


**NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES
OF UKRAINE**


Department of Ecobiotechnology and Biodiversity

"APPROVED"

Dean of the Faculty of plant protection,
biotechnology and ecology
Yulia KOLOMIETS
2024



"APPROVED"

at the meeting of ecobiotechnology and
biodiversity department
Minutes № 05 of " 13 " 05 2024
Head of the Department
 (Olena KVASKO)

"REVIEWED"

Guarantor of the AP "Biotechnology and bioengineering"
 (Olena KVASKO)

CURRICULUM OF ACADEMIC DISCIPLINE

"FUNDAMENTALS OF BIODIVERSITY"

Field of knowledge 16 Chemical and bioengineering

Speciality 162 Biotechnology and bioengineering

Academic program Biotechnology and bioengineering

Faculty of Plant Protection, Biotechnology and Ecology

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Kyiv - 2024

Description of the discipline "Fundamentals of biodiversity"

Academic degree, specialty, academic programme		
Academic degree	bachelor's	
Specialty	162 «Biotechnology and bioengineering »	
Academic programme	Biotechnologies and bioengineering	
Characteristics of the discipline		
Type	compulsory	
Total number of hours	120	
Number of ECTS credits	4,0	
Number of modules	2	
Course project (work)		
Form of assessment	Exam	
Indicators of the discipline for full-time and part-time forms of university study		
	Full-time	Part-time
Course (year of study)	2	
Semester	3	
Lecture classes	15	
Practical, seminar classes	-	
Laboratory classes	15 h	
Self-study	90 h	
Individual assignments	-	
Number of weekly classroom hours for the full-time form of study	2,0 h	

1. Aim, objectives, competences and expected learning outcomes of the discipline

"Fundamentals of biodiversity"

The aim of study of discipline to form a clear understanding of the principles of modern methods of research of biological objects and the environment, to provide and practically master the basic knowledge and skills in the use of various tools in the processes of scientific fundamental and practical research. The course "Fundamentals of Biodiversity" is aimed at familiarizing future specialists with the basic principles of monitoring, inventory of species biodiversity and natural resources.

An objectives consolidation and mastery of the basic concepts of biogeography, evolutionary ecology, to take into account diversity at different levels of organization life: molecular, genetic, cellular, taxonomic, ecological and others, to understand the patterns of anthropogenic transformation of flora and fauna, to take into account the peculiarities of the spread of invasive species and to predict their impact on the species richness and stability of natural ecosystems, and assess possible risks.

The theoretical course "Fundamentals of Biodiversity" is supported by practical developments that enable future specialists to master the skills of collecting and analyzing primary information, assessing species richness and diversity, determining the level of dominance of individual species in the biocenosis, assessing the age composition of organisms in populations, and determining similarity indices of flora and fauna.

Acquisition of competences:

Integral Competence (IC): The ability to solve complex specialized tasks and practical problems characterized by complexity and uncertainty in biotechnology and bioengineering, or in a learning process involving the application of theories and methods of biotechnology and bioengineering.

General competences (GC):

C01. Ability to apply knowledge in practical situations

C05. Ability to learn and master modern knowledge

C09. Ability to preserve and enhance moral, cultural, scientific values and achievements of society based on an understanding of the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and technology, to use different types and forms of physical activity for active recreation and healthy lifestyle.

Special (professional, subject) competences (SC):

C13. Ability to work with biological agents used in biotechnological processes (microorganisms, fungi, plants, animals, viruses, their individual components).

C25. Development of technologies for the creation of cell and tissue culture as biological systems, modification of the genome of plants and microorganisms in order to improvement of their quality characteristics and properties, expansion of genetic diversity of source material for breeding, labeling, certification and expertise, and to theoretically substantiate areas of scientific research.

Expected Learning Outcomes (ELO):

ELO07. Be able to apply knowledge of the composition and structure of cells of various biological agents to determine the optimal conditions of cultivation and the potential of using the studied cells in biotechnology.

ELO22. To be able to take into account social, environmental, ethical, economic aspects, labour protection, occupational health and safety and fire safety requirements when formulating

technical solutions. Be able to use different types and forms of physical activity for active recreation and healthy lifestyle.

ELO24. Be able to apply cryopreservation and cryopreservation to preserve biodiversity of plants and microorganisms. to identify of recombinant clones, conduct clonal micropropagation of plants and obtain virus-free planting material and adapt it to ex vivo conditions.

2. Programme and structure of the discipline for “Fundamentals of biodiversity”

- full-time (part-time) form of study

Modules and topics	Number of hours													
	Full-time							Part-time						
	weeks	total	including					weeks	total	including				
			Le c	la b	ind	ind	s.st			Le c	pr	la b	in d	in d
Module 1. Enzymatic processes in the biotechnology industry														
Topic 1. Definition, importance and classification of biodiversity (genetic, species, ecological/ecosystem). Methods of biodiversity assessment. Biodiagnostics (indication) of the state of cenosis.	1,2	8	2		2		15							
Theme 2. Methods of assessment biodiversity.	3,4	8	2	2			15							
Theme 3. Biodiagnostics (bioindication) of the state of cenosis.														
Total for module 1		16	4	4			15							
Module 2. Scheme and main stage biotech industries.														
Topic 1. Threats to biodiversity. The rate of of species extinction. Anthropogenic impact on the on the stability of biosystems. Changes in the of climate.	5,6		8		5		15							
Topic 2. Monitoring of of biodiversity. Indices and models of biodiversity.	7,9		7		5		15							
Total for module 2	32		15		10		10							
Total for module 3	31		13		10		30							
Total	120		45		30		45							

3. Topics of laboratory classes

Number	Title theme	Hours
1	Familiarization with modern requirements and rules of work in educational and research laboratories and basic microscopic research methods.	2
2	Study of soil fauna (algae diversity) Learn about different types of soil algae, their structures, features, methods of isolation from the soil. Algodiagnosics.	2
3	Study of the main features, characteristics, and ecological niches of niches of micromycetes (soil representatives). The role of soil in the formation and conservation of biodiversity.	2
4	Familiarization with the principles of selection and criteria for assessment, bioindication of the state of cenosis.	2
5-6	Characterization of the main threats to biodiversity, Assessment of anthropogenic impact and climate change on biosystems (ecological models).	4
7-8	Monitoring studies of biodiversity. Indices and models of biodiversity.	4
9	Biodiversity of ecosystems as criteria for stability, a measure of ecosystem reliability in a given situation. a particular situation. The relationship of biodiversity to nature protection and the development of and the development of biosphere monitoring systems.	2

4. Topics for self-study

№	Topic title	Hours
1	Phylogenetic evolution of the species and speciation. The conditions that shape these processes.	6
2	Ruderal weeds. Their economic and biological characteristics. Specialized weeds. Their economic and biological characteristics	6
3	Classification of annual and perennial weeds plants. Parasitic and semiparasitic weeds. plants.	6
4	Interspecific hybridization of citrus fruits in natural and artificial conditions.	6
5	The importance of genetic engineering in the emergence of new forms of organisms. Environmental hazards of the method	6
6	Concepts and methods of biodiversity monitoring diversity monitoring. The system of global monitoring of biological diversity. The regional level of biodiversity monitoring.	6
7	Monitoring of biodiversity in Ukraine.	6
8	The structure of state authorities in charge of natural resources management and environmental protection and environmental protection.	6
9	The importance of biosphere reserves in maintaining and study of biodiversity.	6
10	Principles of modeling artificial ecosystems.	6
11	The importance of zoos and nurseries in maintaining biodiversity.	6

12	The importance of zoos and nurseries in maintaining biodiversity.	6
13	The importance of the technology of obtaining grafted planting material for the restoration of rare plant species.	6
14	Varietal standards in modern crop production.	6
15	The importance of selection, hybridization and mutagenesis in the emergence of new forms of organisms	6

5. Tools for assessing expected learning outcomes:

(select necessary or add)

- exam;
- module tests;
- presentation of laboratory works.

6. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- practical method (laboratory, practical classes);
- visual method (illustration, demonstration);
- processing learning resources (note-taking, summarising, reviewing, writing an abstract);
- video method (remote, multimedia, web-based, etc.);
- self-study (completing assignments).

7. Assessment methods:

- **exam;**
- oral or written assessment;
- module tests;
- presentation of laboratory works;
- presentations at academic events.

8. Distribution of points received by students

The assessment of students' knowledge and skills is conducted by means of a 100-point scale and is converted into national grades according to Table 1 of the current Exam and Credit Regulations at NULES of Ukraine.

Student's rating, points	National grading of exams and credits	
	exams	credits
90-100	excellent	pass
74-89	good	
60-73	satisfactorily	
0-59	unsatisfactorily	fail

To determine a student's rating in the discipline R_{DIS} (up to 100 points), the received assessment rating R_A (up to 30 points) is added to the academic performance rating R_{AP} (up to 70 points): $R_{DIS} = R_{AP} + R_A$.

9. Teaching and learning aids

- e-learning course of the discipline (<https://elearn.nubip.edu.ua>);
- lectures and presentations (in electronic form);
- textbooks, manuals, tutorials;
- guidelines for studying a discipline by full-time and part-time students.

10. Recommended sources of information

1. Fundamentals of biodiversity: theory and practice: a textbook. O.L. Klyachenko and others - Vinnytsia, Nilan LTD, 2015. 128 p.
2. Klyachenko O.L., Lisovyi M.M., Kvasko O.Y. Fundamentals of biodiversity. Textbook. K., 2022. - 300 p.
3. Dictionary of modern ecological and environmental terms. K.: Nauk. svit, 2010. - 67 p. - Dictionary of modern ecological and environmental terms / [compiled by Goncharenko GE, Sovgira SV].
4. Conservation and exhaustive use of biodiversity of Ukraine: state and prospects. and prospects. K.: Himjest, 2003. - 248 p.
5. Biodiversity: Questions and answers. Kyiv: Green Ukraine, 2006.
6. The Law of Ukraine “On the Nature Reserve Fund of Ukraine” (16.06.1992). (16.06.1992) / Bulletin of the Verkhovna Rada of Ukraine, 1992, No. 34.
7. The Law of Ukraine “On the National Program of Formation of the National Ecological Network of Ukraine for 2000-2015” of the National Ecological Network of Ukraine for 2000-2015” / Uryadovyi Courier, 8.11.2000 p., № 207.
8. Marushevskiy G.B., Melnychuk V.P., Kostyushyn V.A. Conservation of biodiversity and creation of ecological Biodiversity conservation and creation of an ecological network - Kyiv, WIBSP, 2008.
9. Reserves and National Parks of Ukraine - Kyiv, 1999.
10. Pan-European Strategy for the Conservation of Biological and Landscape Diversity. Kyiv: Avalon, 1998.
11. Yatsyk A. V., Hryshchenko Y. M., Yakymchuk A. Y., Pashenyuk I. A.; eds. A. V. Yatsyk. Ecology of biodiversity. K.: Genesis, 2013. 408 c.
12. Sheliag-Sosonko Y.R., Dubyna D.V., Vakarenko L.P. et al. Conservation and sustainable use of biodiversity of Ukraine: state and and prospects. K.: Chemjest, 2003. 248 p.