Appendix 2
to the order from 21.05. 2025 No. 646

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Botany, Dendrology and Forest Tree Breeding

"**APPROVED**"
Dean of the Faculty
of Plant Protection,
biotechnology and ecology
_____Yulia KOLOMIETS
"____"_____2025 p.

" **APPROVED** "
at the meeting of Department of
Botany, Dendrology and Forest Tree
Breading
Minutes No.10 from "25" 05 2025
Head of Department
_____ Yurii MARCHUK

"**REVIEWED** "
Guarantor of the AP Ecology
_____ Volodymyr BOHOLUBOV

CURRICULUM OF ACADEMIC DISCIPLINE
Biology I (botany)

Field of knowledge E Natural sciences, mathematics and statistics
Specialty E2 Ecology
Educational program Ecology
Education and Research Institute of Forestry and Landscape Park Management
Author: Andrii CHURILOV, Associate professor of the Department of Botany, Dendrology and Forest Tree Breading, Ph.D. in Botany, Associate professor

Kyiv – 2025

Description of the academic discipline Biology I (botany)

Currently, the problem of preserving vegetation cover in the context of global climate change, preserving the genetic, species and landscape diversity of the planet is becoming more acute, in connection with which qualified assessment and action by specialists in the field of ecology and the organization of environmental protection measures is necessary.

Botanical knowledge is necessary for future specialists for full-fledged scientifically based and rational management of the economy, restoration of natural properties and ecosystem functions of transformed landscapes.

The purpose of the botany course is to learn the laws of the structure, functioning and development of plants, their role in the development of the biosphere and their position in the system of the organic world for further economic activities in the system of rational nature management, improvement and use of plant resources.

The tasks are to form knowledge about the plant organism, its structure and functioning at all levels of organization, mastering the laws of development of plant populations and groups, the mutual influence of plant organisms and environmental factors. A deep understanding of the nature and life of phytocenosis is impossible without studying botany.

Field of knowledge, specialty, educational program, educational degree				
Educational degree	*Bachelor*			
Specialty	*E2 Ecology*			
Educational program	*Ecology*			
Characteristics of the discipline				
Type	*Required*			
Total number of hours	*60*			
Number of ECTS credits	*2*			
Number of modules	*2*			
Course project (work) (if available)	–			
Form of control	*Exam*			
Indicators of academic discipline for full-time and part-time forms of education				
	full-time form of education		part-time form of education	
Year of preparation	1		1	
Semester	1	2	1	2
Lectures		15 h.		6 h.
Practical, seminar classes				
Laboratory classes		30 h.		8 h.
Individual work		15 h.		46 h.
Educational practice		30 h.		
Number of weekly hours for full-time study: classroom -		3,5 h.		

2. Purpose, tasks and competencies of the discipline

The course is designed to enable students develope their future professional skills. Feature, that compared this course from other similar courses are professionally oriented specific focus on the requirements of future specialists in ecology, include material from cell structure and functions to structure and development of plant communities.

Presentation of General Botanical Material is allowing to have opportunities in floristical and geobotanical investigation of different terrestrial ecosystems. As examples for the practical study in plant hystology, organography, morphological and anatomical features will be used as well as systematic, environmental and phytocoenotic association representatives into different plant communities.

The task of the botany course is as follows:

- to teach students to think in botanical categories, to be able to analyze natural phenomena and processes occurring in the plant world at different levels of the organization;
- master the methods of botanical research in the field and laboratory conditions;
- to study anatomical, morphological features, their role in plant life;
- to master the method of determining plants, their systematization;
- be able to analyze the ecological and coenotic properties of species and phytocenoses;
- provide information on rare species of plants and plant communities of Ukraine of different degrees of protection, primarily those listed in the "Red Book of Ukraine" and the "Green Book of Ukraine";
- to study the characteristics of vegetation of botanical and geographical zones of Ukraine;
- to find out the patterns of distribution of plants on the surface of the globe, natural areas of Ukraine.

As a result of studying the discipline the student must
know:
- botanical and ecological-coenotic characteristics of edificators, co-dominants and indicator species of phytocenoses;
- the main anatomical and morphological features of the structure, economic properties of the main plants that occur in the phytocenoses of Ukraine;
- indicative properties of plants in relation to the main environmental factors, their role in determining habitat conditions;
- environmental factors and their impact on the development of natural and cultural plant groups;
- features of the impact of environmental factors on the environment and phytocenoses;
- types of vegetation of Ukraine, their latitudinal zonation and altitude zonation;
- methods and techniques of field geobotanical research of natural and derived plant groups;
- rare species and plant communities and botanical characteristics of the main structural elements of the ecological network of Ukraine.

be able to:
- work independently with a microscope, use laboratory and field instruments;
- correctly analyze the studied botanical objects and make scientifically sound conclusions;
- identify plants and assess their ecological adaptability and resource significance;
- independently conduct field geobotanical research of natural and field vegetation;
- correctly and qualitatively take samples of biological (plant) material for analysis;
- to establish research sites and accounting sites of monitoring studies;
- correctly design and interpret the results of field botanical research;
- make geobotanical descriptions, draw a geomorphological profile and link descriptions;
- based on the results of field research to provide an opinion on the current state of the land and predict its improvement and rational use of plant resources;
- apply knowledge of forest ecology for forestry;
- use ecological and phytocenotic classifications to determine forest vegetation conditions, habitats.

General competencies (GC):

GC1. Knowledge and understanding of the subject area and professional activity.

GC8. Ability to conduct research at an appropriate level.

Professional (special) competencies (PC):

PC2. Ability to critically understand basic theories, methods and principles of natural sciences.

PC8. The ability to justify the need and develop measures aimed at preserving landscape and biological diversity and forming an ecological network.

Program learning outcomes (PLO) of the programme:

PLO2. Understand the main environmental laws, rules and principles of environmental protection and balanced nature use.

PLO17. To be aware of the responsibility for the effectiveness and consequences of the implementation of complex environmental protection measures.

3. Program and structure of the discipline for:

– full-time (part-time) forms of study.

Names of modules and topics	Number of hours												
	full-time							part-time					
	weeks	total	include					total	include				
			lect		lab		ind		lect		lab		ind
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Content module 1													
Section 1. Cytology, histology													
Topic 1.1 The plant cell	1	3	1		2			2,5	0,25		0,25		2
Topic 1.2. Plant tissues	1	3,25	1		2		0,25	2,5	0,25		0,25		2
Section 2. Organography													
Topic 2.1. Root	1	3,25	1		2		0,25	2,5	0,25		0,25		2
Topic 2.2. Stem	1	3,5	1		2		0,5	2,5	0,25		0,25		2
Topic 2.3. Leaf	0,4	2	0,5		1		0,5	2,5	0,25		0,25		2
Topic 2.4. Reproduction	0,1	0,5	0,5					2,5	0,25		0,25		2
Section 3. The system of the organic world: prokaryotes, fungi, lower plants													
Topic 3.1. Introduction to taxonomy. Viruses, Prokaryotes, Fungi	1	5,5	1,5		2		2	4					4
Section 4. Lower plants													
Topic 4.1. Algae	1	2,5	0,5		2			2					2
Section 5. Higher spore plants (archegoniates)													
Topic 5.1. Mosses	1	3	0,5		2		0,5	2,75	0,25		0,5		2
Topic 5.2. Club mosses	0,3	1,5	0,5		0,5		0,5	2,75	0,25		0,5		2
Topic 5.3. Horsetails	0,3	1,5	0,5		0,5		0,5	2,75	0,25		0,5		2
Topic 5.4. Ferns	0,3	1,75	0,25		1		0,5	2,75	0,25		0,5		2
Topic 5.5. Gymnosperms	1	3,25	0,25		2		1	3	0,50		0,5		2

Total on the content module 1	35		9		19		7	33	3		4		26
Content module 2												
Chapter 6. Flowering plants												
Topic 6.1 Flower, inflorescence	1	4	1		2		1	2,75	0,25		0,50		2
Topic 6.2. Fruits, Seeds	1	4	1		2		1	2,75	0,25		0,50		2
Topic 6.3. Dicotyledons	1	4	1		2		1	3	0,50		0,50		2
Topic 6.4. Monocotyledons	1	4	1		2		1	3	0,50		0,50		2
Chapter 7. Fundamentals of geobotany													
Topic 7.1. Geography of plants	0,25	2	0,5		0,5		1	3,75	0,25		0,50		3
Topic 7.2. Phytocenology	0,25	2	0,5		0,5		1	3,75	0,25		0,50		3
Topic 7.3. Ecology of plants and phytocenoses	0,25	2,5	0,5		1		1	4	0,50		0,50		3
Topic 7.4 Conservation and restoration of phytodiversity	0,25	2,5	0,5		1		1	4	0,50		0,50		3
Total on the content module 2	25		6		11		8	27	3		4		20
Total:	60		15		30		15	60	6		8		46

2. Topics of lections

No.	Topic names	Quantity hours
1	Introduction to the course of botany. The structure of the plant cell: protoplast and its products of vital activity. Plant tissues - an introduction to histology	2
2	Introduction to organography, vegetative organs: characteristics of the vegetative body of a flowering plant, types of tissues, root morphology and types of root systems; structure of the shoot, buds, morphology and anatomy of the stem part of the shoot. Leaf. Features of reproduction in plants	3
3	Introduction to taxonomy: classification systems of the organic world, biodiversity, viruses, prokaryotes, fungi, algae	2
4	Higher plants – archegonias: bryophytes-gymnosperms	2
5	Structure of generative organs of angiosperms (flower, fruit)	2
6	Angiosperms: families of the dicotyledonous group of monocotyledons	2
7	Fundamentals of geobotany: geography, plant ecology, phytocoenology and plant protection	2
Total:		15

3. Topics of laboratory classes

No.	Topic names	Quantity hours
1	The structure of the microscope and the technique of working with it. Plant cell structure. Plastids. Spare nutrients. Starch and aleurone grains. Movement of the cytoplasm. Vacuoles, cell juice, pigments.	2
2	Integumentary tissues. Primary cover tissues. Secondary and tertiary integumentary tissues.	1
3	Mechanical tissues. Conductive tissues. Vascular bundles.	1
4	Organography. Root morphology and metamorphosis. Zones of the root, the primary anatomical structure of the root	1
5	Secondary anatomical structure of the root. Features of anatomical structure of root	1
6	Morphological structure of the shoot. Anatomical structure of the Monocot stems.	1
7	Anatomical structure of the stem of herbaceous dicotyledonous plants. Vascular bundle types. Anatomical structure of the Dicot stems	0,5
8	Macroscopic structure of a woody stems.	0,5
9	Anatomical structure of herbal plant stems	1
10	Leaf. Leaf morphology. Anatomical structure of a corn leaf and a Japanese camellia. Features of the structure of pine needles	0,5
11	Fungy. Division of chytridomycota. Class chytridiomyocetes Chytridiomyocetes. Department of oomycota. Class oomycetes. Department of zygomycot.	0,5
12	Division of Ascomycota. Class of marsupial fungi or ascomycetes (Assomyces)	1
13	Division of Basidiomycota. Class basidiomycetes or basidiomycetes (Basidiomycetes). Lichens, lichenized mushrooms (Lishenes	2
14	Division of green algae (Chlorophyta). Department of Charophyta. Class choral (Charophyceae).	2
15	Class liverworts (Marchantiopsida). Class deciduous, or true mosses (Bryorsida)	1
16	Ferns. The structure of sporophytes and gametophytes of the male thyroid, floating salvinia	1
17	Angiosperms. Class pine, or coniferous (Pinopsida)	2
18	Flower morphology. Flower formula and diagram. Types of inflorescences	1
19	Flower anatomy. The structure of the anther, ovary and seed germ.	1
20	Fetal formation. Structure Classification of fruits. Fertility	2
21	Methods of plant herbarium. Morphological analysis plan and technique for determining flowering plants. Identification of plants from the families Ranunculaceae	2
22	Identification of plants from the families Boraginaceae, cabbage (Brassicaceae) Definition of plants from the families Rosaceae, legumes (Fabaceae). Identification of plants from families of families lily (Liliaceae), fine-legged (Poaceae), sedge (Cyperaceae).	2
23	The structure of the phytocenosis and its functioning (on the example of forest groups of NPP "Holosyivskyi")	3
	Total	30

4. Topics of independent student works

No.	Topic names	Quantity hours
1	Comparative morphology of vegetative organs of higher plants, the essence of metamorphoses as evolutionarily fixed adaptations to the environment	2
2	Adaptations to life on land in higher plants: comparative characteristics of departments	4
3	Evolution of the Angiosperm plants: basic concepts of their development	5
4	Phytoindication method, its application and opportunities for improving environmental research	4
Total:		15

5. Methods and means of diagnosing learning outcomes:

– oral or written survey;
– interview;
– testing;
– defense of laboratory/practical, computational/graphic works, projects.

6. Teaching methods:

– problem-based learning method;
– practice-oriented learning method;
– case method;
– research-based learning method.

9. Assessment of learning outcomes.

The knowledge of a higher education applicant is assessed on a 100-point scale and is converted into a national assessment in accordance with the current "Regulations on Examinations and Tests at the NUBiP of Ukraine"

8.1. Distribution of points by types of educational activities

Type of educational activity	Learning outcomes	Assessment
First semester		
Module 1. Organography of seed plants. System of the organic world		
Lab work 1	PLO2. Understand the main environmental laws, rules and principles of environmental protection and balanced nature use. PLO17. To be aware of the responsibility for the effectiveness and consequences of the implementation of complex environmental protection measures. Laboratory and independent work has been assigned and protected.	**2**
Lab work 2		**2**
Lab work 3		**2**
Lab work 4		**2**
Lab work 5		**2**
Lab work 6		**2**
Lab work 7		**2**
Lab work 8		**2**
Lab work 9		**2**
Lab work 10		**4**
Lab work 11		**4**
Lab work 12		**4**
Lab work 13		**4**
Lab work 14		**4**
Lab work 15		**4**
Lab work 16		**4**
Lab work 17		**4**
Independent work 1		**10**
Independent work 2		**10**
Test 1	Answers to test and open-ended questions provided	**30**
Total for module count 1		**100**
Модуль 2. **Систематика квіткових рослин. Основи геоботаніки**		
Lab work 18	PLO2. Understand the main environmental laws, rules and principles of environmental protection and balanced nature use. PLO17. To be aware of the responsibility for the effectiveness and consequences of the implementation of complex environmental protection measures. Laboratory and independent work has been assigned and protected.	**5**
Lab work 19		**5**
Lab work 20		**5**
Lab work 21		**5**
Lab work 22		**5**
Lab work 23		**5**
Independent work 3		**20**
Independent work 4		**20**
Test 2	Answers to test and open-ended questions provided	**30**
Total for module count 2		**100**
Educational work	**(M1 + M2)/2*0,7**	**70**
Exam		**30**
Total:	**(70 + 30)**	**100**

8.2. Scale for assessing knowledge of a higher education applicant

Higher education applicant rating, points	National grading system (exams/credits)
90-100	perfectly
74-89	good
60-73	satisfactorily
0-59	unsatisfactorily

8.3. Evaluation Policy

Deadline and resubmission policy:	Works submitted after the deadline without good reason will be given a lower grade. Modules can be retaken with the permission of the lecturer if there is a good reason (for example, sick leave).
Academic Integrity Policy:	Cheating during tests and exams is prohibited (including using mobile devices). Coursework and essays must have correct text references to the literature used. Students must comply with copyright regulations when using any materials during the preparation and completion of course assignments.
Visitation Policy:	Attendance at classes is mandatory. For objective reasons (e.g. illness, international internship), training may take place individually (online upon agreement with the director of the NNI).

7. Educational and methodological support:

- electronic training course of the academic discipline (on the educational portal of the NUBiP of Ukraine eLearn - https://elearn.nubip.edu.ua/course/view.php?id=4486;
- links to digital educational resources;
- textbooks, study guides, workshops;
- methodological materials for studying the academic discipline for full-time and part-time higher education students;
- program of educational (industrial) practice of the academic discipline (if it is provided for by the curriculum).

7. Recommended sources of information

1. Bryophyte Ecology (електронна книга англійською мовою про екологію мохоподібних, особливості їхньої біології та взаємодії із іншими організмами). Доступ за адресою: https://digitalcommons.mtu.edu/bryophyte-ecology/
2. Global Biodiversity Information Facility (GBIF) https://www.gbif.org
3. iNaturalist – електронна відкрита база данних по біорізноманіттю https://www.inaturalist.org
4. Plant Anatomy Database (англомовний ресурс, містить ілюстрації анатомічних зрізів вегетативних органів вищих рослин). Доступ за адресою: https://anatomy.plb.ucdavis.edu/
5. Plants of the World online (англомовний ресурс, присвячений сучасній систематиці і таксономії вищих рослин, наявні ілюстрації рослин). Доступ за адресою: http://powo.science.kew.org/
6. The Gymnosperm Database (англомовний ресурс присвячений таксономії та біологічним і екологічним особливостям рослин з відділу голонасінні). Доступ за адресою: https://www.conifers.org/index.php
7. The Plant List (англомовний ресурс, присвячений сучасній систематиці і таксономії вищих рослин). Доступ за адресою: http://www.theplantlist.org/
8. World Ferns (англомовний ресурс присвячений таксономії та біологічним і екологічним особливостям рослин з відділів плауноподібні та папоротеподібні). Доступ за адресою: https://worldplants.webarchiv.kit.edu/ferns/