



EDUCATIONAL PROGRAM

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THE MINISTRY OF EDUCATION AND SCIENCE OF THE REPUBLIC OF
KAZAKHSTAN

Non-profit Limited Company M.Auezov South Kazakhstan
University

Chairman of the Board - Rector
d.h.s., academician Kozhamzharova D.P.



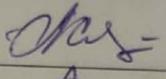
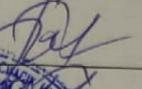
EDUCATION PROGRAMME

7M05123-«Biotechnology»

| | |
|---|---|
| Registration number | |
| Code and classification of the field of education | 7M05 Natural sciences, mathematics and statistics |
| Code and classification of training areas | 7M051 Biological and related sciences |
| Group of educational programs | M082 Biotechnology |
| Type of EP | acting |
| ISCE level | 7 |
| NQF level | 7 |
| SQF of education level | 7 |
| Language of learning | English |
| Typical duration of study | 2 years |
| Training direction | Scientific and pedagogical |
| The complexity of the EP, not less | 120 credits |
| Distinctive features of EP | - |
| University Partner (JEP) | - |
| University Partner (TDEP) | - |
| Social Partner (DE) | - |

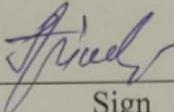
Shymkent, 2021

Drafters:

| Name | Position | Sign |
|------------------|---|---|
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| Ermakhanov M.N. | Head of division LLP «South - West scientific research institute of livestock and plant production» |  |

EP was Considered by the Committee on Innovative Learning Technologies and Methodological Support of higher school «Chemical engineering and biotechnology», Protocol

No _____ from _____ 2021

Chairman of MC (Committee)  Aitkulova R.

Sign

Considered and recommended for approval at the meeting of Educational and Methodical Council of M. Auezov SKSU.

protocol No 7 from «21» 02 2021

Approved by the decision of the Academic Council of the University

protocol No _____ from «22» 02 2021

The educational program was developed with the participation of the partner university -
Dnipro State Agrarian and Economic University

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1. PROGRAM CONCEPT

| | |
|---|---|
| Mission of the University | Generation of new competencies, training of a leader who translates research and entrepreneurial thinking and culture |
| University Values | <ul style="list-style-type: none"> • Openness—open to change, innovation and cooperation. • Creativity – generates ideas, develops them and turns them into values. • Academic freedom – free to choose, develop and act. • Partnership – creates trust and support in a relationship where everyone wins. • Social responsibility – ready to fulfill obligations, make decisions and be responsible for their results. |
| Graduate Model | <ul style="list-style-type: none"> • Deep subject knowledge, their application and continuous expansion in professional activity. • Information and digital literacy and mobility in rapidly changing conditions. • Research skills, creativity and emotional intelligence. • Entrepreneurship, independence and responsibility for their activities and well-being. • Global and national citizenship, tolerance to cultures and languages. |
| Uniqueness | <ul style="list-style-type: none"> • Deep subject knowledge, their application and continuous expansion in professional activity. • Information and digital literacy and mobility in rapidly changing conditions. • Research skills, creativity and emotional intelligence. • Entrepreneurship, independence and responsibility for their activities and well-being. • Global and national citizenship, tolerance to cultures and languages. |
| Academic Integrity and Ethics Policy | <ul style="list-style-type: none"> • In universities, measures are enforced to maintain academic integrity and academic freedom, protecting against the loving view of intolerance and discrimination: • Rules of Academic Integrity (Protocol No. 3 of 30.10.2018); • Anti-corruption standard (type No. 373 n/A dated 12/27/2019). • Code of Ethics (Protocol No. 8 of 31.01.2020). |
| Regulatory framework for the | 1. The Law of the Republic of Kazakhstan "On Education"; |

| | |
|--|--|
| development of OP | <p>2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595;</p> <p>3. State mandatory standards of higher and postgraduate education, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 31, 2018 No. 604;</p> <p>4. Rules for the organization of the educational process on credit technology of training, approved by the Order of the Ministry of Education and Science of the Republic of Kazakhstan dated April 20, 2011 No. 152;</p> <p>5. Qualification directory of positions of managers, specialists and other employees, approved by the Order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan on December 30, 2020 No. 553.</p> <p>6. Guidelines for the use of ECTS.</p> <p>7. Guidelines for the development of educational programs of higher and postgraduate education, Appendix 1 to the order of the Director of the Central Research Institute No. 45 o/d dated June 30, 2021.</p> |
| Organization of the educational process | <ul style="list-style-type: none"> • Implementation of the principles of the Bologna Process • Student-centered learning • Availability • Inclusivity |
| Quality assurance of OP | <ul style="list-style-type: none"> • Internal quality assurance system • Involvement of stakeholders in the development of the OP and its evaluation • Systematic monitoring • Updating the content (updating) |
| Requirements for applicants | <p>They are established according to the Standard Rules for admission to training in educational organizations implementing educational programs of higher and postgraduate education Order of the Ministry of Education and Science of the Republic of Kazakhstan No. 600 dated 31.10.2018</p> |

1. PASSPORT EP

| | |
|--|--|
| Purpose of the OP | Training of highly qualified scientific and pedagogical personnel, fluent in three languages, able to plan and carry out scientific and pedagogical, production activities in the field of biotechnology and able to develop strategic solutions to research tasks in various branches of biotechnological production. |
| OP tasks | <ul style="list-style-type: none">- providing lifelong learning skills and abilities that will enable them to successfully adapt to changing conditions throughout their professional career;- providing conditions for acquiring a high general intellectual level of development, mastering competent and developed speech, culture of thinking and skills of scientific organization of labor in various branches of biotechnological production;- training of highly qualified specialists with in-depth scientific knowledge, able to plan and carry out scientific and industrial activities of a professional biotechnologist, developing strategic approaches to solving research tasks in environmental and agricultural biotechnology;- training of highly qualified specialists capable of analyzing scientific and technical information in the field of environmental and agricultural biotechnology for the purpose of scientific, patent and marketing support of fundamental research and technological developments;- formation of competitiveness of graduates in various branches of biotechnological production, to ensure the possibility of their fastest possible employment in the specialty or continuing education at the next stages of training. |
| Harmonization of OP | <ul style="list-style-type: none">• 7th level of the National Qualifications Framework of the Republic of Kazakhstan;• Dublin descriptors of the 6th level of qualification;• 1 cycle of the Qualification Framework of the European Higher Education Area (A Framework for Qualification of the European Higher Education Area);• Level 7 of the European Qualification Framework for Lifelong Learning (The European Qualification Framework for Lifelong Learning). |
| Connection of the OP with the professional sphere | <ul style="list-style-type: none">• Professional standard "Teacher" (Appendix to the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 133 dated June 8, 2017).• Professional standard: "Selection activity (breeding) in animal husbandry" (Appendix No. 25k to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated December 26, |

2019263)

- Professional standard: "Feed production for farm animals" Appendix No. 18 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated 26.12.2019 No. 263

- Professional standard: "Production of milk and dairy products" Appendix No. 34 to the order of the Deputy Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" dated 26.12.2019 No. 263

The graduate of the educational program 7M05123 - "Biotechnology" is awarded the degree of "Master of Natural Sciences".

Masters of OP 7M05123 - "Biotechnology" can hold the position of the head of the department corresponding to the specialization in the enterprise; a specialist, senior specialist, head of the department of state bodies in this field, a researcher in design and survey, research institutes, a teacher in secondary professional and higher educational institutions, in (research institutions, design and design organizations) without presenting work experience requirements in accordance with the qualification requirements of the "Qualification Handbook positions of managers, specialists and other employees", approved by the Order of the Minister of Labor and Social Protection of the Population of the Republic of Kazakhstan dated May 21, 2012 No. 201-o-M.

The sphere of professional activity is the field of production of biotechnological products for various purposes, scientific developments in the field of biotechnological processes, the field of education

The objects of professional activity of graduates are higher and secondary vocational educational institutions, research institutes and design organizations.

The subjects of professional activity of a master's student in the specialty "Biotechnology" are:

- biotechnological processes and devices;
- biological objects of microbial plant and animal origin;
- improvement of technological processes and equipment;
- modernization of existing production facilities;
- analysis and solution of problematic production situations;
- management and regulation of the production process;
- quality control of raw materials and products;
- assessment of environmental safety of chemical production;
- teaching of specialized disciplines in biology.

Undergraduates of OP 7M05123 - "Biotechnology" can perform

List of qualifications and positions

Field of professional activity

Objects of professional activity

Subjects of professional activity

Types of

professional activity

Learning outcomes

the following types of professional activity:

- production and technological;
- settlement and design;
- scientific research;
- pedagogical.

LO1 Able to demonstrate of history and philosophy of natural and technical sciences, fundamental scientific and professional training, solve modern scientific and practical problems, plan and conduct research and experimental research activities;

LO2 Apply new methodologies of psychological and pedagogical sciences, biotechnological studies of phenomena and processes, the concept of biotechnological formations giving an idea of the impact of pollution on the environment;

LO3 Create and improve biological objects for biotechnological productions, independently combine methods of biotechnologies to obtain modern biological products.

LO4 To be able to competently design and implement energy-saving, low-waste, environmentally friendly technologies that ensure high quality of finished products, technological processes for processing raw materials of plant and animal origin,

LO5 Apply the complex acquired knowledge and skills in the management of biotechnological science. Analyze and apply modern technological methods to solve complex engineering problems in processing raw materials of plant and animal origin, Create intensive environment in the agro-industrial complex by applying various biotechnological methods.

LO6 Have high motivation to perform professional activities; possess the technology of independent learning and self-education, the ability to improve and develop their intellectual and professional level. Solve engineering, analytical and managerial tasks using the basic principles of devices, processes and technologies for the creation of new functional products, as well as the regulation of the reproduction of agricultural animals

LO7 Use research, entrepreneurial skills and skills of work in the face of uncertainty. Effectively work individually and conclusions on problems , to defend your point of view correctly, to correct your actions and use various methods, to be qualified and intelligible with a loving auditor, to understand your ideas and conclusions about problems in the field of biotechnology.

COMPETENCES OF THE GRADUATE OF EP **SOFT SKILLS** (Behavioral skills and personality qualities)

| | |
|---|---|
| SS 1. Competence in managing one's own literacy | SS1.1. Strive for professional and personal growth throughout life. SS 1.2. Constantly update own knowledge within the chosen trajectory and in an interdisciplinary environment, carry out further learning with a high degree of independence and self-regulation. SS 1.3. To be capable of reflection, an objective assessment of one's achievements, an awareness of the need to form new competencies and continue education in doctoral studies. |
| SS 2. Language competence | SS2.1. The ability of possessing a sufficient level of communication in the professional field in the state, Russian and foreign languages for negotiating and business correspondence. SS 2.2. The ability of mastering the skills of mediation and intercultural understanding. |
| SS 3. Mathematical Competence and Competence in the field of Science | SS3.1. The ability to interpret the methods of mathematical analysis and modeling for solving applied problems in the field of study. SS3.2. The ability to plan the setting of scientific experiments, integrate and implement the results of scientific research in the professional field. SS 3.3. The ability to analyze and comprehend modern methods of pedagogical and psychological science and apply them in pedagogical activity. |
| SS 4. Digital competence, technological literacy | SS 4.1. The ability to confidently use modern information and digital technologies, artificial intelligence systems for work, leisure and communications. SS 4.2. Proficiency in the use, recovery, evaluation, storage, production, presentation and exchange of information in a wide range of digital devices. SS 4.3. Ability to confidently use global information resources and apply technological literacy in research and computational and analytical activities. |
| SS 5. Personal, social and academic competencies | SS 5.1. Possession of the norms of business ethics, social and ethical values and focus on them in professional activities. SS 5.2. Formation of a personality capable of mobility in the modern world, critical thinking and physical self-improvement. SS 5.3. Ability to work in a team, correctly, clearly and reasonably defend one's position during discussions and make decisions of a professional nature. SS 5.4. Ability to adequately navigate in various social |

**SS 6.
Entrepreneurial
competence**

spheres of activity and in conditions of uncertainty.

SS 5.5. Ability to find compromises, correlate own opinion with the opinion of the team.

SS 6.1. The manifestation of leadership qualities and the ability to have a positive impact on others, to lead a team.

SS 6.2. The ability to create conditions for the development of creative and entrepreneurial skills of the team.

SS 6.3. The ability to work in a mode of uncertainty and rapidly changing task conditions, make decisions, respond to changing working conditions, allocate resources and manage your time.

SS 6.4. Ability to work with consumer needs.

**SS 7. Cultural
awareness and
ability to express
yourself**

SS7.1. The ability to show worldview, civil and moral positions.

SS7.2. The ability to be tolerant of the traditions and culture of the peoples of the world, to have high spiritual qualities.

PROFESSIONAL COMPETENCIES (HARD SKILLS)

Theoretical
knowledge,
practical skills
and abilities
specific to this
field

PC 1. The ability to carry out the technological process in accordance with the regulations to use technical means to measure the main parameters of biotechnological processes, properties of raw materials and products; the ability to realize and manage biotechnological processes; the willingness to evaluate technical means and technologies with account of the ecological consequences of their application; the ability to ensure compliance with the rules of safety technology, industrial sanitation, fire safety and labor protection.

PC2. Ability to work with scientific and technical information, to use Russian and international experience in professional activities; possession of basic methods and techniques for conducting experimental studies in their professional area; ability to conduct standard certification tests of raw materials, finished products and technological processes; possession of experiment planning, processing and presentation of the results obtained; readiness to use modern information technologies in your professional field, including databases and software packages.

PC 3. Ability to participate in the development of technological projects as part of the team of authors; readiness to use modern systems of automated design. willingness to use their knowledge and achievements in solving problems and problems of biotechnology

3.1 Matrix of correlation of EP learning outcomes in general with modules formed by competencies

| | LO 1 | LO2 | LO3 | LO4 | LO5 | LO6 | LO7 |
|------------|-------------|------------|------------|------------|------------|------------|------------|
| GC1 | | + | | | + | + | + |
| GC2 | + | + | | + | | + | + |
| GC3 | + | + | | | | | + |
| GC4 | + | + | + | | + | | |
| GC5 | | | | + | + | + | |
| GC6 | | | | | + | + | + |
| GC7 | | | | | + | + | + |
| PC1 | | + | + | + | + | + | |
| PC2 | + | + | + | + | | + | |
| PC3 | | + | | + | | + | + |

5. Information about disciplines

| № | Module name | Cycle | HSC/ EC | Component Name | Brief course description | Number of credits | Formed LO (codes) | | | | | | | | |
|----|---|---------------------------------|---------|-----------------------------------|---|-------------------|-------------------|-----|-----|-----|-----|-----|-----|-----|---|
| | | | | | | | LO1 | LO2 | LO3 | LO4 | LO5 | LO6 | LO7 | LO8 | |
| 1 | | BD | HSC | History and Philosophy of Science | Examines history and philosophy of natural and technical sciences. New European science in culture and civilization, emergence of science, its historical dynamics, structure of scientific knowledge, philosophical problems of specific sciences. Communication technologies of the XXI century and their role in modern science. Philosophical problems of development of modern global civilization. Modern actual methodological and philosophical problems of natural and social sciences and humanities. | 4 | v | | | | | | | | |
| | Module of scientific and pedagogical training | | | | | | | | | | | | | | |
| BD | HSC | Foreign Language (Professional) | | | Examines development of skills for preparing written messages on scientific topics in the specialty: scientific report, thesis on the topic of scientific research, abstracting of original sources in a foreign language, annotation of a scientific text, summary. Understanding the general content of authentic records. Listening to lectures, messages containing professional information. Development of oral communication skills in the specialty: presentation with a scientific report, presentation of scientific research, scientific discussion, | 4 | | | | | | | | | v |

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|----|-----|---------------------------|---|---|---|---|---|---|
| | | | scientific debates, use of situational games. | | | | | |
| BD | HSC | Psychology of management | Examines methodological problems of psychological analysis of management processes and phenomena; Development of business and interpersonal skills in the context of contact of different managerial cultures; Mastering the theoretical laws of life and dynamics of control systems; forming ideas about the methods of management and psychological consultation; critical analysis of the structure of a team and socio-psychological climate in a team; leadership styles in an organization's management. | 4 | v | v | v | v |
| BD | HSC | Higher Education Pedagogy | Examines modern paradigms of higher education. System of professional education in Kazakhstan. Methodology of pedagogical science. Professional competence of a high school teacher. Organization of educational process on the basis of the credit system of education in a high school. Methods and forms of training in the training of future specialists in new educational technologies in a high school. High school as a social institution of education and formation of personality of a specialist. | 4 | v | v | v | v |
| BD | HSC | Pedagogical Practice | Examines development of professional research culture in the field of biotechnology as a condition of pedagogical skills and pedagogical creativity, formation of professional | 4 | v | v | v | v |

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| | | | | | | | | | | | | | |
| 3 | Modern methods of scientific researches | BD | EC | Modern Methods in Biotechnology | Characterizes membrane structures, proteomic analysis, molecular diagnosis of genetic diseases, isolation and analysis of nucleic acids, physical methods of gene transfer into plant cells and immunohistochemical methods for studying the interaction of antigen-antibody. Considers issues of cloning technology at the molecular and cellular level. | 4 | v | v | v | v | v | v | v |
| BD | EC | Photobiological Processes and Bioenergy | Forms ideas about the most important physical processes occurring in living organisms, basic principles and theoretical provisions of photobiological processes. Substantiates interrelation of physical and biological aspects of living systems' functioning. Formation of skills of biophysical approach to the experimental study of biological phenomena and patterns. Forms skills of using the knowledge of biophysics to explain the most important physiological | 15 | v | v | v | v | v | v | v | v | |
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| | | | | | | | | |
| BD | EC | Principles of waste management in Biotechnological industries | processes occurring in living organisms, both in normal conditions and under stress and occurrence of pathology. Considers laws of thermodynamics as applied to biological systems. Characterizes methods of research and analysis of living systems. | The main principles of effective waste management for improving the environment, promoting the recovery, reuse and recycling of material flows from industry and municipalities, which are priority issues in Kazakhstan and the world, are considered. The issues of the structure of production and consumption, the development of project standards for the formation and location of production and waste disposal, the planning, implementation, monitoring and analysis of measures for the management of production and waste disposal are considered. | 4 | v v v v v v v v v | v v v v v v v v v | v v v v v v v v v |
| BD | EC | Ecological management of Biotechnological Production | The issues of long-term waste recycling programs in biotechnological industries are considered, taking into account the best European and world practices, technologies and industry features. Analysis of new biotechnological methods of waste disposal and recycling, recommendations for waste disposal. Students learn how to calculate the risks associated with | v v v v v v v v v | v v v v v v v v v | v v v v v v v v v | v v v v v v v v v | |
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| | | | | | | | | | | | | | |
| 4 | Applied aspects of biotechnology | PD | EC | Basics of scientific Research work | management in biotechnological industries. The issues of regulation are considered as a set of measures to improve the state of the environment, various standards for the protection of natural resources. Operations to minimize production waste, including process improvement through waste-free technologies. | Examines modern achievements of science and technology in a specific area of biotechnological productions with the study of practical recommendations and methods for solving research problems. Justifies relevance of selected topic, setting objectives and tasks of the research. Examines issues of carrying out a literature review and patent search for new production methods in the studied field of research and new technologies on the topic of master's dissertation using electronic databases and developing a methodology for theoretical, experimental research, execution and defense of a report on research activities. | 5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5 | | PD | EC | Ensure Genetic Security in the Biotechnological Production | Considers biosafety issues regarding basic principles and methodology for assessing the risk of adverse effects of genetic engineering activities at biotechnological enterprises and possible adverse effects of genetic engineering organisms on the environment and | | | | | | | | |

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| | | | | | | | | | | | | | |
| 6 | Principles of biotechnological processes organization | PD | EC | Cellular and Tissue Biotechnology | human health. Legislative framework for food safety in the Republic of Kazakhstan. Forms skills to comply with the biological safety of genetically modified sources in food production and to carry out food toxicological and hygienic assessment of genetically modified food sources. | Regulatory and legislative framework for food safety in the Republic of Kazakhstan. Forms skills to comply with the biological safety of genetically modified sources in food production and to carry out food toxicological and hygienic assessment of genetically modified food sources. | 4 | v | v | v | v | v | v |
| 7 | PD | EC | Kinetics of Biochemical Processes | Considers issues of plant cell culture as an object of biological design, new experimental systems for synthesis of secondary metabolites using plant tissue culture and animal cells. Forms skills of obtaining artificial associations of cultivated cells of higher plants with microorganisms. Deepening knowledge of cell selection, clonal micropagation and plant health and methods of preserving the gene pool of plants and animals, regulating the reproduction of farm animals. | Considers main issues of kinetic regularities of the course of chemical and enzymatic reactions, physical essence of chemical equilibrium, dependence of rate of a chemical reaction on temperature and concentration of reactants. Characterizes main stages of protein biosynthesis: transcription, translation, basic principles of protein engineering, properties of genetic code and principles of regulation of metabolic processes. | v | v | v | v | v | v | v | |

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|----|------------------------------|----|--|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| 8 | Methodical bases of teaching | PD | HSC | Methods of Teaching Specialty Disciplines | Examines training, integrated, block and paracentric training. Multimedia technology of training. Teaching specialized disciplines by parsing and solving problem situations and cases. Solving problems by compiling a group project, carrying out a role-playing game. Logical methods and techniques. Organization, planning of training process in a high school. Organization of creative work of students. Methodical features of the study of specialized disciplines in the specialty "Biotechnology". Development and updating of training methodical documentation. | technology of individual training, integrated, block and paracentric training. Multimedia technology of training. Teaching specialized disciplines by parsing and solving problem situations and cases. Solving problems by compiling a group project, carrying out a role-playing game. Logical methods and techniques. Organization, planning of training process in a high school. Organization of creative work of students. Methodical features of the study of specialized disciplines in the specialty "Biotechnology". Development and updating of training methodical documentation. | 5 | v | v | v | v | v |
| 9 | PD | EC | Equipment of enterprises of biotechnological industry | Considersequipment biotechnological industries: rules of work and safety. Classification of processes of biotechnological productions and requirements for equipment. Typical scheme of biotechnological production and instrumentation process. Drying process and its hardware design. Studying the effect of filter pore size on sediment formation during filtration. Effect of centrifugation rate on sediment formation. Forms the concept of nutrient media and hardware design processes for their preparation. | 6 | v | v | v | v | v | v | |
| 10 | PD | EC | Equipment for conducting of biotechnological processes | Modernmeth odsofscientific cresearches | Considers equipment for malting and production of enzyme preparations. Yeast and yeast growth apparatus. Equipment for | v | v | v | v | v | v | v |

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|----|----|----|---|--|---|--------------------------------------|--------------------------------------|
| | | | | | | | |
| 11 | PD | EC | Modern Problems of Branch Biotechnology | alcoholic fermentation of food environments. Equipment for fermentation of wort in the production of alcohol. Apparatus for maturation of dairy products. Equipment for cream ripening, milk coagulating and clot processing. Equipment for meat salting. Apparatus for meat ripening. Meat smoking equipment. Automatic smoking chambers and smoking installations. | Considers biotechnological ways to solve the problem of protein deficiency in agriculture, problems in food industry, problems of production of functional foods and biologically active food additives. Considers ways to solve the problems of biomedical industry and molecular mechanisms of intracellular regulation and their use in selection of microorganisms. | v v v v v v v v | v v v v v v v v |
| 12 | PD | EC | Achievements and Prospects of Biotechnology | Examines theoretical foundations of biotechnology by industries. Characterizes physical and biophysical methods used in biotechnology, methods for studying and using membrane structures, methods for studying biopolymers, methods for analyzing and synthesizing nucleic acids. Forms skills of obtaining enzyme preparations and their use in food industry. Considers issues of achievement and prospects of food biotechnology, achievements and | v v v v v v v v | v v v v v v v v | |

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| | | | | | | | | | | | | | |
| 13 | PD | EC | Biotechnology of Biomass Production and Processing | Characterizes main methods of obtaining biotechnology products from renewable raw materials (biomass), methods of preparing biomass for its processing using enzymatic processes and methods of raw materials pre-processing, as well as methods of raw materials bioconversion using various biotechnological agents and cultivation methods. Justifies the choice of methods and technologies for processing plant raw materials, technological control of biotechnological products and analyzing the quality and safety indicators of raw materials and processed products. | 4 | v | v | v | v | v | v | v | v |
| 14 | PD | EC | Progressive Course of Genetic Engineering | Forms theoretical foundations of genetic engineering and applied aspects of its application, ability to present and critically analyze information about achievements and prospects for introducing methods of genetic engineering into the practice of creating new forms of plants, animals and microorganisms. Deepens knowledge in the field of genetic engineering and main methods of genetic engineering, problems of using genetically modified products and transgenic plants, animals for the purposes of | 4 | v | v | v | v | v | v | v | v |

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|----|----|---|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | |
| PD | EC | Molecular genetic research in the biotechnology | Deepens knowledge of molecular genetic bases of modern biotechnology, vector system used for cloning in cells of prokaryotes and eukaryotes and molecular genetic basis for implementation of genetic information in the cell. Substantiates organization of modern microbiological production of biologically active substances for animal husbandry, crop production and technical purposes, modern microbiological production based on living cells and spores, and microbial production of highly purified preparations of biologically active substances for medical and food purposes. | 6 | v | v | v | v | v | v | v | v | v | v | v | v | v | v |
| PD | EC | Industrial microbiology | Considers main types of nutrient media used for cultivation of industrial microorganisms and principles of formulation of industrial nutrient media and technology of cultivation of microorganisms, use of microorganisms in industrial production of steroid hormones and metabolites. Justifies advantages of microbiological method of obtaining primary and secondary metabolites, application of biotechnological methods in various branches of industrial production. Characterizes methods for obtaining pure cultures of microorganisms and microbial | 6 | v | v | v | v | v | v | v | v | v | v | v | v | v | v |

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|----|----|----|--|---|--|--|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| 16 | BD | EC | Ecobiosafety in the agricultural and industrial zone | Principles of biotechnological processes organization | biomass for agriculture, medicine, and food industry. | Deepens knowledge of problems of environmental pollution in agricultural industry, its importance in modern society. Considers issues of biological processing of industrial wastes of various industries, use of microorganisms hydrocarbondestructors for cleaning contaminated soils and safety problems of using microorganisms obtained by genetic engineering methods, and some products of microbial synthesis. Allows to acquire skills of applying in practice a complex of modern research methods in the field of environmental biotechnology for treatment of wastewaters and soils. | 7 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17 | BD | EC | Environmental Aspects of Biotechnological Processes | | Characterizes methods of biological wastewater treatment, methods of biotechnological leaching, disposal of solid wastes and obtaining non-traditional energy sources, aerobic and anaerobic methods of processing industrial and agricultural wastes, biotechnological methods of cleaning objects contaminated with heavy metals and radionuclides. Substantiates the role of microorganisms in biodegradation of organic substances of the environment and relationship of plants with soil | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

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|----|----|----|--|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| 18 | PD | EC | Technology of production and storage of the biotechnological industries products | Issues of using sulfate-reducing bacteria in deposition of metals, conditions of their functioning, use of microorganisms for biosorption of metals, biological processing of industrial wastes of various industries, use of microorganisms – destrucors of hydrocarbons for cleaning wastewaters from oil refineries and soils polluted with oil. | Considers questions of organization of biotechnological productions in agriculture and biotechnology for storage and processing of crop and livestock products. Characterizes modern methods of biotechnology in production and processing of agricultural products and microorganisms used in biotechnology for storage and processing of agricultural products. Substantiates the use of micromycetes in the production of products of plant origin and bacteria in the production of feed. | 6 | | v | v | v | v | v | v | v |
| 19 | PD | EC | Achievements of Genetic Engineering in the Agro-Industrial Complex | Considers problems and prospects of obtaining new varieties of plants resistant to stress factors, problems and prospects of applying methods of genetic engineering, basics of molecular bioengineering, cellular and tissue biotechnology in plant breeding, problems and prospects of obtaining new breeds of animals resistant to diseases using genetic engineering methods. Characterizes methods of selection of a recipient | | | v | v | v | | | | | |

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|----|---|----|---|--|----|--|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |
| 20 | Modern methods of scientific researches | PD | Research Practice | Practical study of the latest theoretical, methodological and technological achievements of domestic and foreign science: modern methodology of scientific research; analysis of state of development of chemical technology and science in the world and Kazakhstan; role of science and innovation in the improvement and modernization of technology; modern trends in the production of inorganic substances. Performance of theoretical and experimental research on the topic of dissertation. | 7 | | | v | v | v | v | v | v | v |
| 21 | Principles of biotechnological processes organization | PD | Master Research Scientific Work Including internship and master thesis (MRSW) | Allows to use the obtained theoretical knowledge of modern methods of biotechnology for experimental work. Allows to acquire the skills of research work according to the plan of academic period with the use of instrumentation base of the chair's laboratory. Justifies choice of technological scheme of production in accordance with the topic of master's dissertation. Forms skills in the use of information technologies, computer programs in the performance | 24 | | v | v | v | v | v | v | v | v |

| | | | | | | | | |
|----|-------------------------------|---|---|----|---|---|---|---|
| | | | | | | | | |
| 22 | Module of final certification | Registration and Defense of a Master's Thesis | The final qualifying work of a graduate of the Master's program, confirming the competencies acquired during the training process in accordance with the chosen specialization of training. Defense of the master's dissertation at the open meeting of the State Attestation Commission with participation of the chairman of the commission and at least half of its composition. The procedure and regulations for the defense of the master's dissertation are established by the chairman. | 12 | ✓ | ✓ | ✓ | ✓ |

5. SUMMARY TABLE REFLECTING THE VOLUME ASSIMILATED CREDITS OF EDUCATION PROGRAM MODULES

| Course of Study | Semester | The number of mastered modules | Number of credits | | | | | | Total hours | Total credits HSC | The number of | | |
|-----------------|----------|--------------------------------|-------------------|-----------|----------------------|----------------------|-------------------|-----------|-------------|-------------------|---------------|----------------------|----------|
| | | | HSC | EC | Theoretical training | Educational practice | Research practice | MF3Ж | | | EC | Theoretical training | |
| 1 | 1 | 4 | 5 | 3 | 29 | | | 1 | | 900 | 30 | 5 | 1 |
| | 2 | 3 | | 4 | 23 | 4 | | 3 | | 900 | 30 | 4 | 1 |
| 2 | 3 | 3 | | 4 | 21 | | 7 | 2 | | 900 | 30 | 5 | 1 |
| | 4 | | | | | | | 18 | 12 | 900 | 30 | | |
| Барлығы | | 10 | 5 | 11 | 73 | 4 | 7 | 24 | 12 | 3600 | 120 | 14 | 3 |

6 LEARNING STRATEGIES AND METHODS, MONITORING AND EVALUATION

| | |
|--|--|
| Learning strategies | <p>Student-centered learning: the student is a center of teaching/learning and an active participant in the learning and decision-making process.</p> <p>Practice-oriented training: orientation to the development of practical skills.</p> |
| Teaching methods | <p>Conducting lectures, seminars, various types of practices with:</p> <ul style="list-style-type: none">• the use of innovative technologies;• problem-based learning;• case study;• work in a group and creative groups;• discussions and dialogues, intellectual games, olympiads, quizzes;• reflection methods, projects, benchmarking;• Bloom's taxonomies;• presentations;• rational and creative use of information sources:• multimedia training programs;• electronic textbooks;• digital resources. <p>Organization of independent work of students, individual consultations.</p> |
| Monitoring and evaluation of the achievability of learning outcomes | <p>Current control on each topic of the discipline, control of knowledge in classroom and extracurricular classes (according to syllabus). Assessment forms:</p> <ul style="list-style-type: none">• survey in the classroom;• testing on the topics of the academic discipline;• control works;• protection of independent creative works;• discussions;• trainings;• colloquiums;• essays, etc. <p>Boundary control at least twice during one academic period within the framework of one academic discipline.</p> <p>Intermediate certification is carried out in accordance with the working curriculum, academic calendar.</p> <p>Forms of holding:</p> <ul style="list-style-type: none">• exam in the form of testing;• oral examination;• written exam;• combined exam;• project defense;• protection of practice reports. <p>Final state certification.</p> |

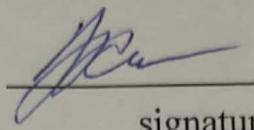
EDUCATIONAL AND RESOURCE SUPPORT OF THE OP

| | |
|-----------------------------|--|
| Information Resource Center | <p>The structure of the JRC has 6 subscriptions, 16 reading rooms, 2 electronic resource centers (IRC). The basis of the network infrastructure of the OIC consists of 180 computers with Internet access, 110 automated workstations, 6 interactive whiteboards, 2 video doubles, 1 videoconferencing system, 3 scanners of A-4 format, 3. The software of the OIC – AIBS "IRBIS-64" for MSWindows (a basic set of 6 modules), an autonomous server for uninterrupted operation in the IRBIS system.</p> <p>The library fund is reflected in the electronic catalog available to users on the website http://lib.ukgu.kz is on-line 24 hours 7 days a week.</p> <p>Thematic databases of their own generation have been created: "Almamater", "Works of scientists of SKSU", "Electronic Archive". Online access from any device 24/7 via an external link http://articles.ukgu.kz/ru/pps.</p> <p>Working with catalogs in electronic form. The EC consists of 9 databases: "Books", "Articles", "Periodicals", "Works of the teaching staff of SKSU", "Rare books", "Electronic Fund", "SKSU in print", "Readers" of "SKU".</p> <p>The JIC provides its users with 3 options for accessing its own electronic information resources: from the Electronic Catalog terminals in the catalog hall and divisions of the JIC; through the university's information network for faculties and departments; remotely on the library's website http://lib.ukgu.kz. Access to international and republican resources is open: "SpringerLink", "Envoy", "Web of Science", "EVSSO", "Epigraph", to electronic versions of scientific journals in open access, "Zan", "RMEB", "Adebiet", Digital library "Akpigress", "Smart-kitar", "Kitar.kz", etc.</p> <p>For people with special needs and disabilities, the library's website has been adapted to the work of visually impaired users in the JRC</p> |
| Material and technical base | <p>Research Laboratory of undergraduates and doctoral students Laboratory "Biochemistry" and Microbiology" BOX "Biotechnology of microorganisms" Laboratory "Biotechnology BASES" Autoclave Laboratory "Biotechnology of animals and plants" The room of teachers The room of the head of the department The room of teachers The lecture hall "Food biotechnology" The room of the Erasmus preparator and the office for shooting video lectures The laboratory "agricultural biotechnology"</p> |

AGREEMENT SHEET

by Education Program code 7M05123- «Biotechnology»

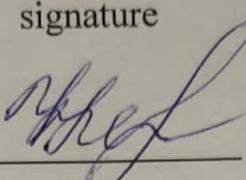
Director of the IPE



Konarbayeva Z.K.

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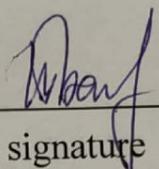
Director of the DAN



Nazarbek U.B.

signature

Director of the DK and P



Bazhirov T.S.

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