

**MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN  
"NJSC "S. SEIFULLIN KAZAKH AGROTECHNICAL UNIVERSITY"**

Approve  
NJSC "Saken Seifullin Kazakh  
Deputy Chairman of the Management  
Board Academic Activity-Rector  
\_\_\_\_\_ A.M Abdyrov.  
« \_\_\_\_\_ » \_\_\_\_\_ 2021.

**CATALOG OF ELECTIVE COURSES**

For students in groups of educational programs

6B05101 Agricultural biotechnology

**Nur-Sultan, 2021**

**MINISTRY OF AGRICULTURE OF THE REPUBLIC OF KAZAKHSTAN  
"NJSC "S. SEIFULLIN KAZAKH AGROTECHNICAL UNIVERSITY"**

Brief description of elective disciplines of the educational program

Physiology and biochemistry of animals

1	Name of course	Professionally-oriented Foreign Language
2	Code of course	POIYa 3219
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	3
8	Prerequisites	"Foreign language" in undergraduate
9	Postrequisites	Disciplines in a specialty in a foreign language
10	Course summary	The discipline studies the terminological dictionary in the field of biotechnology, understanding of special topics and the ability to discuss thematic issues in English.
11	Learning outcomes	To own skills: oral communication in the specialty in the forms of monologue, dialogue / polylogue (report, message, discussion, debate, round-table discussion); preparation of written forms for the presentation of information material in the specialty of communication, poster report, annotation); work with lexicographic sources in a foreign language (traditional and on-line); extract the necessary information from academic texts; understand the main idea of academic texts and texts in the specialty; use of modern approaches to the study of a foreign language.

1	Name of course	English for special purposes
2	Code of course	AYaDSC 4227
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	4
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	4
8	Prerequisites	"Foreign language" in undergraduate level B1-B2
9	Postrequisites	specialty in a foreign language
10	Course summary	In-depth study of a foreign language and carry out foreign language interpersonal and intercultural communication with native speakers.
11	Learning outcomes	According to the results of mastering the program, the student, depending on the level of training, the student at the time of completion of the course reaches the level of B1- (IELTS 4.0-5.0) or B2- (IELTS 5.5-6.0) and the formed skills for solving tasks of professional, interpersonal and intercultural interaction.

1	Name of course	Inorganic and organic chemistry
2	Code of course	NOH 1214
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	3
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	1
8	Prerequisites	Basic school knowledge of biology, chemistry.
9	Postrequisites	To study basic and core disciplines.
10	Course summary	Theoretical foundations, basic laws and concepts of chemistry. The structure of the atom, substance. State of aggregation. Chemical bond. The basic laws of a chemical reaction. Reactions in the aquatic environment. Complex compounds. Redox process. Chemistry of bioactive elements. Fundamentals of Organic Chemistry. The relationship between the structure and property of substances. Methods of preparation, properties and use of organic substances.
11	Learning outcomes	To be able to use the experience of theoretical, experimental research and safe work with chemicals, solve design problems. Know the natural sources of organic raw materials; classification and principles of the nomenclature of organic compounds; know the methods of preparation and chemical properties of the main classes of organic compounds; The use of certain classes of organic compounds as indicators; methods for the isolation and purification of organic compounds (extraction, recrystallization, distillation, sublimation); construct the structural formula of an organic compound by its name and vice versa.

1	Name of course	Inorganic and organic chemistry
---	----------------	---------------------------------

2	Code of course	NOH 1215
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	2
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	1
8	Prerequisites	Basic school knowledge of biology, chemistry.
9	Postrequisites	To study basic and core disciplines.
10	Course summary	Theoretical foundations, basic laws and concepts of chemistry. The structure of the atom, substance. State of aggregation. Chemical bond. The basic laws of a chemical reaction. Reactions in the aquatic environment. Complex compounds. Redox process. Chemistry of bioactive elements. Fundamentals of Organic Chemistry. The relationship between the structure and property of substances. Methods of preparation, properties and use of organic substances.
11	Learning outcomes	To be able to use the experience of theoretical, experimental research and safe work with chemicals, solve design problems. Know the natural sources of organic raw materials; classification and principles of the nomenclature of organic compounds; know the methods of preparation and chemical properties of the main classes of organic compounds; The use of certain classes of organic compounds as indicators; methods for the isolation and purification of organic compounds (extraction, recrystallization, distillation, sublimation); construct the structural formula of an organic compound by its name and vice versa.

1	Name of course	Higher mathematics
2	Code of course	VM 1216
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	2

5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	1
8	Prerequisites	School course of mathematics.
9	Postrequisites	Information and communication technologies, entrepreneurial activity
10	Course summary	Elements of linear algebra and analytic geometry; The limit, derivative and integral of a function of one variable; Functions of several variables; Numeric series. Theory of Probability and Mathematical Statistics.
11	Learning outcomes	To own the technique of solving various types of calculation problems, analyze theoretical data, be able to apply the knowledge gained in solving applied problems in the study of biology, biotechnology, veterinary medicine and medicine; in the formalization of tasks, the construction of mathematical models and the selection of the most acceptable methods of solution; acquire skills in the implementation of algorithms in relation to specific tasks; in solving practical problems, in using the achievements of fundamental science for the successful study of general theoretical and special disciplines of the specialty, the development of mathematical thinking and logic for use in mathematical modeling.

1	Name of course	Higher mathematics
2	Code of course	VM 1217
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	3
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	1
8	Prerequisites	School course of mathematics.
9	Postrequisites	Information and communication technologies, entrepreneurial activity

10	Course summary	Elements of linear algebra and analytic geometry; The limit, derivative and integral of a function of one variable; Functions of several variables; Numeric series. Theory of Probability and Mathematical Statistics.
11	Learning outcomes	To own the technique of solving various types of calculation problems, analyze theoretical data, be able to apply the knowledge gained in solving applied problems in the study of biology, biotechnology, veterinary medicine and medicine; in the formalization of tasks, the construction of mathematical models and the selection of the most acceptable methods of solution; acquire skills in the implementation of algorithms in relation to specific tasks; in solving practical problems, in using the achievements of fundamental science for the successful study of general theoretical and special disciplines of the specialty, the development of mathematical thinking and logic for use in mathematical modeling

1	Name of course	Basics of Biostatistics and Bioinformatics
2	Code of course	OBB 2218
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	2
8	Prerequisites	Computer science, molecular biology, general and molecular genetics, microbiology and virology, immunology
9	Postrequisites	Microorganism biotechnology, animal biotechnology, plant biotechnology, ecological biotechnology, breeding of industrial microorganism strains
10	Course summary	Biological information, statistical processing of measurement results in biological research. Sequencing technology. Microsoft Excel Excel package features. Main categories of statistical analysis in Microsoft Excel, Microsoft Access database. Processing the results of serological studies. Decoding the genetic code of electronic resources NCBI. Possibilities of using the BLAST program. Introducing the Galaxy Web Platform

11	Learning outcomes	To have skills in working with software used in the analysis of biological data; engage in research and biotechnological practice using methods of biostatistics and bioinformatics; be able to process and analyze the results of their own research in the implementation of term papers and dissertations. Know the methodological foundations of scientific knowledge; basic research methods used in the field of biological sciences; general guidelines for experimental research; the methodology of the final scientific processing of research materials.
----	-------------------	---

1	Name of course	Business activities
2	Code of course	PD 4228
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	4
8	Prerequisites	Fundamentals of Economics, Fundamentals of Agribusiness
9	Postrequisites	Organization of production, professional activity
10	Course summary	Concept, essence, basic types and organizational forms. Rationing and remuneration. Costs and financial performance of the organization (company). Economic efficiency of the organization (company) and entrepreneurial projects. Marketing and organization management. State support for entrepreneurship and its infrastructure.
11	Learning outcomes	To own: skills in applying various techniques and tools in a business management system; personnel assessment methods; risk management methods; methods for assessing the effectiveness of entrepreneurial activity.



1	Name of course	Biotechnology in fish aquaculture
2	Code of course	BAR 3223
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	3
8	Prerequisites	Fundamentals of biotechnology, molecular biology, morphology, physiology
9	Postrequisites	Industrial biotechnology, professional activities in the field of aquaculture
10	Course summary	Modern achievements in biotechnology of aquaculture fish. Using modern research methods to increase fish productivity, applied aspects of using modern biotechnology methods. Prospects for fundamental research on the genetics of sex, polyploidy, distant hybridization and biology of the development of bony fish. Obtaining transgenic fish with increased growth rates and surrogate fish. Oogonium and spermatogonia transplantation methods for obtaining surrogate fish
11	Learning outcomes	Know: the basic laws of functioning and quality management of aquatic ecosystems; biology and fishing features of the main fish farming and fishing facilities, their ecology; modern methods for aquaculture and molecular biology. Have skills: in the selection of equipment and apparatus for equipping aquaculture enterprises. Be competent: to ensure the implementation of basic technological processes at aquaculture enterprises; quality assessment of aquaculture facilities; to develop low-waste, energy-saving, environmentally friendly aquaculture technologies;

1	Name of course	Production of feed additives for farm animals
2	Code of course	PKDDSZh 2311
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	5
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	2
8	Prerequisites	Fundamentals of biotechnology, analytical and physical colloid chemistry, microbiology and biochemistry, genetic engineering, cell biotechnology
9	Postrequisites	Industrial biotechnology, green biotechnology and food safety, industrial biotechnology
10	Course summary	Types of dietary supplements, raw materials of plant, animal, mineral origin and its nutritional value for the formulation of bio-feeds and the creation of a feed base. The assortment and quality of produced bio-feeds; theoretical foundations of the processes that determine the technology of feed production. Methods for formulating feeds and evaluating their nutritional value. Progressive, innovative feed technology production; current status and development prospects of the production of bio-feed. Selection of raw materials according to the recipe of a given biocom feed and determination of nutritional value, determination of technological efficiency of the main equipment, individual operations, as well as quality control of raw materials, finished products.
11	Learning outcomes	Know: value, morphology and biology of fodder plants; advanced technologies for the manufacture of feed additives for animals and birds; ways and methods to improve the quality of feed; To know the production processes in the technology of manufacturing bio-feeds; to use resource-saving technologies in production. Know the techniques and methods of biotechnology for the production of microbial mass and feed additives. Carrying out technological tests of new forms and types of feed additives for agricultural animals

1	Name of course	Biotechnology of microorganisms
2	Code of course	BM 3221
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	7
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	3
8	Prerequisites	Morphology, physiology, biochemistry, molecular biology, molecular genetics and genetic engineering, microbiology and virology, the basics of biotechnology
9	Postrequisites	Microbiological control of biotechnological production, veterinary biotechnology, food biotechnology, environmental biotechnology, industrial biotechnology
10	Course summary	Strains producing the target products and requirements for their storage. Principles and methods for producing producer strains and super-producers. Methods for the cultivation of microorganisms. The study of the growth of microorganisms and the effect on it of pH and temperature of cultivation. The characteristics of the producers and the technology for producing microbial protein, organic acids and neutral products, primary metabolites of microorganisms, biologically active substances by microbiological synthesis.
11	Learning outcomes	To know the safety measures when working with biological material, the basics of classification, morphology, physiology, genetics and properties of producer strains; methods and approaches for the preparation, isolation and purification of primary and secondary metabolites of microorganisms; To be able to produce microbiological preparations, cultivate microorganisms by surface and deep methods, isolate pure cultures and identify them, maintain and store industrial cultures of microorganisms. The ability to solve problems of economic efficiency and the feasibility of using a particular producer strain; analyze data, draw up a production protocol.

1	Name of course	General Immunology
2	Code of course	OI 3229
3	Cycle of course	cycle of basic disciplines
4	Amount of credits	6
5	Level of preparation	Undergraduate studies
6	Department	Department of Microbiology and Biotechnology
7	Year	3
8	Prerequisites	Morphology, physiology, biochemistry.
9	Postrequisites	Microbiology and virology, veterinary biotechnology, molecular genetics and genetic engineering, animal biotechnology.
10	Course summary	The concept of natural resistance and species immunity, acquired immunity. Modern ideas about antigens, protective mechanisms of a macroorganism, regulation of the immune response and applied immunology. The functioning of the immune system is normal, laws and principles of functioning. Knowledge of immunological methods for the determination of T and B lymphocytes, as well as methods for the isolation and study of immunoglobulins.
11	Learning outcomes	Know: basic immunological concepts and terms; the structure of the immune system, the mechanisms of formation of the humoral and cellular immune response; molecular genetic basis of immunological reactions and their regulation; features of the formation of various types of non-infectious and infectious immunity; main pathologies of immunity. be able to: apply scientific knowledge in the field of immunology in educational and professional activities; search and analyze scientific information on relevant immunological issues; own: a wide range of methods and approaches of immunological studies. Practical skills in using immunological tests to detect antigens and antibodies.