

AQUATIC ECOTOXICOLOGY

The total complexity: 5 credits

THE PLACE OF DISCIPLINE IN THE STRUCTURE OF THE EDUCATIONAL PROGRAM

1. The course «AQUATIC ECOTOXICOLOGY» refers to the elective disciplines of the variable part of the block of educational program undergraduate training 05.03.02 «Geography».

2. To study this discipline (module) the following knowledge, skills and abilities formed by previous disciplines are necessary:

“Biology, geography of soils with the basics of soil science”:

Knowledge of the basic biological laws, levels of organization and basic principles of functioning of living systems, understanding the theoretical foundations of the formation of reservoirs, hydrological, physical, chemical and biological processes, knowledge of the properties of chemical elements and their compounds; as well as knowledge of the properties of pollutants, their impact on living organisms; understanding of the basic properties of living and non-living objects, the diversity of living organisms.

The ability to reveal the content of the basic properties of the living and their role in geochemical evolution, the evolution of the biosphere; to apply new knowledge in the field of biology in professional activities, to use modern educational and information technologies.

Possession of information on biological disciplines studying certain levels of organization of biological systems, the skills of obtaining biological information from the literature, textbooks, the Internet; information on modern ideas about the diversity of living organisms and methods of its study

“Chemistry”:

Knowledge: peculiarities of chemistry of elements and their compounds with an emphasis on toxic and especially dangerous substances; physicochemical characteristics of the main environmental pollutants; technique of chemical experiment; fundamentals of qualitative and quantitative analysis of environmental objects, the principle of monitoring; main types of pollutants and principles of environmental protection.

Skills: to determine the products of interaction of substances; to assess the possibility of chemical reactions between substances in the environment; to give characteristics of the properties of elements by position in The periodic system of D. I. Mendeleev and to describe the properties of substances of these elements; to choose the optimal method of analysis to determine the composition and properties of the studied object of the environment (water, air, soil, etc.).

Abilities: application of basic knowledge of the fundamental sections of chemistry to the extent necessary for the development of chemical foundations of ecology and environmental management, sampling methods and chemical analysis (monitoring).

“Hydrology”:

Knowledge: the main features of the structure and functioning of the hydrosphere and its individual structural elements, physical, chemical and biological properties of natural waters, the theory of origin of water hydrosphere, especially the geographical distribution of surface and groundwater, especially the functioning of the zone of mixing «river-sea» and forms of anthropogenic impact on natural waters.

Skills: analyze the relationship between precipitation, surface water and groundwater, describe the cycle of water in nature and evaluate water resources, as well as determine the possibility of their use.

Abilities: knowledge in the field of state accounting of natural waters, their use in various spheres of life.

“Biogeography with the basics of ecology”

Knowledge: the most important principles of the organization of ecosystems and the basic laws of their spatial and temporal variability; biogeographic concepts and rules that reflect the

laws of adaptation of living organisms; the role of biota in the formation and functioning of ecosystems and biosphere; methods of conservation of biological diversity of the Earth.

Skills: use biogeographic maps; apply the knowledge gained in the study of other disciplines.

Abilities: comparative geographical methods.

3. The list of the subsequent disciplines for which knowledge, abilities and skills formed by this subject are necessary:

«Fundamentals of Geophysics and Geochemistry of landscapes», «Geographical and environmental monitoring», «Geographical forecast of natural and man-made disasters. Environmental risk» (knowledge of the properties of pollutants, especially their impact on living organisms, the ability to apply in practice); and other disciplines from the variative block of the professional cycle.

Knowledge and practical skills obtained in the study of the course will be useful in the process of further training, diploma design and professional activities of the graduate.

GOALS AND OBJECTIVES

Goal of the discipline: training of qualified personnel to work in the study and assessment of the ecological state of landscapes, development of measures to preserve the unique landscapes and the quality of the environment, their monitoring, with knowledge of the properties and behavior of pollutants in aquatic ecosystems, as well as their impact on living organisms, populations and communities.

Objectives:

Acquaintance with priority pollutants that are typical for water bodies, the regularities of the toxic effects to aquatic organisms;

Understanding migration and transformation mechanisms, forms of pollutants in the aquatic environment;

The formation of ideas on ways of hit of polluting substances in living organisms, the forms of their occurrence and peculiarities of influence.

THE CONTENT OF DISCIPLINE

1. Properties of priority ecotoxicants of aquatic environment, their sources in water bodies

Subject of ecotoxicology and its links with other sciences. Methodology and fundamental research principles. Impacts of land contaminants on aquatic ecosystems. Metal speciation in aquatic ecotoxicology. Sediment toxicity identification evaluation.

2. The nature and effects of toxicants on aquatic habitats of organisms, ways and methods to reduce the negative impact

Cell lines in aquatic toxicology. Aquatic biomarkers. Aquatic mesocosms in ecotoxicology. Aquatic macrophytes in ecotoxicology. Microbial bioremediation of aquatic environments. Bioavailability of contaminants. Water quality guidelines for the protection of aquatic ecosystems. Assessing ecological risks at contaminated sites.

As a result of the discipline explore students' will acquire the following knowledge, skills and abilities:

Knowledge: methods and approaches of modern ecotoxicology; sources and types of pollution of water bodies; the effect of the most common toxicants on aquatic organisms; basic research methods; basic features and methods of analysis of Toxicological processes in the aquatic environment; mechanisms of adaptation to changing environmental conditions necessary for the smooth functioning of ecosystems.

Skills: to detect the reaction of different-level components of water bodies to toxic effects; to determine the presence of stress factors of the environment on the body and to know preventive measures to minimize such effects.

Abilities: environmental system analysis, diagnosis of influence factors; skills toxicological evaluation of quality of sediments; ecotoxicological approaches to assess the impact on water environment, aquatic organizations and food base.

When the learning process implementing a variety of educational technologies are used: problem lectures, lectures with an analysis of a specific situation, case-study, discussion, lecture-visualization, control work, round table, etc.

The program provides for such forms of control as essays, oral presentation, paper, control work. The attestation form is credit.

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