NATIONAL UNIVERSITY OF BIORESOURCES AND NATURE MANAGEMENT OF UKRAINE
Department of Botany, Dendrology and Forest Tree Breeding

APPROVED
Faculty of Plant Protection,
Biotechnology and Ecology
protocol 9 from 21th of May 2026

WORKING PROGRAM OF THE 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
Developer: Andrii CHURILOV, Associate Professors of the Department, Ph.D., Associate Professor

Kyiv – 2026

1. Description of the academic discipline

Biology I (botany)

Field of knowledge, specialty, educational program, educational degree				
Освітній ступінь	*Bachelor*			
Спеціальність	*E2 Ecology*			
Освітня програма	*Ecology*			
Characteristics of the academic discipline				
Type	*Required*			
Total hours	*60*			
Number of ECTS credits	*2*			
Number of modules	*2*			
Course project (if relevant)	–			
Control form	*Exam*			
Academic discipline indicators for full-time and part-time forms of study				
	full-time form of study		part-time form of study	
Year of preparation	1		1	
Semester	1	2	1	2
Lections		15 h.		6 h.
Practical classes				
Lab classes		30 h.		8 h.
Independent work		15 h.		46 h.
Field practice		30 h.		
Number of weekly hours for full-time study: classroom – student's independent work −		 3,5 h.		

1. Purpose, objectives and competencies of the academic discipline

The aim of the course *Biology I (Botany)* is to provide students with an understanding of the principles governing the structure, functioning, and development of plants, their role in the evolution of the biosphere, and their place within the system of the organic world, thereby contributing to sustainable management practices. Particular emphasis is placed on the conservation and restoration of natural resources, including the improvement and rational use of plant resources.

The objectives of the Botany course are to:

- develop students' ability to think in botanical terms and to analyse natural phenomena and processes occurring in the plant kingdom at different levels of biological organization;
- provide training in botanical research methods under field and laboratory conditions;
- study anatomical and morphological features of plants and their significance for plant life;

- master methods of plant identification and classification;
- develop the ability to analyse ecological and coenotic characteristics of species and phytocoenoses;
- provide information on rare plant species and plant communities of Ukraine under different levels of protection, particularly those included in the *Red Data Book of Ukraine* and the *Green Book of Ukraine*;
- study the characteristics of the vegetation cover of the botanical and geographical regions of Ukraine;
- reveal the patterns of plant distribution across the Earth's surface and within the natural zones of Ukraine.

Upon completion of the course, students should possess the following knowledge:

- botanical, ecological, and coenotic characteristics of edificator, codominant, and indicator species of phytocoenoses;
- major anatomical and morphological features and economic importance of the principal plant species occurring in the phytocoenoses of Ukraine;
- indicator properties of plants with respect to major environmental factors and their role in determining habitat conditions;
- ecological factors and their effects on the development of natural and cultivated plant communities;
- the influence of ecological factors on the environment and phytocoenoses;
- vegetation types of Ukraine, their latitudinal zonation, and altitudinal belts;
- methods and techniques of field geobotanical investigations of natural and secondary plant communities;
- rare species and plant communities, as well as the botanical characteristics of the main structural components of the ecological network of Ukraine.

Students should be able to:

- independently operate microscopes and use laboratory and field equipment;
- correctly analyse botanical objects under study and draw scientifically sound conclusions;
- identify plants and assess their ecological adaptability and resource value;
- independently conduct field geobotanical studies of natural and semi-natural vegetation;
- properly and accurately collect biological (plant) material for analysis;
- establish experimental plots and monitoring sample plots;
- correctly document and interpret the results of field botanical investigations;
- carry out geobotanical relevés, construct geomorphological profiles, and georeference vegetation descriptions;
- assess the current condition of a site based on field investigations and provide recommendations for its improvement and the rational use of plant resources;
- apply principles of forest ecology in forestry practice;
- use ecological and phytocoenotic classifications for determining forest site conditions and habitat types.

Competences Acquired

General Competences (GC)

- **GC8.** Ability to conduct research at an appropriate level.
- **GC16.** Ability to critically comprehend the basic theories, methods, and principles of natural sciences.

Professional Competences (PC)

- **PC2.** Ability to critically comprehend the basic theories, methods, and principles of natural sciences.
- **PC8.** Ability to justify the necessity for and develop measures aimed at conserving landscape and biological diversity and establishing ecological networks.

Programme Learning Outcomes (PLO)

- **PLO2.** Understand the fundamental ecological laws, rules, and principles of environmental protection and sustainable natural resource management.
- **PLO17.** Recognise responsibility for the effectiveness and consequences of implementing integrated environmental protection measures.

2. Program and structure of the academic discipline for:

– full-time (part-time) study

Names of content modules and topics	Number of an hours											
	full-time study						part-time study					
	total	include					total	include				
		lec	prc	lab	ind	indp		lec	prc	lab	ind	indp
1	2	3	4	5	6	7	8	9	10	11	12	13
Module 1. Introduction to botany: organography of higher plants												
Topic 1. Introduction to the botany course. The structure of a plant cell: protoplast and products of its vital activity. Plant tissues - an introduction to histology	7	2	4	–	–	1	6	1	1	–	–	5
Topic 2. Introduction to organography: tissues, vegetative organs of a plant organism	6	2	2	–	–	2	6	1	1	–	–	5
Topic 3. Characteristics of the vegetative body of a flowering plant: generative organs, features of reproduction in plants	6	2	2	–	–	2	12	1	1	–	–	10
Total for module 1:	19	6	8	–	–	5	24	3	3	–	–	20
Module 2. The system of the organic world: prokaryotes, fungi, lower and higher plants												
Topic 4. Introduction to systematics: classification systems of the organic world, biodiversity, viruses, prokaryotes, fungi, algae	10	2	6	–	–	2	7	1	1	–	–	5
Topic 5. Higher plants – archegonia plants: bryophytes-gymnosperms	12	2	8	–	–	2	6	–	1	–	–	5
Topic 6. Angiosperms: families of the dicotyledonous group of monocotyledons	10	2	6	–	–	2	12	1	1	–	–	6
Topic 7. Fundamentals of	9	3	2	–	–	4	11	1	–	–	–	10

geobotany: geography, plant ecology, phytocoenology and plant protection												
Total for module 2:	41	9	22	–	–	10	36	3	3	–	–	26
Total:	60	15	30	–	–	15	60	6	6	–	–	46

Topics of lections

No.	Topic	Hours
1	Topic 1. Introduction to the course of botany. The structure of the plant cell: protoplast and products of its vital activity. Plant tissues - introduction to histology	2
2	Topic 2. Introduction to organography: tissues, vegetative organs of a plant organism	2
3	Topic 3. Characteristics of the vegetative body of a flowering plant: generative organs, features of reproduction in plants	2
4	Topic 4. Introduction to systematics: classification systems of the organic world, biodiversity, viruses, prokaryotes, fungi, algae	2
5	Topic 5. Higher plants – archegonias: bryophytes-gymnosperms	2
6	Topic 6. Angiosperms: families of the dicotyledonous group of monocotyledons	2
7	Topic 7. Fundamentals of geobotany: geography, plant ecology, phytocoenology and plant protection	3
Total		15

Topics of practical classes

No.	Topic	Hours
1	The structure of the microscope and the technique of working with it. The structure of the plant cell. Plastids. Reserve nutrients. Starch and aleurone grains. Cytoplasmic movement. Vacuole, cell sap, cell sap pigments	2
2	Fundamentals of histology: types of plant tissue (forming, covering, mechanical, basic, conductive, secretory) and their complexes	2
3	Organography: anatomy and morphology of the root and shoot-flowering plants	2
4	Organography: anatomy and morphology of generative organs (flower, fruit, seed)	2
5	Systematics, life cycles, and ecology of fungi of the phylum Chytridomycota, Oomycota	2
6	Systematics, life cycles and ecology of fungi of the phylum Zygomycota, Ascomycota, and Basidiomycota	2
7	Systematics, life cycles and ecology of lower plants, such as representatives of green algae (Chlorophyta)	2
8	Higher spore plants: liverworts (Marchantiopsida) and mosses (Bryopsida)	2
9	Higher spore plants: systematics, life cycles and ecology of Lycopodiophyta and Equisetophyta	2
10	Higher spore plants: systematics, life cycles and ecology of ferns (Polypodiophyta)	2
11	Higher seed plants: systematics, life cycles and ecology of gymnosperms (Pinophyta)	2
12	Methodology of plant herbarization. Plan of morphological analysis and technique of identification of flowering plants on the example of a representative of the buttercup family (Ranunculaceae)	2
13	Identification of plants from the families Boraginaceae, Caryophyllaceae, Lamiaceae, Brassicaceae, Rosaceae, Fabaceae, Asteraceae, and Apiaceae	2

14	Identification of plants from the families Liliaceae, Iridaceae, Poaceae, Cyperaceae, and Juncaceae	2
15	The structure of the phytocenosis and its functioning (on the example of forest communities of the Holosiivskyi National Park)	2
	Total	30

Topics of independent work of students

No.	Topic	Hours
1	Comparative morphology of vegetative organs of higher plants, the essence of metamorphosis as evolutionarily fixed adaptations to the environment	2
2	Adaptations to life on land in higher plants: comparative characteristics of departments	3
3	Phylogeny of seed plants and features of the divisions of this group	4
4	Phytoindication method, its application and possibilities for improving ecological research	6
Total		15

Methods and Means of Learning Outcomes Assessment

- Oral or written examinations;
- Defence of laboratory assignments;
- Interviews;
- Rating-based assessment / self-assessment;
- Testing;
- Written tests.

Teaching Methods

- Research-based learning;
- Lectures;
- Teamwork;
- Practical classes;
- Practice-oriented learning.

Forms of Assessment

Assessment of students' knowledge (current and final) is carried out in accordance with the credit-modular system of educational process organization.

Current assessment is conducted during laboratory classes, individual assignments, current tests, and module assessment aimed at evaluating the acquisition of knowledge within a particular module. Module assessment is performed in the form of knowledge testing for each content module of the course. Each module test consists of 30 tasks. Every task contains 30 questions, each with 4–5 answer options, from which students are required to select the correct one. Each content module is assessed on a 100-point scale (100%).

Final assessment includes a pass/fail credit at the end of Semester I, a final examination at the end of Semester II, and a pass/fail credit for field training at the end of Semester II. The field training assessment requires students to submit a systematic herbarium collection. The maximum proportion of points awarded for students' academic work during the course is 70% (coefficient 0.7), whereas the final examination accounts for 30% (coefficient 0.3) of the total score.

By decision of the department, students may receive up to 10 additional points for activities not envisaged by the curriculum but contributing to the enhancement of knowledge and skills in the discipline (e.g., presentations at student conferences, prize-winning places in academic competitions, preparation of educational displays, etc.). In addition, the department may apply a penalty rating (negative score) of up to 5 points, which affects the overall academic performance rating.

Distribution of Points Awarded to Students

Students' academic achievements are evaluated on a 100-point scale and converted into national grades in accordance with Table 1 of the *Regulations on Examinations and Credits at the National University of Life and Environmental Sciences of Ukraine (NUBiP of Ukraine)*.

Student rating, points	National assessment based on the results of the exam	
	exams	credits
90-100	Excellent	Enrolled
74-89	Good	
60-73	Satisfactorily	
0-59	Unsatisfactorily	Not included

To determine a student's overall course rating **R** (maximum 100 points), the score obtained from the final assessment **RAT** (up to 30 points) is added to the student's rating for academic performance **RAP** (up to 70 points):

$$\mathbf{Rcourse = R_{AP} + R_{AT}.}$$

Distribution of points by types of educational activities

Topic	Results	Points
Module 1. Introduction to botany: organography of higher plants		
Practical work. The structure of the microscope and the technique of working with it. The structure of the plant cell. Plastids. Reserve nutrients. Starch and aleurone. Movement of the cytoplasm. Vacuole, cell sap, pigments of cell sap	PRN 1, PRN 2. The module is aimed at familiarizing students with the morphology of vegetative organs of plants, their evolutionary adaptations to the environment and the features of adaptations to life on land. Students will gain knowledge about the diversity of plant organs, their functions and evolutionary development, and will also learn to compare the morphological features of different plant departments	15
Practical work. Fundamentals of histology: types of tissues of a plant organism (forming, integumentary, mechanical, basic, conductive, secretory) and their complexes		15
Practical work. Organography: anatomy and morphology of the root and shoot of flowering plants		15
Practical work. Organography: anatomy and morphology of generative organs (flower, fruit, seed)		15
Independent work. Comparative morphology of vegetative organs of higher plants, the essence of metamorphosis as evolutionarily fixed adaptations to the environment		20
Independent work. Adaptations to life on land in higher plants: comparative characteristics of departments		20

Total for 1 module:		100
Module 2. The system of the organic world: prokaryotes, fungi, lower and higher plants		
Independent work. Phylogenesis of seed plants and features of the divisions of this group	PRN 1, PRN 2. The module is devoted to the study of phylogeny and features of the organic world, in particular prokaryotes, fungi and plants. Students will become familiar with the evolutionary features of these groups, learn to apply the phytoindication method for ecological research and analyze their role in natural ecosystems	15
Independent work. The phytoindication method, its application and possibilities for improving ecological research		15
Practical work. Systematics, life cycles and ecology of fungi of the phylum Chytridomycota (Chytridomycota, Oomycota)		5
Practical work. Systematics, life cycles and ecology of fungi of the mushroom-like organisms (Zygomycota, Ascomycota, Basidiomycota)		5
Practical work. Systematics, life cycles and ecology of lower plants, using the example of representatives of green algae (Chlorophyta)		5
Practical work. Higher spore plants: liverworts (Marchantiopsida) and mosses (Bryopsida)		5
Practical work. Higher spore plants: taxonomy, life cycles and ecology of Lycopodiophyta and Equisetophyta		5
Practical work. Higher spore plants: taxonomy, life cycles and ecology of ferns (Polypodiophyta)		5
Practical work. Higher seed plants: systematics, life cycles and ecology of gymnosperms (Pinophyta)		5
Practical work. Methodology of plant herbarization. Plan of morphological analysis and technique of identification of flowering plants using the example of a representative of the buttercup family (Ranunculaceae)		5
Practical work. Identification of plants from the families Boraginaceae, Caryophyllaceae, Lamiaceae, Brassicaceae, Rosaceae, Fabaceae, Asteraceae, and Apiaceae		10
Practical work.		10

Identification of plants from the families Liliaceae, Iridaceae, Poaceae, Cyperaceae, and Juncaceae		
Practical work. The structure of phytocenosis and its functioning (on the example of forest communities of the Holosiivskyi National Park)		10
Total for module 2:		100
Education activities (total for semester)		70
Exam		30
Total		100

Incentive points. In order to stimulate the research activity of higher education applicants, it is possible to award up to 10 additional points for scientific activity and academic activity. The basis for awarding points may be the preparation of theses and speeches at scientific conferences, participation in the work of a student scientific circle, assistance in organizing and maintaining a scientific herbarium, participation in field research and scientific events of the department, as well as other forms of scientific activity that contribute to the deepening of professional competencies. The decision on the number of points awarded is made by the teacher, taking into account the content, quality and practical significance of the work performed.

Methodological support

1. Верхогляд І.М., Алейніков І.М., Якубенко Б.Є. (2010). Курс лекцій з цитології рослин. Київ: Фітосоціоцентр. 179 с.
2. Бережняк М.Ф., Якубенко Б.Є., Тонха О.Л., Чурілов А.М., Сендзюк Р.В., Бережняк Є.М. (2021). Ґрунтознавство з основами геоботаніки. Підручник. К.: Ліра-К, 632 с.
3. Григора І.М., Якубенко Б.Є., Алейніков І.М., Лушпа В.І., Шабарова С.І., Царенко П.М., Пидюра О.І. (2015). Ботаніка. Практикум: навчальний посібник. Київ: Арістей. 340 с.
4. Лушпа В.І., Алейніков І.М., Григора І.М., Шабарова С.І., Якубенко Б.Є. (2002). Систематика квіткових рослин. Двосімядольні. Київ: Вид-во НАУ. 191 с.
5. Лушпа В.І., Алейніков І.М., Григора І.М., Шабарова С.І., Якубенко Б.Є. (2002). Систематика квіткових рослин. Односімядольні. Київ: Вид-во НАУ. 31 с.
6. Якубенко Б.Є., Попович С.Ю., Григорюк І.П., Мельничук М.Д. (2013). Геоботаніка: тлумачний словник. Навчальний посібник. Київ: Фітосоціоцентр, 420 с.
7. Якубенко Б.Є. (2015). Польовий практикум з ботаніки. Навчальний посібник . Київ: Фітосоціоцентр. 400 с.
8. Чурілов А.М., Якубенко Б.Є. (2015). Ботаніка. Методичний посібник щодо користування лісотипологічним гербарієм. Київ: Видавничий центр НУБіП України. 176 с.
9. Чурілов А.М. (2022). Особливості вивчення рослинного покриву лісів. Київ: Експодрук. 160 с.

References

1. Войтюк Ю.О. Кучерява Л.Ф., Баданіна В.А., Брайон О.В. (1998). Морфологія рослин з основами анатомії та цитоембріології. Київ: Фітосоціоцентр. 216 с.
2. Григора І.М., Алейніков І.М., Лушпа В.І., Шабарова С.І., Якубенко Б.Є. (2015). Курс загальної ботаніки. Київ: Фітосоціоцентр. 535 с.
3. Григора І.М., Шабарова С.І., Алейніков І.М. (2015) Ботаніка. Київ: Фітосоціоцентр. 504 с.
4. Григора І.М., Якубенко Б.Є. (2013). Геоботаніка. Київ: Арістей. 448 с.

5. Костіков І.Ю. Джаган В.В., Демченко Е.М., Бойко О.А., Бойко В.Р., Романенко П.О. (2007). Ботаніка. Водорості та гриби. Київ: Арістей. 476 с.
6. Нечитайло В.А., Кучерява Л.Ф. (2000). Ботаніка. Вищі рослини. Київ: Фітосоціоцентр. 432 с.
7. Основи роботи в середовищах програм Turboveg та JUICE (2015). Укладачі: Куземко А.А., Буджак В.В., Чорней І.І., Токарюк А.І. Чернівці: Чернівецький національний університет. 64 с.

Information resources

Ботаніка (Еко): https://elearn.nubip.edu.ua/course/view.php?id=4486

1. Plant Anatomy Database (an English-language resource containing illustrations of anatomical sections of vegetative organs of higher plants). Access at: https://anatomy.plb.ucdavis.edu/
2. The World of Mushrooms of Ukraine (a resource dedicated to the diversity of true mushrooms of the flora of Ukraine, containing photo illustrations of species and information on their use in cooking). Access at: http://gribi.net.ua
3. iNaturalist – an electronic open database on biodiversity https://www.inaturalist.org
4. National Biodiversity Information Network Ukrbin http://ukrbin.com
5. Global Biodiversity Information Facility (GBIF) https://www.gbif.org
6. Bryophyte Ecology (an English-language e-book on the ecology of bryophytes, the peculiarities of their biology and interaction with other organisms). Available at: https://digitalcommons.mtu.edu/bryophyte-ecology/
7. World Ferns (English-language resource devoted to the taxonomy and biological and ecological features of plants of the divisions of the ferns and fern-like plants). Available at: https://worldplants.webarchiv.kit.edu/ferns/
8. The Gymnosperm Database (English-language resource devoted to the taxonomy and biological and ecological features of plants of the division of the gymnosperms). Available at: https://www.conifers.org/index.php
9. Plants of the World online (English-language resource devoted to the modern systematics and taxonomy of higher plants; contains illustrations of plants). Available at: http://powo.science.kew.org/
10. Ukrainian geobotanical site http://geobot.org.ua/