**AL-FARABI KAZAKH NATIONAL UNIVERSITY**

**Faculty of Biology and Biotechnology**

**Educational program in the specialty «5В060700 – Biology»**

**Approved by** the at meeting of an Academic Council

of the faculty of Biology and Biotechnology

Protocol № from 2017

Dean of the faculty

\_\_\_\_\_\_\_\_\_\_\_\_\_ Zayadan B.K.

**SYLLABUS**

**of the discipline**

**“Bioecology”**

**An experimental and educational program**

**on specialty «5В060700 – Biology »\_\_4\_\_credits (2/1/1)**

**1st Semester of Bachelor**

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| **Al-Farabi Kazakh National University**  **Syllabus**  **Fall semester 2017-2018** | | | | | | | | | | | | | |
| **The Code of Discipline** | | **The Name of Discipline** | **Type** | **Hours per week** | | | | | **Credits** | | | **ECTS** | |
| **Lecture** | **Work**  **shop** | **Lab. work** | | |
|  | | Bioecology |  | 2 | 1 | 1 | | | 3 | | | 5 | |
| **Prerequisites** | |  | | | | | | | | | | | |
| **Lecturer**  **Assistant** | | Salmurzayly Ruslan, PhD | | | | | | | **Hours of Classes** | | According to schedule | | |
| **e-mail** | | Ruslaan200587@gmail.com | | | | | | |
| **Mobile:** | | +7 7471215959 | | | | | | | **Room** | | 10, 327 | | |
| **Short description** | | Bioecology studies the laws of the life's organization, including in connection with anthropogenic impacts on ecosystems and the biosphere. Soil science studies soil as a natural resource on the surface of the earth including soil formation, classification and mapping; physical, chemical, biological, and fertility properties of soils; and these properties in relation to the use and management of soils. | | | | | | | | | | | |
| **The main aim of course** | | Formation of fundamental knowledge about the biocostic shell of the Earth - the soil, as a natural body, its formation, properties, development and evolution, the patterns of geographical distribution, rational use and protection of soils | | | | | | | | | | | |
| **Results of Education** | | After the course students have to:   1. theoretical and practical skills in determining the type of soil, the use of botanical, zoological methods for diagnosing soils, and performing laboratory and analytical work. 2. assess the ecological state of soils; 3. the general scientific methods of studying soils, phenomena and processes in soil and form the ability to independently acquire new knowledge and skills, analyze and determine the quality of soil cover at the local level; use methods of laboratory studies of soils; interpret the findings at local, regional, global levels; apply the data obtained in practice to assess the state of the soil cover; 4. know the basic laws of soil cover formation; peculiarities of organization and management of soil fertility monitoring; a methodology for organizing information collection for a comprehensive assessment of the ecological state of the soil cover at the global, regional and local levels; determine the degree of anthropogenic impact on the soil. | | | | | | | | | | | |
| **List of Literature Sources** | | The main sources:   1. Foth H.D. Fundamentals of soil science: eighth edition. - Michigan State University, 1990. – 382 p. 2. Структурно-функциональная роль почвы в биосфере / Отв. Ред. Г.В. Добровольский. М., 1999. 312 с. 3. Глазовская М.А., Геннадьев А.И. География почв с основами почвоведения МГУ, 1995 4. Добровольский В.В. География почв с основами почвоведения: Учебник для вузов. – М.: Гуманит. Изд.Центр ВЛАДОС, 1999. – 384с. 5. Фаизов К.Ш. Почвы Республики Казахстан, Алматы, 2001 6. Асанбаев И.К., Фаизов К.Ш. Почвоведение с основами экологии и географии почв. Алматы, 2007. 250 с. 7. Практикум по почвоведению / Под ред. И.С.Кауричева. – 4-е изд., перераб. и доп. – М.: Агропромиздат, 1986.- 336с. | | | | | | | | | | | |
| **Course**  **Organization** | | This is an introductory course of Bioecology, in particular in Soil Science. It includes in lectures, workshop, laboratory works, individual tasks and work in pairs. | | | | | | | | | | | |
| **Course**  **Requirements** | | 1. Students must be prepared as for lectures in accordance to current schedule. All preparations must be finished **before** the beginning of class. 2. Home works and individual tasks will be spread during the whole period of the course as shown in this syllabus. 3. The majority of home works includes in several tasks as to make scientific reports, do exercises or prepare presentations. Cheating and using another's materials, articles or answers **are not permitted**. 4. For laboratory works labcoats are mandatory. 5. Using mobile phones or other electronic devices or surfing the Internet during the all types of classes is not allowed. | | | | | | | | | | | |
| **Assessment** | | **Individual Student Work Requirements** | | | | | **Percentage** | **Results** | | | | | |
| Student individual work – 4 tasks  Work shop  Laboratory work  MidTerm Exam  Total | | | | | 10%  20%  20%  10%  40%  100% | 1, 3  1, 2, 3, 4  1, 2, 3,4  1, 2, 3, 4  1, 2, 3, 4 | | | | | |
| The final grade will be calculated by the formula:  95% - 100%: А 90% - 94%: А-  85% - 89%: В+ 80% - 84%: В 75% - 79%: В-  70% - 74%: С+ 65% - 69%: С 60% - 64%: С-  55% - 59%: D+ 50% - 54%: D- 0% -49%: F | | | | | | | | | | | |
| **Remarks** | | In case of illness, traumas, disabilities, accidents or scientific/business trips students are allowed to get extra bands overtime. Also in these cases students can select the most comfortable way to do it. All bands will be added to the final grade at the end of the semester. Discussions, disputes and active participation in classes are highly encouraged. Lecturer or assistant can give additional tasks if they is not sure in student's knowledge. | | | | | | | | | | | |
| **Timetable** | | | | | | | | | | | | | |
| **Weeks** | **Topic Name** | | | | | | | | | **Hours** | | | **Max. bands** |
| **Module “Soil Science”** | | | | | | | | | | | | | |
| **1** | **Lecture 1.** Soil Science. Pedological and edaphological concepts. Rocks and minerals. Weathering. Soil formation factors and processes. | | | | | | | | | 2 | | | 0 |
| **Work shop 1.** **O**rigin of the earth. History of Soil Science Development. Relationship of soil science with other sciences | | | | | | | | | 1 | | | 5 |
| **Laboratory work 1.** Determination of rocks and minerals by samples using a determinant. | | | | | | | | | 1 | | | 6 |
| **2** | **Lecture 2.** Soil physical properties. Soil texture. Textural classes. | | | | | | | | | 2 | | | 0 |
| **Work shop 2.** Soil profile. Soil structure (Classification) | | | | | | | | | 1 | | | 5 |
| **Laboratory work 2.** Particle size analysis. Determination of the structural coefficient. | | | | | | | | | 1 | | | 6 |
| **3** | **Lecture 3.** Soil water. Retention and potentials. Soil moisture constants | | | | | | | | | 2 | | | 0 |
| **Work shop 3.** Movement of soil water: Infiltration, percolation, permeability, Drainage | | | | | | | | | 1 | | | 5 |
| **Laboratory work 3.** Methods of determination of soil moisture | | | | | | | | | 1 | | | 6 |
| **4** | **Lecture 4**. Thermal properties of soils. Soil temperature. Soil air (Gaseous exchange) | | | | | | | | | 2 | | | 0 |
| **Work shop 4.** Influence of soil temperature and air on plant growth | | | | | | | | | 1 | | | 5 |
| **Laboratory work 4.** Study of morphological features and description of the structure of the soil profile | | | | | | | | | 1 | | | 6 |
| **SIW 1.** Soil aggregates. Soil compaction | | | | | | | | |  | | | 10 |
| **5** | **Lecture 5.** Soil colloids: Properties, nature, types and significance. Adsorption of ions: Ion exchange, CEC& AEC. | | | | | | | | | 2 | | | 0 |
| **Work shop 5.** Layer silicate clays – their genesis and sources of charges. Factors influencing ion exchange - Significance | | | | | | | | | 1 | | | 5 |
| **Laboratory work 5.** Methods for determination of ion exchange and absorption capacity | | | | | | | | | 1 | | | 7 |
| **6** | **Lecture 6.** Soil organic matter: Composition, Decomposability. Humus: Fractionation of organic matter. | | | | | | | | | 2 | | | 0 |
| **Work shop 6.** Carbon cycle: C: N ratio. Soil biology: Biomass, Soil organisms, their beneficial and harmful roles | | | | | | | | | 1 | | | 5 |
| **Laboratory work 6.** Solving problems in soil science, agroecology | | | | | | | | | 1 | | | 7 |
| **7** | **Lecture 7.** Geography and ecology of soils | | | | | | | | | 2 | | | 0 |
| **Work shop 7.** Soil fertility | | | | | | | | | 1 | | | 5 |
| **Laboratory work 7.** Soil mapping of Kazakhstan | | | | | | | | | 1 | | | 7 |
| **SIW 2.** Soils of Kazakhstan | | | | | | | | |  | | | 10 |
| **Middle Term Control 1** | | | | | | | | | | 100 | | | |
|  | **Midterm** | | | | | | | | | 100 | | | |
| Module “Bioecology” (Department of biodiversity and bio resources) | | | | | | | | | | | | | |
| **8** | **Lecture 8. Temperature.** The effects of cold temperatures, especially freezing, are severe; Hot temperatures limit many species’ distributions; the greenhouse effect causes the earth’s temperature to rise | | | | | | | | | 2 | | | 2 |
| **Laboratory work 8.** Global Warming Is Changing Species Distribution Patterns | | | | | | | | | 2 | | | 6 |
| **9** | **Lecture 9. Terrestrial Biomes.** Variation in solar radiation determines the climate in different areas of the World; terrestrial biome types are determined by climate patterns. | | | | | | | | | 2 | | | 2 |
| **Laboratory work 9.** Anthropogenic biomes of the world | | | | | | | | | 2 | | | 6 |
| **10** | **Lecture 10. Marine Biomes.** Variations in ocean currents and tidal range; deep-ocean currents are caused by thermohaline circulation; | | | | | | | | | 2 | | | 2 |
| **Laboratory work 10.** Marine biomes are determined by water temperature, depth, and wave action | | | | | | | | | 2 | | | 6 |
|  | **SIW 3 - Biomes** | | | | | | | | |  | | | 18 |
| **11** | **Lecture 11. Freshwater Biomes.** Freshwater biomes are determined by variations in temperature, light availability, productivity, and oxygen content | | | | | | | | | 2 | | | 2 |
| **Laboratory work 11.** The properties of freshwater vary dramatically with temperature | | | | | | | | | 2 | | | 6 |
| **12** | **Lecture 12. Competition and Coexistence.** Several different types of competition occur in nature; The winners and losers of competitive interactions may be predicted using mathematical models | | | | | | | | | 2 | | | 2 |
| **Laboratory work 12.** The outcome of competition can vary with changes in the biotic and abiotic environments | | | | | | | | | 2 | | | 6 |
| **13** | **Lecture 13. Facilitation.** Mutualism is an association between two species that benefits both species | | | | | | | | | 2 | | | 2 |
| **Laboratory work 13.** Facilitation may be more common under conditions of environmental stress | | | | | | | | | 2 | | | 6 |
| **14** | **Lecture 14. Predation.** Animals have evolved many antipredator adaptations; Predator-prey interactions may be modeled by Lotka-Volterra equations | | | | | | | | | 2 | | | 2 |
| **Laboratory work 14.** Humans, as predators, can greatly impact animal populations | | | | | | | | | 2 | | | 6 |
|  | **SIW 4 - Biomes** | | | | | | | | |  | | | 18 |
| **15** | **Lecture 15. Parasitism.** Parasites exhibit a wide range of attributes and lifestyles | | | | | | | | | 2 | | | 2 |
| **Laboratory work 15.** Host-Parasite Models Are Different from Predator-Prey Models | | | | | | | | | 2 | | | 6 |
| **100** | | | | | | | | |  | | | 100 |
|  | | | | | | | | | |  | | | |

The Dean of the Faculty of

Biology and Biotechnology B.K. Zayadan

Methodical Council M.S. Kulbayeva

The Head of the Department of

Molecular Biology and Genetics Z.G. Aytasheva

Lecturer A.V. Lovinskaya