1
Credits count	3
Lections	15hours
Practical and seminar classes	15hours
Independent work of a student under the guidance of a teacher	20hours
Independent work of the student	40hours
Total	90hours
Knowledge control form	Examination

Short description of discipline

At the present stage of economic reforms, significant changes are taking place in the economy, especially at the microeconomic level: the nature and methods of economic activity of enterprises are changing. This course studies in detail the resources of the enterprise, the efficiency of their use, profitability and the main technical and economic indicators of the functioning of the enterprise. In addition, methods of stimulating labor resources, in order to optimize the production capacity and capital of the enterprise.

Purpose of studying of the discipline

The purpose of studying the discipline "Enterprise Economics" is to develop students` economic thinking based on the study of the economic mechanism of the enterprise in market conditions, providing deep theoretical knowledge and practical experience in the field of economics and organization of the enterprise and the use of technological equipment.

Learning Outcomes

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

Prerequisites

Bases of economics, law and ecological knowledge

Postrequisites

Final examination

Biotechnological waste recycling food production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30195 (3012860)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

The discipline studies low-waste technologies; general principles for creating resource-saving technologies; limitations of technogenic development of the economy; characterization and classification of waste; general methods and principles of solid waste disposal; recycling of agricultural waste; general methods and principles of gaseous waste disposal; chemicals used in food production, disposal of residual substances in septic tanks, reuse of water resources opens up great opportunities for the food industry .; biotechnology in waste processing.

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

Prerequisites

Fundamentals of biotechnology Objects of biotechnology

Postrequisites

Final examination

Design of fermentation enterprises

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30201 (3012840)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

The discipline studies the structure of fermentation enterprises; factors regulating the location of fermentation enterprises, requirements for production buildings of fermentation production; feasibility study of construction; fundamentals of designing food industry enterprises; industrial transport; design of air conditioning systems in industrial premises; calculation of raw materials and substantiation of the range; the current state of the enterprises of the fermentation industry for the production of alcohol, alcoholic beverages, baker`s yeast, malt and the prospects for its development.

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Biotechnology fermentation production Microorganisms of fermentative productions

Postrequisites

Final examination

Designing of the enterprises of meat and milk industry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30200 (3012841)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline

Studying the structure of meat and dairy industry enterprises; requirements for industrial buildings; feasibility study of construction; basics of designing enterprises of the meat and dairy industry; calculation of raw materials and substantiation of the assortment; schedule of organization of technological processes; calculation of the areas of production shops; layout of technological equipment; the current state of the enterprises of the meat and dairy industry and the prospects for its development; the state and prospects for the development of the production of sausages, meat semi-finished products of fermented milk products.

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
Microbiology and biotechnology in the meat and milk industries Technological equipment of enterprises of meat and dairy industry
Postrequisites
Final examination

CAD Designing of the enterprises biotechnological production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30199 (3012842)
Course	4
Term	1
Credits count	6
Lections	30hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	40hours
Independent work of the student	80hours
Total	180hours
Knowledge control form	Examination and term work/Project

Short description of discipline
Learns the basics of designing biotechnological enterprises for the production of food products; design principles for individual industries and the relationship between them, the technological structure of the enterprise, the composition and types of projects, the feasibility study of design, the principles of reconstruction of industries. Enterprise design using CAD; schedule of organization of technological processes; grocery calculation of a dairy plant; grocery calculation of the cheese-making plant; assortment selection; calculation and selection of technological equipment.
Purpose of studying of the discipline
Obtaining knowledge with the subject area of a food industry specialist, the ability to practically apply the knowledge gained in work on term and diploma projects.
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases
Prerequisites
Industrial biotechnology Food Biotechnology Biotechnology equipment
Postrequisites
Final examination

Modern problems of biosafety in food and industrial production

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30192 (3012862)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the concept of biosafety in food production; hazardous biological organisms and their products; biotechnology and biosafety; stability of biosafety in bioengineering; creation of genetically modified organisms; biological, ecological, economic, food and other security; the main constituents of food products and their properties, structure, classification and changes in their production process; biosafety in tissue, cellular and organogenic biotechnologies.
Purpose of studying of the discipline
Study of topical issues in food and industrial production, identification of modern problems, in solving which methods and approaches of traditional and modern biotechnology can be used.
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

Prerequisites
Expertise of food products Safety of food products

Postrequisites
Final examination

Modern technologies of use of biologically active substances in bioindustry

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30194 (3012861)
Course	4
Term	1
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the classification of enzymes, hormones and vitamins; catalysis and activation energy; regulation of metabolism; the mechanism of action of enzymes and hormones; sources and uses of enzymes; production of vitamins; technology for isolation and purification of enzymatic preparations; immobilized enzymes; cell immobilization; industrial processes using enzymes and cells; enzyme immobilization methods; application of biologically active substances in the microbiological, food and medical industries; ecological and genetic safety of biologically active substances.

Purpose of studying of the discipline
Getting the students knowledge of the subject area of activity specialist food industry.

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

Prerequisites
Fundamentals of biotechnological production Industrial biotechnology

Postrequisites
Final examination

Prediploma practice

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30205 (3012853)
Course	4
Term	2
Credits count	15
Undergraduate practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline
Selection and study of material for use and interpretation in their thesis (project). Acquaintance with the peculiarities of the production of the enterprise, its organization, research for the practical part of the thesis (project), systematization of the results obtained.

Purpose of studying of the discipline

Learning Outcomes
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
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

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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Production practice III

Postrequisites

Final examination

Production practice III

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30204 (3012852)
Course	4
Term	2
Credits count	15
Working practice	450hours
Total	450hours
Knowledge control form	Total mark on practice

Short description of discipline

Acquaintance with the features of the production of the enterprise, its organization. Design of the main workshops, auxiliary, technological schemes of products and the general plan of the enterprise. Water, heat and power supply of the enterprise. Communication during the practice between students and the head in a foreign language. Writing a Biotechnology Part of a Practice Report in a Foreign Language.

Purpose of studying of the discipline

Learning Outcomes

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
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
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Production practice II

Postrequisites

Prediploma practice

Module 7. Research and protection of intellectual property

Microbiological bases of biotechnological production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29999 (3012855)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studies the structure of the cell, the chemical composition of cells, the role of water in life processes, metabolism and enzymatic processes, enzymes and coenzymes, the kinetics of enzymatic reactions, the most important energy processes, the biosynthesis of proteins and nucleic acids, the principles of regulation of metabolism, the cultivation of microorganisms, optimal cultivation conditions, growth and reproduction, cultivation methods, basics of microbiological production, raw materials, technological equipment, stages of the technological process.

Purpose of studying of the discipline

Have an idea about the features of metabolic and biosynthetic capabilities of microorganisms, the principles of regulation of metabolism of microorganisms at the genetic and biochemical level, the laws of growth of the microorganism, the influence of external conditions on the growth and biosynthesis of primary and secondary metabolites.

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

Prerequisites

Food Microbiology and sanitary hygiene

Postrequisites

Yeast and micromycetes in industrial biotechnology Probiotic biotechnology Microorganisms of fermentative productions

Scientific basis of food production

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	29993 (3012854)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studying ways to control technological processes in order to obtain finished food products of high quality; biochemical, physical and chemical processes occurring in products during their processing; methods of research of technological processes of production, raw materials and finished products; methods and principles of conservation; technological properties of food products; emulsion and foam structures; adhesive properties of food products; hydrolysis of disaccharides and polysaccharides.

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
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Fundamentals of biotechnology Food Microbiology

Postrequisites

Fundamentals of scientific research Biotechnology of dairy production and processing of secondary raw materials

Modern directions the development of food biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30001 (3012856)
Course	3
Term	1
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

He studies the directions and stages of modern biotechnology. Development trend of food and industrial biotechnology. Processes for obtaining substances and compounds useful for humans with the help of microbial, animal, plant cells; biotechnological processes used

in various areas of the food industry, and their role in the formation of consumer properties of food products; today`s achievements in food biotechnology and the main trends in its development.

Purpose of studying of the discipline

The acquisition of theoretical knowledge and development of skills and abilities in the field of modern food biotechnology.

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
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

Prerequisites

Food Microbiology and sanitary hygiene Microbiology and biotechnology in the meat and milk industries

Postrequisites

Functional starter cultures in food industry Modern technologies of use of biologically active substances in bioindustry Modern problems of biosafety in food and industrial production

Intellectual property in quality management

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30179 (3012831)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studies the protection of intellectual property and copyright; the volume and composition of intangible assets of enterprises, their condition and development; innovative activity of enterprises; improving the qualification level of personnel; accounting for rationalization proposals and inventions in the course of production; intellectual property in quality management; intellectual goods, intellectual property; objects of industrial property and its types; objects of industrial property; documents certifying authorship.

Purpose of studying of the discipline

The acquisition of knowledgein the field ofintellectual propertyandthe rules of registrationof patent documents.

Learning Outcomes

ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Fundamentals of biotechnological production Safety of food products

Postrequisites

Standardization, certification and technical measurements

Medical and veterinary biotechnology

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30178 (3012830)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline

Studies the stages of development of medical and veterinary biotechnology; basic approaches to the creation of biotechnological pharmaceutical and veterinary preparations; objects of medical and veterinary biotechnology; preclinical and clinical trials of medicines;

biotechnology of immunogens and vaccines; genetic engineering microbiological production; immunobiotechnology; immunological diagnostic systems; modern biotechnologies in animal husbandry; transgenic animals; methods of obtaining and prospects for use; study of the basics of feeding laboratory animals.

Purpose of studying of the discipline

Getting the students knowledge of the aims and objectives of the medical and veterinary biotechnology, research on natural compounds that control the level of the body`s defenses against infection, malignancy and other diseases.

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

ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites

Bioengineering General and molecular genetics Animal biotechnology

Postrequisites

Selection of industrial strains of microorganisms

Methods of food analysis

Discipline cycle	Basic disciplines
Discipline component	University component
SubjectID	30010 (3012828)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	15hours
Laboratory works	15hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
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

Prerequisites

Industrial biotechnology Food Biotechnology Food Microbiology

Postrequisites

Biotechnology of industrial waste processing Standardization, certification and technical measurements

Patent engineering

Discipline cycle	Basic disciplines
Discipline component	Electives
SubjectID	30177 (3012829)
Course	3
Term	2
Credits count	5
Lections	15hours
Practical and seminar classes	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours

Knowledge control form	Examination

Short description of discipline
The discipline studies the fundamentals of the legislation of foreign countries and the Republic of Kazakhstan in the field of protection of objects of intellectual (industrial) property; the essence of the system of patenting industrial property objects; legal documentation of the Republic of Kazakhstan on the protection of intellectual property; features and structure of patent documentation; the structure of the description of the invention; the essence of the system of patenting industrial property objects; INID codes for identifying bibliographic data in the specification; features of text construction; composition of an application for an object of industrial property.

Purpose of studying of the discipline
The acquisition of knowledgein the field ofintellectual propertyandthe rules of registrationof patent documents.

Learning Outcomes
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
Food Biotechnology

Postrequisites
Final examination

The methodology of research work

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	29996 (3012832)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the main stages of research work; methods of theoretical research; methodological foundations of scientific knowledge; search and processing of scientific information and registration of the results of experimental studies; issues of modeling in scientific research; methods of selection and objectives of the direction of scientific research; search, accumulation and processing of scientific information; theoretical and experimental research; processing the results of experimental studies; structure and concept of master`s thesis.

Purpose of studying of the discipline
To learn the system and methods of producing the specific methods of scientific knowledge and its presentation in forms appropriate requests of the scientific community.

Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases

Prerequisites
Bioengineering Fundamentals of biotechnological production Safety of food products

Postrequisites
Yeast and micromycetes in industrial biotechnology Probiotic biotechnology

Research work on the specialty

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30183 (3012834)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
The discipline studies the planning of scientific research; formulation of the problem; scientific research methods; conducting empirical or theoretical research; evaluation of the result, conclusions, prospects; development of regulatory and technical documentation for processes and products, practical work on the creation of new food products; selection and justification of the research topic; analysis of the main results and provisions; evaluation of their effectiveness in the framework of the study; planning and conducting experimental research on the problem.

Purpose of studying of the discipline
Mastering the rules of scientific research and the processing of their results.
Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases
Prerequisites
Bioengineering Fundamentals of biotechnological production Safety of food products
Postrequisites
Yeast and micromycetes in industrial biotechnology Probiotic biotechnology

Fundamentals of scientific research

Discipline cycle	Profiling discipline
Discipline component	Electives
SubjectID	30182 (3012833)
Course	3
Term	2
Credits count	5
Lections	15hours
Laboratory works	30hours
Independent work of a student under the guidance of a teacher	35hours
Independent work of the student	70hours
Total	150hours
Knowledge control form	Examination

Short description of discipline
Studying research activities and its features; stages of research activities; information resources of research activities; bibliographic information and forms of its existence; information retrieval strategies; results of research activities; research presentation forms; master`s thesis: purpose, tasks, structure; methodological basis of scientific knowledge; methods of theoretical and empirical research; methods of the metatheoretical level; elements of the theory and methodology of scientific and technical creativity.
Purpose of studying of the discipline
Getting knowledge of the subject area of work engineer - an expert.
Learning Outcomes
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
ON11 Use information resources to search and store infor-mation, work with spreadsheets, organize data, work with databases
Prerequisites
Fundamentals of biotechnology
Postrequisites
Use o f enzyme preparations in food production Ecological biotechnology

Final examination

Writing and defending a graduation project or preparing and passing a comprehensive exam.

Diploma project

Credits count	8

Comprehensive exam

Credits count	8

4.Summary table on the scope of the educational program

«6B05102 - Biotechnology»

Name of discipline	Cycle/ Component	Term	Number of credits	Total hours	Lec	SPL	LC	IWST	IWS	Knowledge control form
Module 1. Fundamentals of social and humanitarian knowledge										
Foreign language	GER/CC	1	5	150		45		35	70	Examination
Kazakh language	GER/CC	1	5	150		45		35	70	Examination
Bases of economics, law and ecological knowledge	GER/US	1	5	150	15	30		35	70	Examination
Russian language	GER/CC	1	5	150		45		35	70	Examination
Physical Culture	GER/CC	1	2	60		60				Differentiated attestation
Kazakh language	GER/CC	2	5	150		45		35	70	Examination
Foreign language	GER/CC	2	5	150		45		35	70	Examination
History of Kazakhstan	GER/CC	2	5	150	30	15		35	70	Qualification examination
The module of socio-political knowledge (sociology, political science, cultural studies, psychology)	GER/CC	2	8	240	30	45		55	110	Examination
Russian language	GER/CC	2	5	150		45		35	70	Examination
Physical Culture	GER/CC	2	2	60		60				Differentiated attestation
Physical Culture	GER/CC	3	2	60		60				Differentiated attestation
World of Abai	BS/US	3	3	90	15	15		20	40	Examination
Information and communication technology	GER/CC	4	5	150	15	15	15	35	70	Examination
Physical Culture	GER/CC	4	2	60		60				Differentiated attestation
Philosophy	GER/CC	5	5	150	15	30		35	70	Examination
Module 2. language training										
English for Academic purposes	BS/CCh	3	3	90		30		20	40	Examination
Professionally-oriented foreign	BS/CCh	3	3	90		30		20	40	Examination
Work with professional – oriented text	BS/CCh	3	3	90		30		20	40	Examination
Module 3. Natural Sciences										
Mathematics	BS/US	1	5	150	15	30		35	70	Examination
Physics	BS/US	1	3	90	15	15	0	20	40	Examination
Chemistry	BS/US	3	5	150	15	15	15	35	70	Examination
Module 4. Biotechnology of living systems										
Introduction to the profession	BS/US	1	3	90	15	15		20	40	Examination

Microbiology and biotechnology in the meat and milk industries	BS/CCh	2	5	150	15		30	35	70	Examination
Food Microbiology	BS/CCh	2	5	150	15		30	35	70	Examination
Food Microbiology and sanitary hygiene	BS/CCh	2	5	150	15		30	35	70	Examination
Training practice	BS/US	2	2	60						Total mark on practice
General and molecular genetics	BS/CCh	3	5	150	15		30	35	70	Examination
Objects of biotechnology	BS/US	3	5	150	15		30	35	70	Examination
Physiology of nutrition	BS/CCh	3	5	150	15		30	35	70	Examination
Plant physiology	BS/CCh	3	5	150	15		30	35	70	Examination
Bioengineering	BS/CCh	4	5	150	15	30		35	70	Examination
Biochemistry	BS/US	4	5	150	15		30	35	70	Examination
Cell biotechnology	BS/CCh	4	5	150	15	30		35	70	Examination
Plant cell culture	BS/CCh	4	5	150	15	30		35	70	Examination
Fundamentals of biotechnology	BS/US	4	5	150	15		30	35	70	Examination
Fundamentals of Biotechnology of microorganisms	BS/CCh	4	5	150	15	15	15	35	70	Examination
Commodity Basics	BS/CCh	4	5	150	15	15	15	35	70	Examination
Production practice I	BS/US	4	5	150						Total mark on practice
Modern methods of creation of industrial strains of microorganisms	BS/CCh	4	5	150	15	15	15	35	70	Examination
Animal biotechnology	BS/CCh	5	5	150	15	30		35	70	Examination
Plant biotechnology	BS/CCh	5	5	150	15	30		35	70	Examination
Phytohormones in biotechnology	BS/CCh	5	5	150	15	30		35	70	Examination
Module 5. Organization of biotechnological production										
Safety of food products	AS/CCh	5	5	150	15		30	35	70	Examination
Industrial biotechnology	AS/CCh	5	5	150	15	30		35	70	Examination
Fundamentals of biotechnological production	AS/CCh	5	5	150	15	30		35	70	Examination
Food Biotechnology	AS/CCh	5	5	150	15		30	35	70	Examination
Industrial biotechnology	AS/CCh	5	5	150	15	30		35	70	Examination
Expertise of food products	AS/CCh	5	5	150	15		30	35	70	Examination
Microbiological control of biotechnological productions	BS/CCh	6	5	150	15	15	15	35	70	Examination
Microorganisms of fermentative productions	BS/CCh	6	5	150	15	15	15	35	70	Examination
Functional starter cultures in food industry	BS/CCh	6	5	150	15	15	15	35	70	Examination
Biotechnology fermentation production	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Biotechnology of dairy production and processing of secondary raw materials	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project

Biotechnology for the production of national dairy products	AS/CCh	6	5	150	15	15	15	35	70	Examination and term work/Project
Cost management	BS/CCh	7	3	90	15	15		20	40	Examination
Biotechnology of industrial waste processing	AS/CCh	7	6	180	30	30		40	80	Examination
Biotechnology of phototrophic microorganisms	AS/CCh	7	6	180	15	30	15	40	80	Examination
Yeast and micromycetes in industrial biotechnology	AS/CCh	7	6	180	15	30	15	40	80	Examination
Use o f enzyme preparations in food production	AS/CCh	7	6	180	15	30	15	40	80	Examination
Probiotic biotechnology	AS/CCh	7	6	180	30	30		40	80	Examination
Selection of industrial strains of microorganisms	AS/CCh	7	6	180	30	30		40	80	Examination
Ecological biotechnology	AS/US	7	6	180	30	30		40	80	Examination
Module 6. Design of enterprises of biotechnological production										
Engineering Graphics	BS/CCh	3	5	150	15	30		35	70	Examination
Computer graphics	BS/CCh	3	5	150	15	30		35	70	Examination
Descriptive geometry and drawing	BS/CCh	3	5	150	15	30		35	70	Examination
Biotechnology equipment	BS/CCh	5	5	150	15	30		35	70	Examination
Processes and devices of food manufactures	BS/CCh	5	5	150	15	30		35	70	Examination
Technological equipment of enterprises of meat and dairy industry	BS/CCh	5	5	150	15	30		35	70	Examination
Production practice II	BS/US	6	5	150						Total mark on practice
Organization and planning of production	BS/CCh	7	3	90	15	15		20	40	Examination
Standardization, certification and technical measurements	BS/US	7	5	150	15	30		35	70	Examination
Economics of enterprise	BS/CCh	7	3	90	15	15		20	40	Examination
Biotechnological waste recycling food production	AS/CCh	7	5	150	15	30		35	70	Examination
Design of fermentation enterprises	AS/CCh	7	6	180	30	30		40	80	Examination and term work/Project
Designing of the enterprises of meat and milk industry	AS/CCh	7	6	180	30	30		40	80	Examination and term work/Project
CAD Designing of the enterprises biotechnological production	AS/CCh	7	6	180	30	30		40	80	Examination and term work/Project
Modern problems of biosafety in food and industrial production	AS/CCh	7	5	150	15	30		35	70	Examination
Modern technologies of use of biologically active substances in bioindustry	AS/CCh	7	5	150	15	30		35	70	Examination
Prediploma practice	AS/CCh	8	15	450						Total mark on practice
Production practice III	AS/CCh	8	15	450						Total mark on practice
Module 7. Research and protection of intellectual property										
Microbiological bases of biotechnological production	BS/CCh	5	5	150	15		30	35	70	Examination

Scientific basis of food production	BS/CCh	5	5	150	15		30	35	70	Examination
Modern directions the development of food biotechnology	BS/CCh	5	5	150	15		30	35	70	Examination
Intellectual property in quality management	BS/CCh	6	5	150	15	30		35	70	Examination
Medical and veterinary biotechnology	BS/CCh	6	5	150	15	30		35	70	Examination
Methods of food analysis	BS/US	6	5	150	15	15	15	35	70	Examination
Patent engineering	BS/CCh	6	5	150	15	30		35	70	Examination
The methodology of research work	AS/CCh	6	5	150	15		30	35	70	Examination
Research work on the specialty	AS/CCh	6	5	150	15		30	35	70	Examination
Fundamentals of scientific research	AS/CCh	6	5	150	15		30	35	70	Examination
Final examination										
Diploma project		8	8	240						
Comprehensive exam		8	8	240						