to the Order of March 23, 2023 № 244

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE
Faculty of Plant Protection, Biotechnology and Ecology

"CONFIRMED"
Dean of the Faculty
of Plant Protection, Biotechnology and Ecology
Kolomiets Y.V.
"01" 06 2023 p.

"APPROVED"
at the meeting of the department of
Agrosphere Ecology and Environmental Control
Protocol №5 dated "03" 05 2023 p.
Head of Department
Naumovska O.I.

"REVIEWED"
Program Coordinator OP 101 Ecology
Bogolubov V.M.

PROGRAM OF THE COURSE
General Ecology

Specialization 101 "Ecology"
Educational program "Ecology"
Faculty Plant Protection, Biotechnology and Ecology

Developers: Ass. Professor. Candidate of Biology Sciences **Rubezhniak Iryna**

Kyiv – 2023 p.

Description of the course "**General Ecology**"

Field of knowledge, specialization, educational program, educational degree		
Educational degree	Bachelor's	
Specialization	101-Ecology	
Educational degree	Ecology	
Characteristics of the course		
Type	Compulsory/elective	
Total number of hours	156	
Number of ECTS credits	5	
Number of content modules	4	
Course project (work) (if applicable)		
Form of assessment	Exam	
Indicators of the course for full-time and part-time forms of study		
	Full-time form of study	Part-time form of study
Course (year of study)	2	
Semester	3	
Lecture classes	60 hr.	
Practical, seminar classes	75 hr.	
Laboratory classes		
Self-study	21 hr.	
Individual assignments		
Number of weekly classroom hours for the full-time form of study	9 hr.	

2. Goal and objectives of academic discipline

THE OBJECT AND ASSIGNMENTS OF THE COURSE

After taking over the course students are gaining knowledge about fundamental ideas of Ecological Science: doctrine about biosphere and ecosystems, sources and flaws of energy issues in ecosystems, influence pattern of ecological factors, biotic relation between bionts, species and populations; skills to define natural-resources potential of ecosystem and socioeconomic analyses of their macroeconomic activity.

Goal of the course is to understand the nature of environmental influences on individual organisms, their populations and communities, on landscapes and, ultimately, biosphere (all life on Earth).

Learning objectives are organism, population, community, ecosystem, biome, and biosphere.

Learning outcome of course is the student's ability as a specialist:

- to have a clear understanding of the scientific method, including hypothesis formation and testing.
- to understand how individual developmental and physiological constraints and adaptations relate to ecological processes
- to have familiarity with the use of theoretical models to explain processes such as competition and predation
- to understand population structure and dynamics in the context of demographic life history tables and the evolution of life history patterns
- to have a basic familiarity with the evolution of mating systems, social behavior, plant animal coevolution
- to understand the organization of communities, including hierarchal structure, food webs, bottom-up and top-down processes
- to understand ecosystem patterns and processes to have a clear understanding of the scientific method, including hypothesis formation and testing.
- to understand how individual developmental and physiological constraints and adaptations relate to ecological processes
- to have familiarity with the use of theoretical models to explain processes such as competition and predation
- to understand biosphere structure and dynamic process in it
- to have a basic familiarity with main biosphere cycles as carbon cycle, sulfur cycle, nitrogen cycle, water cycle and phosphoric cycle
- to understand the main anthropogenic impact on the environment
- to understand basic world environmental problems.
- how different pollutants effect water, soil and air quality, etc.;
- a definition and/or example of water pollution, air pollution and land pollution;
- how anthropogenic pollution changes main biosphere cycles;
- the concept of greenhouse effect, acid rains and ozone depletion;
- the definition of eutrophication, the factors which take part in this process.

Upon completion of this course, students should be known

- how the different organisms grow, populate;
- distinguish between the concept of the habitat and niche, and be able to recognize examples of each;
- types of abiotic factors;
- how different organisms interact as parasites, predators, etc.;
- the difference between intraspecific and interspecific competition
- a definition and/or example of species diversity;
- the four factors which affect density of a population in any given area (natality, mortality, immigration, emigration) and recognize examples of each;
- the concept of ecological succession;
- the definition of a biome, the factors which are used to characterize biomes;
- to use basic conceptual and analytical tools for describing and quantifying ecological relationships;
- to quantify mechanisms of resource acquisition and environmental tolerance;
- to understand and apply models and conceptual frameworks describing main environmental cycles;
- to understand and use fundamental analytical methods to describe dynamics of anthropogenic changes of the environment;
- to make predictions about anthropogenic impacts the environment based on their knowledge about man-made factors;
- to integrate their knowledge about ecological problems.

should be able:

- to analyze ecological systems in terms of proximate and ultimate causation,
- to work with multi-level systems interactions;
- to use basic conceptual and analytical tools for describing and quantifying ecological relationships;
- to quantify mechanisms of resource acquisition and environmental tolerance;
- to understand and apply models and conceptual frameworks describing physiological function;
- to understand and use fundamental analytical methods to describe structure and dynamics of populations and communities;
- to make predictions about population and community dynamics based on their knowledge about biotic and abiotic factors influencing species interactions;
- to integrate their knowledge about species interactions;
- to explain higher level ecosystem processes;
- to analyse ecological systems in terms of proximate and ultimate causation,

- to work with multi-level systems interactions;
- to use basic conceptual and analytical tools for describing and quantifying ecological relationships;
- to quantify mechanisms of resource acquisition and environmental tolerance;
- to understand and apply models and conceptual frameworks describing main environmental cycles;
- to understand and use fundamental analytical methods to describe dynamics of anthropogenic changes of the environment;
- to make predictions about anthropogenic impacts the environment based on their knowledge about man-made factors;
- to integrate their knowledge about ecological problems.

Integrative competency (IC): Ability to solve complex specialized problems and solve practical problems in the field of ecology

General competencies (GC:)

01. Knowledge and understanding of the subject area and professional activity

K07. The ability to act socially responsibly and consciously

K08. Ability to conduct research at an appropriate level

Professional (special) competencies (PC):

K14. Knowledge and understanding of theoretical foundations of ecology, environmental protection and balanced nature management

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3. Program discipline

№	Themes and modules to be covered	Hour				
		Full-time				
		week	total	lecture	laboratory work	independent study
	Module 1. Ecological factors. Adaptation					
1.	Lecture 1. Introduction to Ecology	1	4	2	2	
2.	Lecture 2-3. Habitat. Environmental factors	2-3	9	4	4	1
3.	Lecture 4-5. Abiotic factors-climatic factors	4-5	9	4	4	1
4.	Lecture 6. Adaptation of plants to the environment	6	5	2	2	1
5.	Lecture 7-9. Animal adaptation to the environment	7-9	13	6	6	1
6.	Lecture 10-12. Mechanism of adaptation	10-12	13	6	6	1
7.	Lecture 13-14. Interactions between members of one species	13-14	9	4	4	1
	Total for module I		**62**	**28**	**28**	**6**
	Module 2. Community and population. Ecosystem					
8.	Lecture 15. Population and Its Characteristics	15	8	2	5	1
9.	Lecture 16. Interaction between members of different species: positive and negative	16	5	2	2	1
10.	Lecture 17. Negative interactions between members of different species	17	6	2	3	1
11.	Lecture 18. Biotic Community	18	6	2	3	1
12.	Lecture 19. Biotic community (part II)	19	5	2	3	
13.	Lecture 20. Ecosystem	20	6	2	3	1
14.	Lecture 21. Species in ecology	21	5	2	2	1
15.	Lecture 22. Ecological rules and lows	22	5	2	2	1
	Total for module II		**46**	**16**	**23**	**7**
	Module III. Biosphere and biogeochemical cycles					
16.	Lecture 23**.** Structure of biosphere	23	6	2	3	1
17.	Lecture 24. Water cycle	24	6	2	3	1
18.	Lecture 25. Nitrogen cycle in nature	25	6	2	3	1
19.	Lecture 26. Carbon cycle	26	6	2	3	1
	Total for module III		**24**	**8**	**12**	**4**
	Module IV. Environmental pollution					
20.	Lecture 27. The environmental pollution	27	6	2	3	1
21.	Lecture 28. Air pollution	28	6	2	3	1
22.	Lecture 29. Water pollution	29	6	2	3	1
23.	Lecture 30. Soil contamination. Global ecological effects	30	6	2	3	1
	Total for module IV		**24**	**8**	**12**	**4**
	TOTAL, hour	**30**	**156**	**60**	**75**	**21**

4. Themes of laboratory activities

№	Name of theme	Hours
1	Introduction to ecology	2
2	Terrestrial habitat. Adaptations of organisms to the terrestrial and aerial habitat	4
3	Comparison of leaves structure of heliophytes and sciophytes	4
4	Comparison of photophilic and shade loving leaf of one plant	2
5	Comparison of anatomical features of plants from different habitats	6
6	Adaptations of species to aquatic habitat	6
7	Life forms by Raunkiaer system	4
8	Evaluation of plants and animals size, density and population	5
9	Competitive relationships	5
10	Competition of two species for limited resources	6
11	Predator – prey cycles	3
12	Structure and dynamic of ecosystem	2
13	Examining the stages in ecological succession	2
14	Biosphere and its components	1
15	Hydrosphere	1
16	Water cycle	2
17	Nitrogen cycle	2
18	Sulfur cycle	2
19	Phosphorus cycle	2
20	Carbon cycle	2
21	Air pollution	1
22	Car pollution	1
23	Assessment of car pollution on the main street (carbon monoxide concentration)	3
24	Water pollution	1
25	Determination of noise pollution	3
26	Estimation of environment contamination on a base of lichen indication	3
Total, hours		**75**

5. Independent study

№	Name of theme	Hours
1	Independent studies 1. Adaptations of Plants to Water Scarcity and Heat	2
2	Independent studies 2. Terrestrial biomes	2
3	Independent studies 3. Aquatic biomes	2
4	Independent studies 4. Assay	3
5	Independent studies 5. The phosphorus cycle	3
6	Independent studies 6. The sulfur cycle	3
7	Independent studies 7. The assay	3
8	Independent studies 8. Presentation and test	3
Total, hours		**21**

6. Control questions

1. Types of Habitat. Climatic factors
2. Photoperiodism and examples
3. Effect of Light on Animals
4. Interaction between members of a species: mating and parental care
5. Topographic or physiographic factors
6. Range of tolerance
7. Interaction between members of a species: family formation
8. Edaphic Factors
9. Interaction between members of a species: aggregations and types
10. Interaction between members of a species: types of communication
11. Give a definition of the term "ecology".
12. History and different branches of ecology
13. Interaction between members of a species: Society Formation
14. Temporary and non- temporary aggregations
15. Significance of aggregations
16. Adaptation and its types
17. Adaptation to flight
18. Adaptation of fish to the water environment
19. Adaptation of plants to water quantity
20. Adaptation of plants to water habitat
21. Adaptation of plats to light
22. Adaptation to digging
23. Biotic Community. Structure and features
24. Negative interactions amongst different species in a community
25. Positive interactions amongst different species in a community
26. Characteristics of Population
27. Age distribution of population
28. Primary Succession. Steps of formation
29. Secondary Succession. Steps of formation
30. Pyramid of biomass
31. Pyramid of numbers
32. Parasitic food chain. Provide an illustration
33. Pyramid of energy. Provide an illustration
34. Parasitic food chain. Provide an illustration
35. Detritus food chain. Provide an illustration
36. Grazing food chain. Provide an illustration
37. Food web. Food chain
38. Ecosystem and its types
39. Carbon cycle. Anthropogenic impact on carbon cycle
40. Phosphor cycle. Anthropogenic impact on phosphor cycle
41. Water cycle. Main steps
42. Nitrogen cycle. Anthropogenic impact on nitrogen cycle
43. Sulfur cycle. Anthropogenic impact on carbon cycle

44. Biosphere: structure and borders
45. Hydrosphere and its properties
46. Lithosphere and its structure
47. Atmosphere and its structure
48. Vernadskia and theory of anthroposphere
49. Water pollution.
50. Sources of water pollution. Negative impact
51. Air pollution.
52. Sources of air pollution. Negative impact
53. Land pollution.
54. Sources of land pollution. Negative impact
55. Global ecological consequences of anthropogenic pollution
56. Ecological problems in agriculture

7. Teaching methods

Verbal, visual, practical

8. Forms of control

Modules, test, exam

9. Evaluation and grading

Оцінювання знань студента відбувається за 100-бальною шкалою і переводиться в національні оцінки згідно з табл. 1 «Положення про екзамени та заліки у НУБіП України» (наказ про уведення в дію від 27.12.2019 р. № 1371).

Рейтинг студента, бали	**Оцінка національна за результати складання**	
	екзаменів	**заліків**
90-100	**Відмінно**	**Зараховано**
74-89	**Добре**	
60-73	**Задовільно**	
0-59	**Незадовільно**	**Не зараховано**

Для визначення рейтингу студента (слухача) із засвоєння дисципліни **Rдис** (до 100 балів) одержаний рейтинг з атестації (до 30 балів) додається до рейтингу студента (слухача) з навчальної роботи **Rнр** (до 70 балів): **R дис = R нр + R ат**

10. Required and recommended references

Methodological support

1. *Rubezhnyak I.G.* Workbook to laboratory works of discipline “Fundamentals of ecology” for students of higher education institute of III - IV accreditations levels, direction 101 “Ecology”. – Kiev, 2018.- 50 p.

2. *Rubezhnyak I.G.* Workbook to laboratory works of discipline "Fundamentals of ecology" for students of higher education institute of III - IV accreditations levels, direction 101 "Ecology". – Kiev, 2016.- 40 p.

11. Main readings

1. Ecology: Concepts and Applications/ Anna Sher and Manuel Molles.- 2022.-435 p.

2. Ecology: International Edition. Fifth Edition/ William D. Bowman, Sally D. Hacker- Oxford University press,2020.-744 p.

3. Ecology: A Very Short Introduction/ Jaboury Ghazoul.- - Oxford University press,2020.-176 p.