2. OPTIONAL COMPONENTS OF THE CYCLE OF CORE COURSES

Optional component 1

Course: **Kartography**
Intensity of the Course: 5 academic credits
Module Code: **FGS – 5**
Module Name: Physical geography subjects module
Prerequisites: Naturalscience and Earthscience
Purpose: To form an idea of the relationship between the phenomena of nature and society, their spatial location, changes in time, cartographic images, geographical maps, their creation and use.
Short Description: Discipline-forms knowledge about geographical maps, types of cartographic images, carrying out measurement work on the map. Students know the theoretical foundations of cartography, the content of maps, mathematical and geodetic basics, elements. Classifies card types and types. Defines the scale, coordinate system, symbol on the map. He gets acquainted with the types of search and cartographic projects on maps, technologies for creating geographical maps. Understands the principles of mapping, creating a cartographic image and its transformation. Knows how to use geographical maps correctly
Learning Outcomes in EP (LOP):
LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.
LOP 7– Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.
Learning Outcomes in Course (LOC):
LOC 1 - Owns the compilation of maps, the principles of map construction, the creation of a cartographic image and its transformation;
LOC 2 - Learns to distinguish geographical, topographic, cartographic map elements, types and types and classify maps;
LOC 3 - Can describe topographic and cartographic material and the results of geodetic measurements;
LOC 4 - Creates Scale, cartographic projections, topographic maps and plans.
Postrequisites: Geology and geomorphology, Topography with base of the geodesies, Gydrology, climatology and meteorology Geoecology and nature protection

Course: **Sacred geography of Kazakhstan**
Intensity of the Course: 5 academic credits
Module Code: **FGS – 5**
Module Name: Physical geography subjects module
Prerequisites: Naturalscience and Earthscience
Purpose: The study of historical and cultural monuments of Kazakhstan, the history of the origin of natural sacred places, spatial distribution, location features.
Short Description: The discipline studies the history of the origin of unique paleocultural, historical and natural sacred sites of regional and local significance in Kazakhstan, spatial distribution, features of archaeological and architectural monuments, religious and places of worship. Educates respect for sacred places and cultural and historical monuments. Students collect information about nature, the organic world, population, economy, environmental problems, the main stages of history, monuments of culture, literature, art, architecture of sacred places of Kazakhstan.
Learning Outcomes in EP (LOP):
LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines,

compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.

LOP 7– Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 - Can conduct research on sacred places;

LOC 2 - Formation and development of national values Kazakhstan patriotism and civic responsibility;

LOC 3 - Promotes culture, traditions, respect for the work and creativity of the peoples of Kazakhstan, openness, lifelong education.

LOC 4 - He can independently organize active training, studying the sacred places of the country.

Post requisites: Geology and geomorphology, Topography with base of the geodesies, Gydrology, climatology and meteorology Geoecology and nature protection

Optional component 2

Course: **Geology and geomorphology**

Intensity of the Course: 5 academic credits

Module Code: **FGS – 5**

Module Name: Physical geography subjects module

Prerequisites: Kartography, Sacred geography of Kazakhstan

Purpose: Explanation of the Earth's crust and inner layers, their composition, structure, movement, history of development. Formation of ideas about internal and external trends occurring in the Earth's crust and surface, the formation of ore riches, patterns of location, types of rocks and minerals. Explanation of the origin, age, structural specificity of the earth, the development and distribution of elements on the Earth's surface, external and internal processes, anthropogenic factors of the formation of the Earth's surface.

Short Description: The discipline forms knowledge about the origin and development of the Earth, geological processes, relief, its types and forms, origin, distribution. Students describe the forms of relief, external and internal processes. Knows about the origin of minerals and how to use them effectively. Determines the absolute and relative age of rocks. Compares rocks and minerals. Can use, analyze and draw geological and geomorphological maps.

Learning Outcomes in EP (LOP):

LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.

LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.

LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the forms and basic elements of the relief, the origin of the relief;

LOC 2 – Characterizes the factors forming the relief, the main types of relief;

LOC 3 – Understands the ways of formation of individual landforms and their components.

LOC 4 – Defines the types of terrain on the map.

Post requisites: Physical geographical regions of the world, Physical geographical regions of Kazakhstan

Course: **Topography with base of the geodesies**
Intensity of the Course: 5 academic credits
Module Code: **FGS – 5**
Module Name: Physical geography subjects module
Prerequisites: Kartography, Sacred geography of Kazakhstan
Purpose: Training in methods for determining the shape and size of the Earth, mapping and planning changes and phenomena on its surface.
Short Description: Discipline provides types of cartographic images and topographic surveys, measuring work on the map. Students know the contents of a topographic map, will get acquainted with modern technologies for creating geographical maps. Students determine the position of points on the Earth's surface, geographical and rectangular coordinates, directional angles, azimuths, point height, orientation on the terrain. Knows, uses geodetic instruments (theodolites, levelers, electronic total stations). Creates topographic maps and plans. Conducts local geodetic measurements.
Learning Outcomes in EP (LOP):
LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.
LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.
LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.
Learning Outcomes in Course (LOC):
LOC 1 – Can solve various geodetic problems based on a topographic map;
LOC 2 – Knows the symbols of topographic maps; can analyze topographic maps.
LOC 3 – Knows and applies in practice the principles of working with geodetic instruments, the theory of processing field measurement data;
LOC 4 – Carry out cartometric and graphical measurement and survey work on the ground using high-precision geodetic instruments;
Post requisites: Physical geographical regions of the world, Physical geographical regions of Kazakhstan

Optional component 3

Course: **Gydrology, climatology and meteorology**
Intensity of the Course: 5 academic credits
Module Code: **FGS – 5**
Module Name: Physical geography subjects module
Prerequisites: Kartography, Sacred geography of Kazakhstan
Purpose: Explain natural waters, the processes occurring in them, their relationship with the atmosphere, lithosphere and biosphere.
Short Description: Discipline-considers the layer of the hydrosphere taking into account its elements, types of climate, climate-forming factors, factors affecting climate change, weather and phenomena occurring in it. Students describe the processes occurring in natural waters, the hydrological state of water bodies, the composition, properties of the atmosphere (heat exchange, thermal regime). Discusses climate change, rational use of water resources. Knows the ways of efficient use of water resources, classifies climate types, compares climate changes, predicts the weather.
Learning Outcomes in EP (LOP):
LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines,

compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.

LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.

LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 - Ideas about hydrological processes are formed;

LOC 2 - Determines the water cycle in nature, the importance of water in human economic activity;

LOC 3 - Discusses hydrological problems and ways to solve them;

LOC 4 - Predicts the ecological state and sustainability of the environment.

Post requisites: Physical geographical regions of the world, Physical geographical regions of Kazakhstan

Course: **Geoecology and nature protection**

Intensity of the Course: 5 academic credits

Module Code: **FGS – 5**

Module Name: Physical geography subjects module

Prerequisites: Kartography, Sacred geography of Kazakhstan

Purpose: Explain the concept of a geosystem, its connections with the main elements, differences, the influence of economic factors on the terrain. Formation of knowledge about the conservation of natural resources, their rational use, restoration, environmental protection.

Short Description: Discipline-forms knowledge on the issues of rational nature management, organization, management of natural resources at the regional level and socio-ecological and economic assessment, improvement of the state of natural resources and the environment. Students know how to optimize the environment, protect the animal and plant world. The state of the environment and human health are interrelated. Predicts the ecological state and sustainability of the environment. Protects the environment from pollution, calculates the costs incurred and payments for environmental pollution.

Learning Outcomes in EP (LOP):

LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.

LOP 6– Knows the essence, the main types of political geography, methods of environmental protection, discusses external and internal geopolitics, administrative-territorial division and regional policy, political ideas. Compares urban agglomerations, discusses strategic directions of urban development, environmental problems, analyzes, predicts sustainability.

LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 – Knows the basic laws, principles and mechanisms of nature management;

LOC 2 –Knows the theoretical and methodological foundations of the economy of nature management, basic environmental and economic indicators;

LOC 3 – Knows methods of rational nature management, ways of rational use of natural resources with the help of new waste-free technologies;

LOC 4 – Understands the basics of geographical differences between an ecosystem and a geosystem;

Post requisites: Physical geographical regions of the world, Physical geographical regions of Kazakhstan

Optional component 4

Course: **Geographical research methods**
Intensity of the Course: 5 academic credits
Module Code: **EGS – 6**
Module Name: Economic geography subjects module
Prerequisites: Methodology of teaching geography
Purpose: The content and application of traditional and new methods used in the study of geographical objects, natural phenomena and trends, forms knowledge about the ways of their application.
Short Description: The discipline studies the theory and practice of applying geographical research methods in conducting geographical education and geographical research. The discipline studies the essence of geographical research methods and objects of research, basic and modern methods. Students understand the essence of geographical research methods and classify geographical methods. Uses geographical methods in conducting experimental, experimental, analytical work. When studying geographical objects, phenomena, processes, geographical methods and techniques are used to create geographical records, obtain graphic material. Develops and discusses projects.
Learning Outcomes in EP (LOP):
LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.
LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.
LOP 6 – Knows the essence, the main types of political geography, methods of environmental protection, discusses external and internal geopolitics, administrative-territorial division and regional policy, political ideas. Compares urban agglomerations, discusses strategic directions of urban development, environmental problems, analyzes, predicts sustainability.
LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.
LOP 12– Is able to apply innovative methods of teaching geography and biology and methods of practical activity, a system of criteria assessment. Has pedagogical and geographical, biological experience, uses the results of research in professional activities.
Learning Outcomes in Course (LOC):
LOC 1 - Masters the theory and practice of applying geographical research methods in conducting geographical research;
LOC 2 - Uses modern methods of geographical research;
LOC 3 - Classifies geographical methods;
LOC 4 - Conducts observations and experiments on geographical research.
Post requisites: Fundamentals of Educational research

Course: **Recreational geography**
Intensity of the Course: 5 academic credits
Module Code: **EGS – 6**
Module Name: Economic geography subjectsmodule
Prerequisites: Physical geographical regions of the world, Economic geography of Kazakhstan Practical geography
Purpose: Explanation of the functioning and development of territorial recreational systems, recreational resources, recreational areas.

Short Description: Discipline-forms knowledge about the recreational resources of the regions and the patterns of their geographical distribution. Students know recreational concepts and concepts, ways of effective use of recreational resources. Characterizes natural recreational resources in different regions of the world by geographical factors affecting them. Defines recreational places in individual countries and regions of the world. Assesses the state of recreational resources. Compares the quality of recreational activities among themselves. Connects recreational activities and the healthcare system.

Learning Outcomes in EP (LOP):

LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.

LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.

LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 – Knows natural recreational resources;

LOC 2 – Defines recreational places and organizes recreational activities;

LOC 3 – Assesses the state of recreational resources;

LOC 4 – Compares the quality of recreational activities among themselves.

Post requisites: Fundamentals of Educational research

Optional component 5

Course: **Zoology**

Intensity of the Course: 6 academic credits

Module Code: **BPA-7**

Module Name: Biodiversity of plants and animals

Prerequisites: Botany

Purpose: Formation of students' basic knowledge about the structure and vital activity of invertebrates and vertebrates.

Short Description: As part of the study of the discipline, students systematize vertebrates and invertebrates. Study their evolution and phylogenetic relationships, vital activity, distribution in the environment. Characterize and compares structural features of invertebrates. Uses animals in natural and fixing liquids, laboratory equipment. Studies the diversity of animals, organizational features, lifestyle, origin and evolution, significance in nature and human life.

Learning Outcomes in EP (LOP):

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 9– Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1- Determination of morphological and biological characteristics of animals;

LOC 2- Systematizes and compares vertebrates and invertebrates;

LOC 3- Knows how to correlate zoology with school biology and other subjects, has the knowledge, skills and abilities necessary in other subject areas;

LOC 4- The student knows what results should be achieved in the study of the discipline, and acquires knowledge in close connection with the results necessary for teaching biology to schoolchildren.

Post requisites: Ecophysiology, Environmental studies

Course: **Entomology**
Intensity of the Course: 6 academic credits
Module Code: **BPA-7**
Module Name: Biodiversity of plants and animals
Prerequisites: Botany
Purpose: Knows the origin, systematics, morphological and anatomical features of the structure, biology and useful, harmful insects.
Short Description: In the discipline "Entomology" students study the origin, systematics, morphological and anatomical features of the structure, biology, ecological features of the growth and development of insects, their practical significance. Learn the types of beneficial and harmful insects and how they are used in agriculture. Receive basic ideas about the diversity of biological objects, the importance of biodiversity for the sustainability of the biosphere, the possibility of using methods of observation, description, identification, classification, cultivation of biological objects.
Learning Outcomes in EP (LOP):
LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;
LOP 9– Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;
LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;
Learning Outcomes in Course (LOC):
LOC 1 – Effectively uses the acquired knowledge for further study of biological disciplines
LOC 2 –- Can identify the main groups of insects
LOC 3 – Works with visual AIDS, animals in natural and fixed fluids, models, tables, diagrams, laboratory equipment, microscopic equipment
LOC 4 –Uses innovative technologies
Post requisites: Ecophysiology, Environmental studies

Optional component 6

Course: **Ecophysiology**
Intensity of the Course: 5 academic credits
Module Code: **BPA-7**
Module Name: Biodiversity of plants and animals
Prerequisites: Botany
Purpose: Students need to understand the functions of a plant organism in changing environmental conditions, identify the ability to adapt and acclimatize various types of plants, analyze ways to increase plant resistance to adverse environmental factors, develop students' ICT and research skills.
Short Description: On the course, the student studies the biochemical foundations, the variability of plants on physiological and environmental factors. Analyzes the interaction of plant activity in the environment with physiological processes, temperatures, global changes under abiotic stress. Students acquire new competencies in studying whether living organisms interact with factors of the physical environment or biophysical, biochemical and physiological processes used in ecological communication with other organisms
Learning Outcomes in EP (LOP):
LOP 8– Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;
LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;
LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;
Learning Outcomes in Course (LOC):
LOC 1- In the course of laboratory work, students interpret, analyze and compare practical work, form theoretical knowledge.
LOC 2- Applies knowledge and concepts in the field of chemical and biological disciplines, applying innovative teaching methods and new technologies.

LOC 3- Students can discuss and analyze the acquired knowledge in ecophysiology; effectively use digital resources when analyzing information about the association of plants and the environment.

LOC 4- Is able to conduct research and experimental research work on the disclosure of the essence of natural phenomena and processes, laws and patterns and their concepts;

Post requisites: Cytology, histology and embryology, Cellular pathology

Course: **Environmental studies**
Intensity of the Course: 5 academic credits
Module Code: **BPA-7**
Module Name: Biodiversity of plants and animals
Prerequisites: Botany

Purpose: To understand the causes and general laws of the historical development of the place of existence of living matter.

Short Description: In the course of studying the discipline, students study the ecological situation of the environment, the components and evolution of the biosphere, the patterns of development of processes. Examine the concept of a living being and the concepts of life support and sustainable development. Form scientific thinking and outlook and a scientific approach to the biosphere, the genesis of human settlements, the structure of the fauna and flora of urban areas, the methodology of environmental monitoring.

Learning Outcomes in EP (LOP):

LOP 8– Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1-Mastering knowledge about the environment using modern information and educational technologies;

LOC 2-Knowledge of skills and methods of studying places and objects of living matter habitat;

LOC 3-Is capable of critical analysis of modern scientific research and practical evaluation of new ideas when solving research projects, including in interdisciplinary fields;

LOC 4-Comparison of the problems of the global social environment;

Post requisites: Cytology, histology and embryology, Cellular pathology

Optional component 7

Course: **Human anatomy**
Intensity of the Course: 6 academic credits
Module Code: **SHD-8**
Module Name: Structure, heredity and development of living organisms
Prerequisites: Botany, /Zoology

Purpose: 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; 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 process of mastering the discipline, students study the shape and structure, origin and development of the human body. Systematically characterizes the shape, structure, location and topographic relationships of body parts and organs, taking into account age, gender and individual characteristics. Realizes the social significance of his future profession, becomes able to carry out professional activities. Possesses basic biological concepts, knowledge of biological laws and phenomena.

Learning Outcomes in EP (LOP):

LOP 9 – Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

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

LOC 4 – 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.

Post requisites: Fundamentals of genetics and molecular Biology, Plant selection and animal breeding, Biochemistry, Fundamentals of Enzymology

Course: **Biology of ontogenesis**
Intensity of the Course: 6 academic credits
Module Code: **SHD-8**
Module Name: Structure, heredity and development of living organisms
Prerequisites: Botany, Zoology

Purpose: To acquaint students with the laws of reproduction and individual development of organisms, as the fundamental basis of life processes.

Short Description: When mastering the course, students study the patterns of ontogenetic development of organisms. The course gives an idea of the macro- and micro-morphological, physiological-biochemical, molecular and genetic processes occurring in developing organisms, as well as the factors and mechanisms that control development processes at all stages of the ontogenesis of animal and plant organisms. Willingness to solve standard tasks of professional activity using information and communication technologies and taking into account the basic requirements of information security.

Learning Outcomes in EP (LOP):

LOP 9 – Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1-They 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 about 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, 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. Has basic ideas about the laws of reproduction and individual development of biological objects

Post requisites: Fundamentals of genetics and molecular Biology, Plant selection and animal breeding, Biochemistry Fundamentals of Enzymology

Optional component 8

Course: **Fundamentals of genetics and molecular Biology**
Intensity of the Course: 4 academic credits
Module Code: **SHD-8**
Module Name: Structure, heredity and development of living organisms
Prerequisites: Entomology, Ecophysiology

Purpose: To acquaint with the basic laws, methods of genetics and molecular biology, to explain the mechanism of patterns of transmission of traits to offspring at the chromosomal, molecular level, to deeply educate and teach the use of new methods in breeding pedigrees of animals, new plant varieties. In addition, the biological value of nucleic acids, molecular mechanisms of replication, molecular mechanisms of transcription, protein biosynthesis and the fine structure of genes, as well as the regulation of gene function, as well as an explanation of the molecular mechanisms of metabolism and transition of nucleic acids.

Short Description: In the course of studying the discipline, students study the history of the development and research methods of genetics and molecular biology, as well as their relationship with other sciences. They also get acquainted with the material foundations of heredity, that is, the structural features of the nucleus, chromosome, DNA. Focusing on the laws of G. I. Mendel, i.e. solving the problems of mono– and dihybrid (interaction of non-allelic genes) crossing, determines the preservation of heredity and variability over generations. In the process of ontogenesis, he studies the method of the family tree in human genetics. Extensively examines the macromolecules of the cell – proteins, nucleic acids and their processes. They get acquainted with the mechanisms of gene expression of translation, transcription.

Learning Outcomes in EP (LOP):

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 9– Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

LOP 10 – Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1- Genetics and the ability to bring specific concepts instead of molecular biology in the system of natural sciences;

LOC 2- Patterns of inheritance-combinational and crossing processes ability to solve problems in the directions of flow;

LOC 3- Familiarity with the features of the structural and classification function of the protein;

LOC 4- Knowledge of the structure and functional features of DNA, RNA;Understanding virus replication with their genomic specificity;

Post requisites: Fundamentals of Educational research

Course: **Plant selection and animal breeding**

Intensity of the Course: 4 academic credits

Module Code: **SHD-8**

Module Name: Structure, heredity and development of living organisms

Prerequisites: Entomology, Ecophysiology

Purpose: Formation of students' system of knowledge on the fundamental genetic foundations of the emergence and functioning of living organisms and biocenoses on the Earth, their stability, variability and development in onto - and phylogeny.

Short Description: When mastering the course, the student gets acquainted with modern methods and trends of plant and animal breeding, problems facing breeding science, methods of genetic and breeding improvement of plants. Studies the ratio of heredity and environment in the formation of the phenotype, the role of selection in improving the well-being of mankind. Acquires the basic laws and modern achievements of genetics and breeding, basic ideas about genomics, proteomics.

Learning Outcomes in EP (LOP):

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 9– Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

Learning Outcomes in Course (LOC):

LOC 1- Analysis of the conclusions about the origin of plants and animals on Earth

LOC 2- Be able to analyze the views of scientists on artificial selection.
LOC 3- Know the basic methods of selecting plants and animals.
LOC 4- Know the importance of plant breeding methods.Knowledge of breeding methods and types of hybridization.

Post requisites: Fundamentals of Educational research

Optional component 9

Course: **Biochemistry**
Intensity of the Course: 5 academic credits
Module Code: **SHD-8**
Module Name: Structure, heredity and development of living organisms
Prerequisites: Human Anatomy, Biology of ontogenesis

Purpose: Assimilation of the chemical composition of living organisms, their metabolism and its role in life processes, biochemical processes in the growth and development of plants and the formation of professional skills of students.

Short Description: When mastering the course of biochemistry, students study the chemical composition of living organisms and the chemical processes occurring in them. They study the structure and properties of the most important biological compounds - proteins, nucleic acids, carbohydrates, lipids; their chemical transformations in the body and the significance of these transformations for understanding the physical and chemical foundations of the vital activity of all life on Earth. Know and apply the main theories, concepts and principles in the chosen field of activity, capable of systemic thinking.

Learning Outcomes in EP (LOP):

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 9– Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

LOP 10 – Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1- Masters the methods of studying proteins, carbohydrates, lipids, enzymes and other compounds.

LOC 2- Explains the advantages and disadvantages by comparing photosynthesis, respiratory tract, types of minerals, phytohormones, stages of growth and development.

LOC 3- Proves the laws of the vital activity of living organisms and the relationship between biological processes.

LOC 4- Can use equipment used in biochemical research.Professionally uses the materials of the course on the subject of "Biochemistry" when performing individual thematic and project research

Post requisites: Fundamentals of Educational research

Course: **Fundamentals of Enzymology**
Intensity of the Course: 5 academic credits
Module Code: **SHD-8**
Module Name: Structure, heredity and development of living organisms
Prerequisites: Human Anatomy, Biology of ontogenesis

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: In the Basics of Enzymology course, students learn about enzymes. They study the principles of operation of protein molecules that catalyze or inhibit biochemical reactions that underlie all biological processes and are used in various industries, agriculture and medicine. Use modern methods of processing, analysis and synthesis of field and laboratory biological information, demonstrate knowledge of the principles of compiling scientific and technical projects and reports.

Learning Outcomes in EP (LOP):

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 9– Proficient in the methods of molecular biology, biotechnology and microbiological research, applies in scientific projects;

LOP 10 – Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

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 idea 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. Interprets the system of knowledge that characterizes modern methods of enzymatic research

Post requisites: Fundamentals of Educational research

3. OPTIONAL COMPONENTS OF THE CYCLE OF MAJOR COURSES

Optional component 1

Course: **Geoinformatics**

Intensity of the Course: 5 academic credits

Module Code: **FGS – 5**

Module Name: Physical geography subjects module

Prerequisites: Kartography

Purpose: It teaches you to learn new information about the collection, storage, processing, analysis, presentation, distribution of data and, based on them, about geographical space.

Short Description: The discipline forms an idea of the structure, classification, functionality of geographical information systems, the development of a database of geographical information and systems. Students get acquainted with functional programs used for input, storage, processing, analysis, visualization of geographical information. Learn to use software, work in computer networks. Students form groups of geographical data, form and process types of cartographic works using geoinformation technologies.

Learning Outcomes in EP (LOP):

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.

LOP 7– Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

LOP 12 – Is able to apply innovative methods of teaching geography and biology and methods of practical activity, a system of criteria assessment. Has pedagogical and geographical, biological experience, uses the results of research in professional activities.

Learning Outcomes in Course (LOC):

LOC 1 – He is able to work with GIS technologies in data search, processing of graphic and cartographic materials during geographical research;

LOC 2 – Analyzes cartographic material for display on maps using a digital model;

LOC 3 – Creates electronic maps using GIS technologies.

LOC 4 – Generates the basic basic data of geoinformation systems.

Post requisites: Fundamentals of Educational research

Course: **Toponymy**

Intensity of the Course: 5 academic credits

Module Code: **FGS – 5**

Module Name: Physical geography subjects module

Prerequisites: Physical geographical regions of the world, Physical geographical regions of Kazakhstan

Purpose: Discipline is to form a general idea about the features of regional toponymic systems of the Earth, geographical terms and their role in toponymy.

Short Description: The discipline examines the concepts of toponymy, the theoretical foundations of toponymy, toponyms, the main groups of geographical names, factors influencing the formation of toponomic systems. The discipline studies geographical names, their origin, semantic meaning, essence, subdivisions of toponymy, toponyms and etymology, principles of word formation in toponymy, the law of series in cartographic toponymy, local development, current state, main groups, spelling and pronunciation. Students combine toponyms into groups, determine the meaning of geographical names.

Learning Outcomes in EP (LOP):

LOP 4 – Discusses the history, theoretical foundations, main problems, prospects of geographical science, knows the patterns characteristic of the globe, the causes of natural phenomena and trends, predicts, determines, compares, understands the physical and geographical position, interrelations of the components of nature, characterizes, distinguishes natural territorial complexes and features of their location, determines geographical objects and recreational places.

LOP 7– Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 - Owns and applies in practice the main methods of toponymic research;

LOC 2 - It can characterize the toponymic systems of individual territories;

LOC 3 - Knows geographical terms and concepts, is able to analyze geographical concepts, theories and patterns;

LOC 4 - It shows various aspects of the study of geographical names and describes the main structural elements of toponymy.

Post requisites: Fundamentals of Educational research

Optional component 2

Course: **Economic geography of Kazakhstan**

Intensity of the Course: 5 academic credits

Module Code: **EGS – 6**

Module Name: Economic geography subjects module

Prerequisites: Physical geographical regions of the world

Purpose: Training in natural resource potential of Kazakhstan, population, economy, economy, foreign economic relations with the countries of the world.

Short Description: The discipline characterizes the administrative-territorial division, population and labor resources, economy, economy of Kazakhstan. Predicts socio-economic processes in Kazakhstan and classifies natural resources, economic sectors. Students will discuss the economic, social and geopolitical situation of Kazakhstan, its role and place among the countries of the world. Divides the economic districts and regions of Kazakhstan. Kazakhstan's foreign economic relations determine and compare economic development with other countries. Analyzes the economic situation in Kazakhstan and the world and assesses the current economic situation.

Learning Outcomes in EP (LOP):

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

LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.

LOP 6– Knows the essence, the main types of political geography, methods of environmental protection, discusses external and internal geopolitics, administrative-territorial division and regional policy, political ideas.

Compares urban agglomerations, discusses strategic directions of urban development, environmental problems, analyzes, predicts sustainability.

LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 - He knows the peculiarities of nature, mineral resource, socio-demographic, production and economic potential of the Republic of Kazakhstan;

LOC 2 - Monitor the state of the economy using statistical and graphical data.

LOC 3 - Defines the place and role of the Republic of Kazakhstan among the countries of the world community;

LOC 4 - It can determine the main directions of geostrategy, internal and external geopolitics of Kazakhstan.

Post requisites: Geoinformatics

Course: **Practical geography**

Intensity of the Course: 5 academic credits

Module Code: **EGS – 6**

Module Name: Economic geography subjects module

Prerequisites: Physical geographical regions of the world

Purpose: Formation of knowledge about geographical research and development when performing practical tasks in various spheres of human economic activity, design and regional planning of geosystem development.

Short Description: Discipline-forms knowledge about applied problems of geography, the importance of applied research. The discipline examines political, environmental, economic, demographic, food, energy problems and ways to solve them. Students describe the issues of territorial organization of society and nature, production and population, placement and rational use of economic facilities. Students define various geotechnical systems. Uses modern equipment and technologies to solve problems in society.

Learning Outcomes in EP (LOP):

LOP 5– Characterizes the economic and geographical position, compares, evaluates socio-economic development and the quality of recreational activities, knows the categories of geo-economics, methods of effective use of natural resources, classifies, determines the role of countries and regions in geographical space, discusses, evaluates the geo-economic situation.

LOP 6– Knows the essence, the main types of political geography, methods of environmental protection, discusses external and internal geopolitics, administrative-territorial division and regional policy, political ideas. Compares urban agglomerations, discusses strategic directions of urban development, environmental problems, analyzes, predicts sustainability.

LOP 7 – Creates, analyzes geographical maps and plans, conducts cartographic and geodetic measurement and field research. Defines geographical concepts and terms, the meaning of geographical names, knows, classifies, applies geography teaching tools, topographic tools, geodetic instruments, geoinformation technologies, methods of geographical research.

Learning Outcomes in Course (LOC):

LOC 1 – The economy is understood as the placement of objects, their rational use and sustainable development;

LOC 2 – Knows the possibilities of applied geography in solving environmental issues;

LOC 3 – Analyzes the scheme of changes in natural territorial complexes and the formation of geotechnical systems;

LOC 4 – Solves the problems of interaction between society and nature, ensures the territorial organization of production and population.

Post requisites: Geoinformatics

Optional component 3

Course: **Cytology, histology and embryology**
Intensity of the Course: 6 academic credits
Module Code: **BPA-7**
Module Name: Biodiversity of plants and animals
Prerequisites: Ecophysiology, Environmental studies
Purpose: To introduce students to the structure of cells, tissues and organs.
Short Description: In the course of studying the discipline, students master the structure and chemical composition of cells, functions, general patterns of reproduction and cell structure. Knowledge is formed about the classification of tissues, the function and formation of germ cells, the process of development and fertilization, the main stages of embryonic development. He is proficient in methods of studying the microscopic structure of cells and tissues. Defines the organic connection of histology between the sciences of anatomy, biochemistry and physiology.
Learning Outcomes in EP (LOP):
LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;
LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;
LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;
Learning Outcomes in Course (LOC):
LOC 1- knows the histological signs of various tissues in the body of animals.
LOC 2- explains the possible mechanisms of neoplasm formation.
LOC 3- using knowledge about the histological features of tissues, he learns different tissues in the body of animals.
LOC 4- explains the basic histological terms and concepts.
Post requisites: Human Anatomy, Biology of ontogenesis

Course: **Cellular pathology**
Intensity of the Course: 6 academic credits
Module Code: **BPA-7**
Module Name: Biodiversity of plants and animals
Prerequisites: Ecophysiology, Environmental studies
Purpose: Master the techniques of experimental work with cells and cell cultures, physico-chemical methods of macromolecule research, methods of research and analysis of living systems, mathematical methods of processing the results of biological research, the basics of bioengineering necessary to create bioengineered objects.
Short Description: In this discipline, students consider typical pathological processes characterized by a violation of intracellular homeostasis. Studies what limits the functionality of the cell and leads to its death or a decrease in life expectancy. She supplemented her knowledge of pathological disorders of cells in tissues and the body, histopathology and phytopathological molecular methods, the initial levels of malignant neoplasms. Knowledge is formed about the morphological foundations of pathological processes developing in connection with the disease in living organisms.
Learning Outcomes in EP (LOP):
LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;
LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;
LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;
Learning Outcomes in Course (LOC):
LOC 1- Cell biology, histology, fundamentals of molecular biology, genetics, biochemistry, virology, physiology (at the level of specialist/master's degree programs), theoretical and methodological foundations of biological scientific research.

LOC 2- To develop, on the basis of a rational analysis of experimental results, one's point of view on issues of cellular pathologies and defend it during discussions with specialists and non-specialists; to read and review scientific literature in the field of organelle ultrastructure in normal and pathological conditions, including in foreign languages, subject to compliance with scientific ethics and copyright.

LOC 3- Modern information and communication technologies, a foreign language.

LOC 4- Ability to abstract thinking, analysis, synthesis.

Post requisites: Human Anatomy, Biology of ontogenesis

Optional component 4

Course: **Evolutionary studies**

Intensity of the Course: 5 academic credits

Module Code: **BPA-7**

Module Name: Biodiversity of plants and animals

Prerequisites: Cytology, histology and embryology, Cellular pathology

Purpose: To know the main methodological methods of studying the evolutionary process, the laws of the historical development of organic nature, the stages of evolutionary development

Short Description: The course is aimed at studying: the history of the formation of modern evolutionary theory and its main provisions; features of the processes of micro- and macroevolution; speciation concepts; the genetic structure of populations; causes of modification and mutational variability; consequences of the influence of abiotic, biotic and anthropogenic factors on the heredity and variability of living organisms

Learning Outcomes in EP (LOP):

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

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1- Students use the knowledge of evolutionary theory to form worldview views.

LOC 2- Students ' mastering of the theory of evolution develops their ability to independently analyze and synthesize complex materials of modern biology.

LOC 3- Knows about organic evolution, the genetic and ecological foundations of evolution, the driving forces and results, the main stages of life development

LOC 4- Analyzes the evolutionary processes.Understands the main signs and stages of the evolution of life on Earth

Post requisites: Fundamentals of Educational research

Course: **Anthropology**

Intensity of the Course: 5 academic credits

Module Code: **BPA-7**

Module Name: Biodiversity of plants and animals

Prerequisites: Cytology, histology and embryology, Cellular pathology

Purpose: To indicate the presence of morphological, physiological and genetic associations in the development of Homo sapiens

Short Description: This course studies the origin and evolution of human being and human races, the physical structure of human being, the morphological and physiological characteristics of ethnic and other communities of human beings. Students study the formation of human culture and civilizations, the structure of human society in different historical periods and in different territories. The proof of the modern evolutionary approach to the study of biological processes has the skills to use modern scientifically based methods, methods and means of teaching biology, including technical teaching aids, information and computer technologies.

Learning Outcomes in EP (LOP):

LOP 8 – Apply the principles of distribution, systematization, evolution and phylogenetic relationships of plants, animals and microorganisms in the environment in the learning process;

LOP 10– Analyzes the basic structure of the human body, historical development, age characteristics and its interaction with the environment;

LOP 11 – Possesses knowledge in the field of modern biological science, studies, generalizes, applies and disseminates the experience of highly professional teachers;

Learning Outcomes in Course (LOC):

LOC 1 – Knows historical materials and methods

LOC 2 – Analyzes the main theories of human origin

LOC 3 – Is able to explain the content of the questions raised in a reasoned and complete manner;

LOC 4 – Can participate in the discussion, giving a reasoned opinion. Knows the basic terms and concepts of anthropology

Post requisites: Fundamentals of Educational research