KAZAKH NATIONAL WOMEN'S TEACHER TRAINING UNIVERSITY
INSTITUTE OF NATURAL SCIENCE
6B05101-BIOLOGY

CONTENT

EDUCATIONAL PROGRAMME: 6B05101-BIOLOGY

1. OPTIONAL COMPONENTS OF THE CYCLE OF GENERAL COURSES

Optional component 1

Course: **Fundamentals of Legal Literacy and Anti-Corruption culture**
Intensity of the Course: 5 academic credits
Module Code: **GES -1**
Module Name: General educational subjects module
Prerequisites: Basics Law (school cours)
Purpose: formation of a legally competent, law-abiding person who knows his rights and duties, intolerant of any manifestations of corruption.
Short Description: The course is aimed at the formation of a legally competent, law-abiding person who knows his rights and obligations, intolerant of any manifestations of corruption. Students will be able to operate with the social, legal and ethical norms of Kazakhstani society.
Learning Outcomes in EP (LOP):
LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential
LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.
LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.
Learning Outcomes in Course (LOC):
LOC 1 - To know the importance and role of legal culture in the life of society, its relationship with the political culture of the individual and the main definitions of corruption;
LOC 2 - Analyze the main obstacles on the way to ensuring the inalienable human rights; the role of human rights in personal life and in the life of society;
LOC 3 - Apply the acquired knowledge in political analysis, in the activities of public authorities, political and public organizations, analyze problems related to corruption and countering it;
LOC 4 - Be able to engage in dialogue as a way of relating to legal culture and society.
Post requisites: no

Optional component 1

Course: **Fundamentals of Ecology and Safe life**
Intensity of the Course: 5 academic credits
Module Code: **GES -1**
Module Name: General educational subjects module
Prerequisites: Biology, Geography (school program)
Purpose: maintaining the stability of life by analyzing environmental processes, forming priority areas and setting specific tasks for nature conservation.
Short Description: The discipline forms students' modern environmental education and culture, develops skills in applying methods to improve the safety of technical means and technological processes for safe life. Reveals the basic laws of the functioning of ecosystems of various levels of organization, the biosphere as a whole, the contradictions that arise in the relationship between man and nature, as well as the need for respect for nature and ecology.
Learning Outcomes in EP (LOP):
LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential
LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.
LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - Knows the terms and concepts that define the main features and features of ecosystems;

LOC 2 - Has an idea of the complex relationships taking place in nature, as well as between society and nature;

LOC 3 - Can give an environmental assessment of the situation in the region and promote the knowledge gained as a result of work in all areas of its activities;

LOC 4 - It can analyze the main legislative documents on environmental safety and modern environmental problems.

Post requisites: no

Optional component 1

Course: **Fundamentals of Economics and Entrepreneurship**

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: Fundamentals of Entrepreneurship and bissnes (school course)

Purpose: familiarization of students with the basics of economics and entrepreneurship, mastering the conceptual apparatus and basic forms of doing business.

Short Description: The discipline is focused on the formation of students' skills of entrepreneurship and business thinking. Through a comprehensive view of the laws of the functioning of the economy, the conditions for doing business, its internal and external environment, students will have the skills to develop a business plan, create and successfully run their own business.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - Know the basic concepts in the field of economics and entrepreneurship;

LOC 2 - Be able to find and use the necessary economic information; determine the organizational and legal forms of organizations;

LOC 3 - Determine the composition of the material, labor and financial resources of the organization;

LOC 4 - Evaluation of a business idea and development of a business plan.

Post requisites: no

Optional component 1

Course: **Fundamentals of Leadership and receptivity to innovation**

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: no

Purpose: in the process of studying the discipline, the student develops the skills of setting goals and objectives, timely planning of group work, problem solving, a sense of responsibility and effective communication.

Short Description: The course contributes to the disclosure and development of leadership qualities in the personality of each student, the development of innovative susceptibility skills in him, as a process of adaptation to innovations caused by innovative processes, as well as the use of the results of scientific and technical processes in his life and professional activities. Studies the current state and prospects for the development of leadership qualities and the human factor in management.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - Understands theoretical and applied research in the field of modern management achievements in Kazakhstan and abroad using modern scientific methods;

LOC 2 - Knows how to work effectively individually and in a team;

LOC 3 - Independently study and continuously improve their qualifications throughout the entire period of professional activity;

LOC 4 - Applies professional knowledge in the field of organizational and managerial activities.

Post requisites: no

Optional component 1

Course: **Emotional Intellect**

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: no

Purpose: knowledge and ability to apply modern methods of diagnostics and development of emotional intelligence of students and soft skills, including in the format of distance learning.

Short Description: The discipline is aimed at mastering the role of a tutor by the teacher in the context of strategic guidelines and priority areas of the state educational policy of Kazakhstan. Students determine the place of emotional intelligence and "flexible competencies" in the educational process of the modern school. They apply modern methods and technologies for organizing educational activities, taking into account the development of soft skills, including in the digital environment. They possess technologies for assessing and developing the emotional intelligence of students of different age groups.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - Modern methods and technologies of organizing educational activities taking into account the development of soft skills, diagnostics and evaluation of flexible skills, the formation of individual educational directions and methods of organizing group activities;

LOC 2 - Application of modern methods and technologies for organizing educational activities, taking into account the development of flexible skills, including in the digital environment;

LOC 3 - Flexible skills on the skillfolio platform have the ability to carry out complex diagnostics of soft skills, interpret the results and develop them both in individual and group forms of training.

Post requisites: no

Optional component 1

Course: **Fundamentals of mathematical statistics**

Intensity of the Course: 5 academic credits

Module Code: **GES -1**

Module Name: General educational subjects module

Prerequisites: Mathematics (school programe)

Purpose: is to familiarize students with the forms and laws of consistent thinking, to teach students to think consistently, to contribute to the development of skills of sound argumentation.

Short Description: Students understand the process of collecting, processing data and transmitting ideas, develop skills in using quantitative and qualitative data analysis in assessing the state of the object or phenomenon in question.

Learning Outcomes in EP (LOP):

LOP 1 - Applies a variety of communication formats taking into account socio-cultural diversity, adheres to the principles of equality and accessibility in education, to create a prosperous and inclusive environment, has leadership qualities and is able to apply them to develop collective potential

LOP 2 - Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LOP 3 - Demonstrate knowledge of and adherence to ethical and legal norms in research and use of digital technologies. Apply security measures when working with digital information and data protection, promote the active, safe and ethical use of digital resources.

Learning Outcomes in Course (LOC):

LOC 1 - The student summarizes the results of pedagogical and scientific research and learns to process them mathematically.

LOC 2 - Learns to systematize, clarify and use statistical data using statistical and mathematical methods.

LOC 3 - Effectively uses Chi-square, SSPP and Jamovi applications that statistically process the collected numbers.

Post requisites: no

2. OPTIONAL COMPONENTS OF THE CYCLE OF CORE COURSES

Optional component 1

Course:**Biochemistry**

Intensity of the Course: 6 academic credits

Module Code: STB-6

Module Name: Scientific theories of biology

Prerequisites: Botany

Purpose: To give students an idea of the principles of the structure of the main classes of compounds, their properties, as well as physical and chemical methods for studying substances that are part of living organisms, and

- knowledge of the chemical basis of the body's vital processes;
- knowledge of the basics of the chemical composition of the human body and the General laws of metabolism (carbohydrates, lipids, proteins);
- knowledge about the transformation of energy in living systems;

Short Description: When mastering the course, the student studies the chemical composition of living organisms and about the chemical processes and reactions taking place in them. Study of the structure and properties of the most important biological compounds - proteins, nucleic acids, carbohydrates, lipids; their chemical transformations in the body and the importance of these transformations for understanding the physicochemical fundamentals of life**.**

Learning Outcomes in EP (LO):

LO 8 – Studies physiological, anatomical, biochemical methods for assessing living biological objects;

LO 9 – Critical thinking and knowledge of microbiology, molecular biology and genetics, working with databases from various sources

can do; Can perform systemic, molecular and statistical analysis;

LO 10 – Solves applied problems based on fundamental knowledge accumulated from the cycle of disciplines in the natural sciences.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the biochemistry of proteins, nucleic acids, carbohydrates, lipids, minerals and vitamins and hormones;

LOC 2 –Will know the essence of chemical transformations occurring in organisms, the mechanisms of their regulation and their role in ensuring the life of the body, and methods of theoretical and experimental research;

LOC 3 –independently acquires new knowledge in this discipline and analyzes them;

LOC 4 –applies the acquired knowledge in practice and in the study of other disciplines;

LOC 5- Knows the molecular level of organization of living organisms;

LOC 6- proficient in methods of qualitative and quantitative analysis of nucleic acids, proteins, fats, carbohydrates, vitamins and hormones in biological material;

LOC 7-uses the knowledge gained in the course of studying biochemistry to solve issues of healthy and rational nutrition

Post requisites: Molecular biology and genetics

Optional component 2

Course: **Basics of Enzymology**

Intensity of the Course: 6 academic credits

Module Code: STB-6

Module Name: Scientific theories of biology

Prerequisites: Botany

Purpose: The objectives of mastering the discipline "Enzymology" is to acquaint students with the basics of modern concepts in the field of the structure and function of proteins, to give the basic concepts of enzymatic catalysis, to consider the participation of enzymes in the basic biological processes of the cell.

Short Description: Enzymology is the science of enzymes. It studies the principles of functioning of protein catalysts for biochemical reactions that underlie biological processes and are used in various industries, agriculture and medicine. Enzymes are protein catalysts for biochemical reactions.

Learning Outcomes in EP (LO):

LO 8 – Studies physiological, anatomical, biochemical methods for assessing living biological objects;

LO 9 – Critical thinking and knowledge of microbiology, molecular biology and genetics, working with databases from various sources

can do; Can perform systemic, molecular and statistical analysis;

LO 10 – Solves applied problems based on fundamental knowledge accumulated from the cycle of disciplines in the natural sciences.

Learning Outcomes in Course (LOC):

LOC 1 – Master the system of knowledge about the strategy of structural and functional research of proteins and enzymes;

LOC 2 –Has an understanding of the laws underlying enzymatic catalysis in biological systems;

LOC 3 –Owns methods for determining the activity of proteins and enzymes, bioregulators;

LOC 4 –Analyzes the main mechanisms of the active centers of enzymes

LOC 5- Compares knowledge of proteins and enzymes for practice in biotechnology.

LOC 6- Interprets the system of knowledge characterizing modern methods of enzymatic research

LOC 7- Systematizes theoretical knowledge and practical skills acquired in the study of the discipline and transfer them to others.

Post requisites: Molecular biology and genetics

Optional component 3

Course: **Human anatomy**

Intensity of the Course: 6 academic credits

Module Code: FAP -5

Module Name: Fundamentals of anatomy and physiology

Prerequisites: Vertabrate zoology

Purpose: 1) deep assimilation by students of the structure of the human body, organ system and individual organs based on modern achievements of anatomy, physiology and biology;

2) the ability to use the acquired knowledge in the study of other fundamental disciplines, as well as in future research and production activities.

Short Description: In the course «Human Anatomy» students study the structure, shape and development of organs and organ systems of the human body. Students get acquainted with the laws of development related to the function of organs and the impact of the environment, acquire the skills to study the main stages of human development in the course of evolution and age characteristics.

Learning Outcomes in EP (LO):

LO-2: Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LO 7 – Masters the methods of control, description, identification, systematization of biological objects;

LO 8 – Studies physiological, anatomical, biochemical methods for assessing living biological objects;

Learning Outcomes in Course (LOC):

LOC 1 – Knowledge of basic terms of human anatomy and development of anatomical research methods.

LOC 2- Knowledge of the anatomical structure and function of organs and systems of the human body, patterns of mental and physical development and features of their manifestation in different age periods.

LOC 3 –Mastering the methods of medical-biological, pedagogical and psychological control over the condition of students.

LOC 4 –the Ability to apply various forms of classes, taking into account the current methods of training and education in professional activities, age, morphofunctional and psychological characteristics of students, their level of physical and athletic training, health status, choose tools and methods in accordance with the tasks.

LOC 5- Improvement of medical and biological, sanitary and hygienic, psychological and pedagogical bases of physical activity.

LOC 6- Planning of various forms of classes taking into account climatic, regional, and national characteristics in order to protect the health, recovery, rehabilitation, and recreation of students; determining the functional state, level of physical development, and fitness of students at various stages of age development.

LOC 7- Develops skills of rational use of educational, laboratory and management equipment, special equipment and modern computer equipment.

Post requisites: Humanand animal phisiology

Optional component 4

Course: **Biology of individual development**

Intensity of the Course: 6 academic credits

Module Code: FAP-5

Module Name: Fundamentals of anatomy and physiology

Prerequisites: Vertabrate zoology

Purpose: "Biology of individual development" is a field of science that studies the patterns of ontogenetic development of organisms. The course provides an understanding of macro-and micromorphological, physiological and biochemical, molecular and genetic processes occurring in developing organisms, as well as factors and mechanisms that control the development processes at all stages of ontogenesis of animals and plant organisms.

The purpose of the discipline is to acquaint students with the laws of reproduction and individual development of organisms as the fundamental basis of life processes.

The aim of the discipline is to study the basic laws of animal reproduction biology, the main stages of ontogenesis, phases of embryonic development, growth mechanisms, morphogenesis, and causes of developmental abnormalities.

Short Description: When mastering the course, students study patterns of ontogenetic development of organisms. The course provides insight into the macro- and micro-morphological, physiology-biochemical, molecular and genetic processes that occur in developing organisms, as well as the factors and mechanisms that guide the development processes at all stages of the ontogenesis of animals and plant organisms.

Learning Outcomes in EP (LO):

LO-2: Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems.

LO 7 – Masters the methods of control, description, identification, systematization of biological objects;

LO 8 – Studies physiological, anatomical, biochemical methods for assessing living biological objects;

Learning Outcomes in Course (LOC):

LOC 1 – Know the basic laws of individual development of animals and plants at all stages of ontogenesis in close connection with their historical development;

LOC 2 they are Able to understand the macro-and micromorphological, physiological and biochemical, molecular and genetic processes occurring in developing organisms;

LOC 3 –Possess basic knowledge in the field of developmental biology, understand the social significance of this knowledge, and be able to predict the consequences of their professional activities;

LOC 4 Use in practice the acquired knowledge about the mechanisms of morphophysiological differentiation of the organism in ontogenesis; use the acquired knowledge to solve scientific and practical problems.

LOC 5- Applies modern experimental methods of working with biological objects in field and laboratory conditions, develops skills of working with modern equipment.

LOC 6- Has a basic understanding of the patterns of reproduction and individual development of biological objects.

LOC 7-Uses methods for obtaining and working with embryonic objects.

Post requisites: Humanand animal phisiology

3. OPTIONAL COMPONENTS OF THE CYCLE OF MAJOR COURSES

Optional component 1

Course:**Microbiology**

Intensity of the Course: 8 academic credits

Module Code: STB-6

Module Name: Scientific theories of biology

Prerequisites: Fundamentals of Citology and Histology

Purpose: to form students' deep and stable knowledge of soils, the characteristics of the soil cover, the rational use of soils; to develop the ability to navigate modern scientific information for subsequent use in scientific and educational activities, to foster interest in the study of the discipline.

Short Description: To acquaint students with the most important properties of prokaryotes, their physiology and biochemistry, show the general biological and practical significance of achievements in the field of microbiology, determine the

relationship of microbiology with other biological disciplines, highlight the ideological and social ethical significance of discoveries in the field of microbiology.

Learning Outcomes in EP (LO):

LO-2: Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems

LO 6 – Knows the basics of the mechanisms of cellular processes and the structural and functional tissues, organs and systems of the body. Able to perform microscopic examination of tissues.

LO 9 – Critical thinking and knowledge of microbiology, molecular biology and genetics, working with databases from various sources can do; Can perform systemic, molecular and statistical analysis;

Learning Outcomes in Course (LOC):

LOC 1 – Collect scientific reliable information in the field of soil science;

LOC 2- Apply scientific analysis in the field of soil science;

LOC 3- Process the information received in the field of soil science using abstracts and abstracts

LOC 4- Use knowledge in the field of geology for the purposes of soil science;

LOC 5- Use knowledge in the field of theoretical and practical geography for the purposes of soil science;

LOC 6-Use knowledge in the field of soil science for environmental purposes Use knowledge in the field of landscape science for purposes

LOC 7-Use them in the field of ecology and nature management

Post requisites: Fundamentals of Scientific Research

Optional component 2

Course: **Biotechnology of microorganisms**

Intensity of the Course: 8 academic credits

Module Code: STB-6

Module Name: Scientific theories of biology

Prerequisites: Fundamentals of Citology and Histology

Purpose: Students acquire knowledge in the field of modern technologies of microbial biotechnology, industrial microorganisms, obtaining microbial mass, substances by microbial synthesis

Short Description: Genetic and cellular engineering are the main modern methods of biotechnology. Cell engineering is based on the creation and modification of cells. History of development of biotechnology of microorganisms. Works of scientists. Achievements of biotechnology in the field of biotechnology. The use of immobilized enzymes. Synthesis of artificial vaccines.Hybridomas and antibodies synthesized by them are widely distributed, which are further used as diagnostic and therapeutic drugs. The role of microorganisms in human life and in nature.

Learning Outcomes in EP (LO):

LO-2: Possess high-level critical and creative thinking skills, are capable of self-regulation and reflection to solve professional problems

LO 6 – Knows the basics of the mechanisms of cellular processes and the structural and functional tissues, organs and systems of the body. Able to perform microscopic examination of tissues.

LO 9 – Critical thinking and knowledge of microbiology, molecular biology and genetics, working with databases from various sources can do; Can perform systemic, molecular and statistical analysis;

Learning Outcomes in Course (LOC):

LOC 1 – Know the goals, directions and methods of microbial biotechnology, classification and properties of producing strains, master the methods and technology of manufacturing products based on microbiological production.

LOC 2- Be able to analyze the literature on microbial biotechnology

LOC3- prepare microbiological preparations, cultivate micro-organisms and isolate pure cultures, identify them, maintain production cultures of micro-organisms;

LOC 4 -.prepare microbiological preparations, cultivate microorganisms and isolate pure cultures, identify them, support production cultures of microorganisms;

LOC 5-conduct microbiological control of biotechnological production facilities

LOC 6- solve problems of economic efficiency and expediency of using a certain producer strain;

LOC 7-Master the methodology of scientific research

Post requisites: Fundamentals of Scientific Research

Optional component 3

Course: **Botany**

Intensity of the Course: 10 academic credits

Module Code: BLO-4

Module Name: Biodiversity of living organisms
Prerequisites: Vertabrate zoology

Purpose: Oznokomit students with the basic elements of the body herbaceous and woody plants, with the internal structure of vegetative and generative organs in connection with the functions performed, the patterns of growth, development and structure of plants based on modern knowledge and achievements of botany, directions of morphological evolution of plants, the essence of reproduction and breeding, seasonal changes of plants.

Short Description: The science of Botany studies the internal structure of plant organs at the microscopic level, starting with the characteristics of the plant cell, then the plant tissues and the patterns of their placement in various organs. Botany allows you to determine the differences between varieties of cultivated plants by their economically valuable traits.

Learning Outcomes in EP (LOP):

LO 4 – Knows the laws of biodiversity distribution, the main directions for the effective use of renewable and non-renewable resources of the biosphere.

LO 5 – Forms the ability to identify botanical and zoological objects and work with them in the field and laboratory conditions.

LO 7 – Masters the methods of control, description, identification, systematization of biological objects;

Learning Outcomes in Course (LOC):

LOC 1 – has the skills of long-term planning of training, professional growth, forms a stable positive attitude to the profession and its social responsibilities.
LOC 2 – has a methodology for analyzing and evaluating the information received.
LOC 3 – uses modern information and educational technologies in work and self-development.
LOC 4 – familiar with the procedures for the classification of plants;
LOC 5 familiar with the basic principles and rules of plant nomenclature;
LOC 6 – assesses the role of taxonomy in the biological Sciences.
LOC 7 – analyzes educational and methodological literature and uses it to build its own presentation of program material and its logical sequence and using interdisciplinary connections;

Post requisites: Plant physiology

Optional component 4

Course: **Resources of medicinal plants**
Intensity of the Course: 10 academic credits
Module Code: BLO-4
Module Name: Biodiversity of living organisms
Prerequisites:Vertabrate zoology

Purpose: Resource Studies of Medicinal Plants deals with the study of natural resources of medicinal plants, their distribution, methods of harvesting, restoration and extended reproduction in natural conditions.

Short Description: History, condition and prospects of medicinal plants research.Microscopic analysis of medicinal plants.Microscopic analysis of medicinal plants.Biologically active substances in the tissues of medicinal plants. Qualitative reactions to identify biologically active substances in medicinal plants. Medicinal plants of RK containing alkaloids, flavonoids, essential oils, phenols, lignans, glycosides and saponins.Threatening medicinal plants of Kazakhstan and the legal framework for their protection.

Learning Outcomes in EP (LO):

LO 4 – Knows the laws of biodiversity distribution, the main directions for the effective use of renewable and non-renewable resources of the biosphere.

LO 5 – Forms the ability to identify botanical and zoological objects and work with them in the field and laboratory conditions.

LO 7 – Masters the methods of control, description, identification, systematization of biological objects;

Learning Outcomes in Course (LOC):

LOC 1 – Knows methods for determining the degree of resistance of a species in a community;

LOC 2 – Knows methods for determining stocks of medicinal plants and measures for the protection of natural, exploited thickets of medicinal plants;

LOC 3 –Knows the influence of environmental factors on the quality of medicinal plant materials;

LOC 4 – Knows the species diversity of medicinal plants of the Republic of Kazakhstan;

LOC 5- possesses the skills of identifying medicinal plants by external signs in live and herbarized species;

LOC 6 – knows and is able to demonstrate methods of harvesting plant materials, analyze possible risks and ways to eliminate them;

Post requisites: Plant physiology

Optional component 5

Course:**Bioresources of Kazakhstan**
Intensity of the Course: 7 academic credits
Module Code: BLO-4
Module Name: Biodiversity of living organisms
Prerequisites: Botany
Purpose: Introducing students to the diversity of plant and animal resources.
Short Description: Familiarization of students with the variety of resources of the flora and fauna of Kazakhstan, with the main stages of the history of the study and economic development of individual groups and types of useful plants and animals in Kazakhstan, with methods for obtaining raw materials and their application areas, as well as about the rational use of biological resources and measures for their protection and Prospects for Resource Researches in Kazakhstan.
Learning Outcomes in EP (LO):
LO 5 – Forms the ability to identify botanical and zoological objects and work with them in the field and laboratory conditions.
LO 7 – Masters the methods of control, description, identification, systematization of biological objects;
LO 10 – Solves applied problems based on fundamental knowledge accumulated from the cycle of disciplines in the natural sciences.
Learning Outcomes in Course (LOC):
LOC 1 – Knows the biodiversity of flora and fauna on the territory of Kazakhstan
LOC 2- Efficiently uses and protects useful plants of the natural flora of Kazakhstan
LOC 3 - is Able to carry out the main methods of accounting for animals.
LOC 4 -Classifies the main groups of raw and medicinal plants.
LOC 5-Knows the resources of the animal world.
LOC 6 -Knows the methods of obtaining raw materials and their applications
Post requisites: Ecophysiology

Optional component 6

Course: **World flora and fauna**
Intensity of the Course: 7 academic credits
Module Code: BLO-4
Module Name: Biodiversity of living organisms
Prerequisites: Botany
Purpose: Examines the peculiarities of the distribution of flora and fauna of the world, general concepts, types, stability and formation of habitats, the location of kingdoms and their characteristic animals and plants, the main endemic species and familiarity with the
Short Description: Animals and plants as components of the biosphere. Flora and fauna of the terrestrial regions of the globe. Animal world of oceans and seas. Major kingdoms of fauna and flora. Flora and fauna are typical for tropical and subtropical regions. Characteristics of the desert regions of the world and features of their flora and fauna. Plants and animals characteristic of tropical and subtropical regions. Plants and animals of South and North America.
Learning Outcomes in EP (LO):
LO 5 – Forms the ability to identify botanical and zoological objects and work with them in the field and laboratory conditions.
LO 7 – Masters the methods of control, description, identification, systematization of biological objects;
LO 10 – Solves applied problems based on fundamental knowledge accumulated from the cycle of disciplines in the natural sciences.
Learning Outcomes in Course (LOC):
LOC 1 – They characterize, group and systematize the diversity, similarities, differences of flora and fauna.
LOC 2- Forms knowledge about the economic and professional value and role of biodiversity in the ecological system
LOC 4 -Classifies the main groups of raw and medicinal plants.
LOC 5-Knows the resources of the animal world.
LOC 6 -Knows the methods of obtaining raw materials and their applications
LOC 7- Mastering the ability to use the necessary tools, devices
Post requisites: Ecophysiology

Optional component 7

Course:**Plant physiology**
Intensity of the Course: 6 academic credits
Module Code: FAP-5
Module Name: Fundamentals of anatomy and physiology
Prerequisites: Botany
Purpose: To acquaint students with modern and applied concepts of physiological and biochemical processes in a plant organism, mechanisms of regulation and the basic laws of the relationship of a plant organism with the environment.
Short Description: During the course, students study the general laws of vital activity of plant organisms vital activity, the processes of plant organisms' absorption of minerals and water, the processes of growth and development, flowering and fruiting, root (mineral) and air (photosynthesis) nutritions, respiration, biosynthesis and accumulation of various substances, the combination of which provides the plant's ability to build its body and reproduce itself.
Learning Outcomes in EP (LO):
LO 6 – Knows the basics of the mechanisms of cellular processes and the structural and functional tissues, organs and systems of the body. Able to perform microscopic examination of tissues.
LO 8 – Studies physiological, anatomical, biochemical methods for assessing living biological objects;
Learning Outcomes in Course (LOC):
LOC 1 – Apply the principles of structural and functional organization of biological objects
LOC2 -Explain various natural phenomena in terms of plant physiology;
LOC 3 -Apply experimental methods when working with plants in the field and laboratory conditions.
LOC4 -.Plan, organize and conduct private and complex physiological research, present and critically analyze basic general professional information,
LOC -5Possesses the basic skills required for performing simple tasks under supervision, taking plant material from the natural environment, growing an object for research, preparing for research;
LOC6- Demonstrates knowledge of basic physiological terminology, owns basic methods of analysis, under supervision;
LOC7- Possesses the skills of searching, selecting and using scientific physiological terminology, is able to independently choose the methods of analysis and assessment of the state of a higher plant; to work out the obtained research results.
Post requisites:Phytopotology

Optional component 8

Course: **Biometry**
Intensity of the Course: 6academic credits
Module Code: FAP-5
Module Name: Fundamentals of anatomy and physiology
Prerequisites: Botany
Purpose: Teaching students the basics of practical knowledge and skills in the field biometrics and its relationship with other sciences, i.e. for specialists to master basic methods of modern biometrics.
Short Description: Variability of organs, methods of their research. Construction of a variational series and stamping it with curves. The statistical errors of average values. and determination of their reliability (accuracy). Chi-square test to determine the relationship between signs in a smaller and larger sample. Familiarization with the types of biometric distribution, their use for breeding purposes. Analysis of variance transgressional distribution. The only factor complex analysis. Application of correlation tables in analysis of variance.
Learning Outcomes in EP (LO):
LO 6 – Knows the basics of the mechanisms of cellular processes and the structural and functional tissues, organs and systems of the body. Able to perform microscopic examination of tissues.
LO 8 – Studies physiological, anatomical, biochemical methods for assessing living biological objects;
Learning Outcomes in Course (LOC):
LOC 1 – Knowledge of the object and research methods in the science of biometrics.
LOC2- Formation of ideas about the variability of organisms, methods of their study
LOC3- The importance of creating a variation series and the possibility of using it in research.
LOC 4 -Be able to determine the arithmetic mean.
LOC 5-Be able to calculate the statistical errors of mean values and their accuracy.
LOC 6 -Be able to distinguish correlations.
LOC7-Ability to conduct analysis of variance
Post requisites: Phytopotology

Optional component 9

Course:**Biotechnology**
Intensity of the Course: 10 academic credits
Module Code: STB -6
Module Name: Scientific theories of biology
Prerequisites: Biochemistry

Purpose: The subject of the course " fundamentals of biotechnology together with other disciplines is aimed at highly qualified training of students. At the same time, it contributes to a deeper assimilation of core Discipline "Fundamentals of Biotechnology" - studies. use of biological processes and facilities for the production of economically important substances and the creation of highly productive plant varieties, animal breeds, and microbial strains.

Short Description: The discipline provides technological processes for the creation of new materials, the use of biotechnological processes in solving environmental problems, processing and extraction on an industrial scale of food proteins, vitamins, enzymes, transgenic plants and animals, complex and expensive products, environmentally friendly energy sources, the use of solar energy, hydrogen production, purification of water sources, processing and extraction of household waste. During the course, students learn scientific and practical problems of biotechnology, study deep freezing methods for preserving the gene pool of plants necessary for agriculture. They are able to carry out genetic manipulations with objects in vitro to obtain various forms for breeding, organize biotechnological methods of selection and assembly of fundamentally new organisms, have an idea of the methods of cellular and genetic engineering of plants.

Learning Outcomes in EP (LO):

LO 6 – Knows the basics of the mechanisms of cellular processes and the structural and functional tissues, organs and systems of the body. Able to perform microscopic examination of tissues.

LO 7 – Masters the methods of control, description, identification, systematization of biological objects;

LO 9 – Critical thinking and knowledge of microbiology, molecular biology and genetics, working with databases from various sources can do; Can perform systemic, molecular and statistical analysis;

Learning Outcomes in Course (LOC):

LOC 1 – The course consists of the main sections - biology of cultured cells, as well as the actual biological processes: technologies for the production of economically important substances of plant origin, techniques of clonal micropropagation, methods of cell selection and cell engineering.disciplines that form the special knowledge of specialists.

LOC 2- The purpose of this course is to provide students with theoretical knowledge on the problems of biotechnology related to the industrial production of economically important products using cultured plant cells, the preservation of the gene pool of varieties and wild plants.

LOC 3 -The main objectives of the course:

LOC 4 -.As a result of studying discipline the student should:

LOC 5- be able to perform genetic manipulations with objects in vitro in order to obtain a variety of forms for selection;

LOC 6- have an understanding of the methods of cellular and genetic engineering of plants

LOC7- gain experience in the correct and effective use of biotechnological methods in the selection and design of fundamentally new organisms.

Post requisites: Fundamentals of Scientific Research

Optional component 10

Course: **Cellular biotechnology**
Intensity of the Course: 10 academic credits
Module Code: STB -6
Module Name: Scientific theories of biology
Prerequisites: Biochemistry

Purpose: Formation of a complex of basic knowledge on cellular and genetic engineering, obtaining skills and ideas about the basic methods and approaches of genetic and cellular engineering.

Short Description: When studying the course of the subject of Cellular biotechnology and its main directions and tasks, the student argues the ability and readiness: knowledge concerning the application of genetic engineering in agricultural biotechnology and microbiological industry.He knows the modern requirements for biotechnological products, is able to analyze and summarize information about new achievements in biotechnology. Recognizes biotechnological processes in food production. Production of enzymes. Plant biotechnology. Cultivation of plant crops. Biology of cells grown in artificial nutrient media. Microcloning of plants. Cellular engineering. Genetic engineering. Preservation of the gene pool in vitro.

Learning Outcomes in EP (LO):

LO 6 – Knows the basics of the mechanisms of cellular processes and the structural and functional tissues, organs and systems of the body. Able to perform microscopic examination of tissues.

LO 7 – Masters the methods of control, description, identification, systematization of biological objects;

LO 9 – Critical thinking and knowledge of microbiology, molecular biology and genetics, working with databases from various sources can do; Can perform systemic, molecular and statistical analysis;

Learning Outcomes in Course (LOC):

LOD 1 – The ability of the graduate to use theoretical knowledge and practical skills in the field of genetic engineering, structure and functioning of living cells to obtain biotechnological product

LOD 2 -Graduate possession of basic methods of manipulation with genetic material and cell culture

LOD 3- The graduate's readiness to use modern information technologies to solve the problems of cellular biotechnology

LOD 4 -.Interprets the principles of cell cultivation, the principles of cloning animals and plants;

LOD 5 -Systematizes the terminology used in cellular and genetic engineering

LOD 6 - Possesses the methods of cell cultivation, the skill of sterile work

LOD 7 -Independently conducts bibliographic searches using modern information technologies.

Post requisites: Fundamentals of Scientific Research