

**NATIONAL UNIVERSITY of LIFE and
ENVIRONMENTAL SCIENCES**
Department of Botany, Dendrology and Forest Tree Breeding

«**CONFIRMED**» by
Agrobiological
faculty dean



Vitalii KOVALENKO

« _____ » _____ 2025

«**APPROVED**»
at the meeting of the department of Botany,
Dendrology and Forest Tree Breeding
Protocol № 10 dated «29th of 05» 2025



Head of Department
Yurii Marchuk

«**REVIEWED**»



Guarantor of EP
Volodymyr MOKRIIENKO

WORKING PROGRAM OF STUDY DISCIPLINE

BOTANY

Branch of knowledge H Agriculture, forestry, fisheries and veterinary medicine
Specialty H1 Agronomy (Agronomy)
Educational program Agronomy
Agrobiological faculty
Developer Associate Professor, PhD in Biological Sciences Anatolii TERTYSHNYI

Description of the study discipline «Botany»

Botany (OK1) is a mandatory component of the general training cycle (Educational and professional program "Agronomy" for the training of applicants for the first (bachelor's) level of higher education in the specialty H1 Agronomy of the field of knowledge H Agriculture, forestry, fisheries and veterinary medicine. Qualification: bachelor of agronomy. Minutes No. 10 of April 25, 2025 of the meeting of the Academic Council of NUBiP of Ukraine)

The **objectives** of the botany course are as follows

- to study botanical terminology and methods of investigation of plants that are necessary to study plants on practice; to form for student's general vision of the plant world.
- to learn, to analyze and to work with the literature and botanical objects;
- to learn a technique of experimental research of botanical objects in laboratory and in practice;
- to learn the laws of morphological and anatomical structure and development of plants and microorganisms;
- to learn a technique of identification of plants, their taxonomy;
- to learn and to analyze the botanical phenomena, changes and to form the appropriate conclusions.

As a result of teaching of academic subject the student

has to know terms, systematic and main groups of plants;

can operate on the botanical terminology and methods of investigation of plants that are necessary to study plants on practice. The variety of plants induces the study of specific features of different groups of plants, their development, phylogenic relations and value for agriculture.

Branch of knowledge, direction of training, study quality level		
Level of education	Bachelor	
Specialty	H1 Agronomy (Agronomy)	
Educational program	Agronomy	
The description of the study discipline		
Form	Obligatory	
Total number of hours	150	
Number of credits ECTS	5	
Number of modules	2	
Course project (work) in the presence		
Form of control	exam	
Indexes of study discipline for full-time tuition and distance learning of obtaining higher education		
	Full-time tuition of obtaining higher education	Distance learning of obtaining higher education
Year of study	1	1
Semester	2	1
Lecture lessons	45 hours	10 hours
Practical, seminar lessons		
Laboratory lessons	60 hours	8 hours
Selfwork	45 hours	162 hours
Hours per week for full-time tuition of obtaining higher education	7 hours	

1. Aim, tasks, competencies and program results of the educational discipline

Aim is to study the laws of development of plants as major components of biosphere.

Competence acquisition:

Integral competence (IC):

The ability to solve complex specialized tasks and practical problems in agronomy, which involves the application of theories and methods of the relevant science and is characterized by the complexity and uncertainty of conditions.

General competences (GC):

GC 6. Knowledge and understanding of the subject area and understanding of professional activity;

GC 7. Ability to apply knowledge in practical situations;

GC 11. Efforts to preserve the environment.

Special (professional) competences (SC):

SC 3. Knowledge and understanding of basic biological and agrotechnological concepts, rules and theories related to the cultivation of agricultural and other plants;

SC 4. Ability to apply knowledge and understanding of the physiological processes of agricultural plants to solve production technological problems.

Program learning outcomes (PLO):

PLO 6. Demonstrate knowledge and understanding of fundamental disciplines to the extent necessary to possess appropriate skills in the field of agronomy;

PLO 9. Possess at the operational level methods of observation, description, identification, classification, as well as cultivation of objects and maintaining the stability of agrocenoses while preserving natural diversity;

PLO 10. Analyze and integrate knowledge from general and special professional training to the extent necessary for specialized professional work in the field of agronomy.

2. Program and structure of the study discipline

Names of content modules and topics	Hours													
	Full-time education							Distance learning						
	week	total	including					total	including					
			lec	pr	lr	ind	sw		lec	pr	lr	ind	sw	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Module 1. Propagation of plants. Introduction to systematic. Non-vascular and vascular seedless plants.														
Topic 1. Introduction to botany	1	2	2		1			5	1				4	
Topic 2. Propagation. Plant systematic. Introduction to systematic. LUCA, Bacteria, Arkarya	1	12	4		3		4	7,5	1		0,5		6	
Topic 3. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae. Nonvascular & vascular seedless Embryophyta.	2	3	1		1		1	7,5	0,25		0,25		7	
Total		17	7		5		5	20	2,25		0,75		17	
Module 2. Seed plants. Systematic of flowering plants. Basis of phytocoenology. Basis of phytogeography.														
Topic 1. Spermatophyta, Gymnospermatophyta . General characteristic and classification of Flowering plants (Magnoliophyta, APG IV) .	2,3	22	6		8		8	14	2		2		10	
Topic 2. Characteristic of Magnoliophyta families (APG IV). ANA GRADE Nymphaeales Nymphaeaceae Austrobaileyales Schisandraceae MAGNOLIIDS Piperales Aristolochiaceae Piperaceae Magnoliales	4, 5, 6, 7, 8, 9, 10	55	15		25		15	94,5	3		1,5		90	

Magnoliaceae Laurales Lauraceae MONOCOTS Acorales Acoraceae Alismatales Alismataceae Araceae Butomaceae Liliales Liliaceae Asparagales Amaryllidaceae Asparagaceae Iridaceae Orchidaceae Zingiberales Zingiberaceae Poales Bromeliaceae Cyperaceae Juncaceae Poaceae EUDICOTS Ranunculales Berberidaceae Papaveraceae Ranunculaceae SUPERROSIDS Saxifragales Grossulariaceae ROSIDS Vitales Vitaceae Fabales Fabaceae Rosales Cannabaceae Elaeagnaceae Moraceae Rosaceae Urticaceae Fagales Betulaceae Fagacea Juglandaceae Cucurbitales Cucurbitaceae Malpighiales Euphorbiaceae Myrtales Lythraceae Sapindales Rutaceae Malvales Malvaceae Brassicales Brassicaceae Resedaceae													
Theme 3. Characteristic of families (APG IV). SUPERASTERIDS Caryophyllales	10, 11, 12, 13	38	11		16		11	23	2		2		19

Amaranthaceae												
Caryophyllaceae												
Polygonaceae												
Portulacaceae												
ASTERIDS												
Ericales												
Actinidiaceae												
Ericaceae												
Gentianales												
Apocynaceae												
Boraginales												
Boraginaceae												
Solanales												
Solanaceae												
Lamiales												
Lamiaceae												
Oleaceae												
Orobanchaceae												
Pedaliaceae												
Asterales												
Asteraceae												
Dipsacales												
Adoxaceae												
Caprifoliaceae.												
Apiales												
Apiaceae												
Topic 4. Elements of Phytocenology	13, 14	9	3		3		3	17,75	0,5		0,25	17
Topic 5. Elements of Phytogeography	15	9	3		3		3	10,75	0,5		0,25	10
Total	15	133	38		55		40	160	8		6	146
All hours per year		150	45		60		45	180	10		8	162

3. Lecture topics

№	Topic title	Number of hours
1	Introduction to Botany.	2
2	Propagation. Plant systematic. Introduction to systematic. LUCA, Bacteria, Arkarya	4
3	Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae.	1
4	Spermatophyta, Gymnospermatophyta . General characteristic and classification of Flowering plants (Magnoliophyta, APG IV)	6
5	Characteristic of Magnoliophyta families (APG IV). ANA GRADE MAGNOLIIDS MONOCOTS. EUDICOTS. SUPERROSIDS.	15
6	Characteristic of Magnoliophyta families (APG IV). SUPERASTERIDS. ASTERIDS.	11
7	Elements of Phytocenology	3
8	Elements of Phytogeography	3

4. Topics of laboratory works

№	Topics of laboratory works	Hours
1	Bacteria, Viruses, Algae	2
2	Fungi. Chytridiomycota, Chytridiomycetes. Oomycota, Oomycetes. Zygomycota. Ascomycota, Ascomycetes. Basidiomycota, Basidiomycetes. Lichens.	2
3	Bryophyta, Equisetophyta, structure, life cycle.	1
4	Magnoliophyta. Main peculiarities and classification.	2
5	Flower morphology. Formula and diagram of flower. Types of inflorescences. Anatomy of flower. Structure of stamen, ovary and seed embryo.	4
6	Seed formation. Seed structure of monocots and dicots plants.	2

7	Fruit formation. Structure and classification of fruits. Collective fruit.	2
8	Methodology of herbarization. Plan of morphological analysis. Plant identifying.	2
9	Plant identifying of family Ranunculaceae	2
10	Plant identifying of family Berberidaceae, Papaveraceae, Portulacaceae, Caryophyllaceae	2
11	Plant identifying of family Amaranthaceae, Polygonaceae	2
12	Plant identifying of family Betulaceae, Juglandaceae	2
13	Plant identifying of family Actinidiaceae, Ericaceae	2
14	Plant identifying of family Cucurbitaceae, Brassicaceae, Resedaceae	2
15	Plant identifying of family Moraceae, Cannabaceae, Urticaceae, Euphorbiaceae	2
16	Plant identifying of family Lythraceae, Adoxaceae	2
17	Plant identifying of family Fabaceae, Rutaceae, Elaeagnaceae	2
18	Plant identifying of family Vitaceae, Apiaceae, Caprifoliaceae	2
19	Plant identifying of family Boraginaceae, Solanaceae, Pedaliaceae	2
20	Plant identifying of family Lamiaceae, Asteraceae	2
21	Plant identifying of family Iridaceae, Liliaceae	2
22	Plant identifying of family Amaryllidaceae	2
23	Plant identifying of family Asparagaceae, Orchidaceae, Bromeliaceae	2
24	Plant identifying of family Zingiberaceae, Juncaceae, Cyperaceae	2
25	Plant identifying of family Poaceae	4
26	Flora. Main ecological factors. Plant distribution.	3
27	Elements of Phytocenology	4

5. Topics of selfwork

№	Themes of selfwork	Hours
1	Topic 1. Introduction to botany	2
2	Topic 2. Propagation. Plant systematic. Introduction to systematic. LUCA, Bacteria, Arkarya	2
3	Topic 3. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae. Nonvascular & vascular seedless Embryophyta.	1
4	Topic 1. Spermatophyta, Gymnospermatophyta . General characteristic and classification of Flowering plants (Magnoliophyta, APG IV) .	8
5	Topic 2. Characteristic of Magnoliophyta families (APG IV). ANA GRADE Nymphaeales Nymphaeaceae Austrobaileyales Schisandraceae MAGNOLIIDS Piperales Aristolochiaceae Piperaceae Magnoliales Magnoliaceae Laurales Lauraceae MONOCOTS Acorales Acoraceae Alismatales Alismataceae Araceae Butomaceae Liliales Liliaceae Asparagales Amaryllidaceae Asparagaceae Iridaceae Orchidaceae Zingiberales Zingiberaceae Poales Bromeliaceae Cyperaceae Juncaceae Poaceae EUDICOTS Ranunculales Berberidaceae Papaveraceae Ranunculaceae SUPERROSIDS Saxifragales Grossulariaceae ROSIDS Vitales Vitaceae Fabales Fabaceae Rosales Cannabaceae Elaeagnaceae Moraceae Rosaceae Urticaceae Fagales Betulaceae Fagaceae Juglandaceae Cucurbitales Cucurbitaceae Malpighiales Euphorbiaceae Myrtales Lythraceae Sapindales Rutaceae Malvales Malvaceae Brassicales Brassicaceae Resedaceae	15
6	Topic 3. Characteristic of families (APG IV). SUPERASTERIDS Caryophyllales Amaranthaceae Caryophyllaceae Polygonaceae Portulacaceae ASTERIDS Ericales Actinidiaceae Ericaceae Gentianales Apocynaceae Boraginales Boraginaceae Solanales Solanaceae Lamiales Lamiaceae Oleaceae Orobanchaceae Pedaliaceae Asterales Asteraceae Dipsacales Adoxaceae Caprifoliaceae Apiales Apiaceae	11
7	Topic 4. Elements of Phytocenology	3
8	Topic 5. Elements of Phytogeography	3

6. Methods and means of diagnosing learning outcomes:

- oral or written survey;
- interview;
- testing;
- defense of laboratory/practical, computational/graphic works, projects;
- peer assessment, self-assessment.

7. Teaching methods:

- problem-based learning method;
- practice-oriented learning method;
- case method;
- project-based learning method;
- flipped classroom method, blended learning;
- research-based learning method;
- educational discussions and debates method;
- teamwork, brainstorming method
- gamified learning method.

8. Assessment of learning outcomes.

Assessment of knowledge of a higher education applicant is carried out 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 activity

Type of learning activity	Learning outcomes	Assessment
Module 1. Propagation of plants. Introduction to systematic. Non-vascular and vascular seedless plants. Module 2. Seed plants. Systematic of flowering plants. Basis of phytocoenology. Basis of phytogeography.		
Lecture 1. Introduction to Botany.	PLO 6, 9. 10. Including knowing: terms, systematic and main groups of plants; Can operate on the botanical terminology and methods of investigation of plants that are necessary to study plants on practice. The variety of plants induces the study of specific features of different groups of plants, their development, phylogenetic relations and value for agriculture.	-
Lecture 2. Propagation. Plant systematic. Introduction to systematic. LUCA, Bacteria, Arkarya		-
Laboratory work 1. Bacteria, Viruses, Algae		17
Self-study topic 1. Introduction to botany		17
Self-study topic 2. Propagation. Plant systematic. Introduction to systematic. LUCA, Bacteria, Arkarya		17
Lecture 3. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae. Nonvascular & vascular seedless Embryophyta.		-
Laboratory work 2. Fungi. Chytridiomycota, Chytridiomycetes. Oomycota, Oomycetes. Zygomycota. Ascomycota, Ascomycetes. Basidiomycota, Basidiomycetes. Lichens.		17
Laboratory work 3. Bryophyta, Equisetophyta, structure, life cycle.		16
Self-study topic 3. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae. Nonvascular & vascular seedless Embryophyta.		16
Module 1.		35
Total by module 1		100
Module 2. Seed plants. Systematic of flowering plants. Basis of phytocoenology. Basis of phytogeography.		
Lecture 4. Spermatophyta, Gymnospermatophyta . General characteristic and classification of Flowering plants (Magnoliophyta, APG	PLO 6, 9. 10. Including knowing: terms, systematic and main groups of plants; Can operate on the botanical terminology and methods of investigation of plants that are	-

IV)	necessary to study plants on practice. The variety of plants induces the study of specific features of different groups of plants, their development, phylogenic relations and value for agriculture.	
Laboratory work 4. Magnoliophyta. Main peculiarities and classification.		4
Laboratory work 5. Flower morphology. Formula and diagram of flower. Types of inflorescences. Anatomy of flower. Structure of stamen, ovary and seed embryo.		4
Laboratory work 6. Seed formation. Seed structure of monocots and dicots plants.		4
Laboratory work 7. Fruit formation. Structure and classification of fruits. Collective fruit.		4
Self-study topic 4. Spermatophyta, Gymnospermatophyta . General characteristic and classification of Flowering plants (Magnoliophyta, APG IV)		4
Lecture 5. Characteristic of Magnoliophyta families (APG IV). ANA GRADE MAGNOLIIDS MONOCOTS. EUDICOTS. SUPERROSIDS.		-
Laboratory work 8. Methodology of herbarization. Plan of morphological analysis. Plant identifying.		4
Laboratory work 9. Plant identifying of family Ranunculaceae		4
Laboratory work 10. Plant identifying of family Berberidaceae, Papaveraceae, Portulacaceae, Caryophyllaceae		4
Laboratory work 11. Plant identifying of family Amaranthaceae, Polygonaceae		4
Laboratory work 12. Plant identifying of family Betulaceae, Juglandaceae		4
Laboratory work 13. Plant identifying of family Actinidiaceae, Ericaceae		4
Laboratory work 14. Plant identifying of family Cucurbitaceae, Brassicaceae, Resedaceae		4
Self-study topic 5. Characteristic of Magnoliophyta families (APG IV). ANA GRADE Nymphaeales Nymphaeaceae Austrobaileyales Schisandraceae MAGNOLIIDS Piperale Aristolochiaceae Piperaceae Magnoliales Magnoliaceae Laurales Lauraceae MONOCOTS Acorales Acoraceae Alismatales Alismataceae Araceae Butomaceae Liliales Liliaceae Asparagales Amaryllidaceae Asparagaceae Iridaceae Orchidaceae Zingiberales Zingiberaceae Poales Bromeliaceae Cyperaceae Juncaceae Poaceae EUDICOTS Ranunculales Berberidaceae Papaveraceae Ranunculaceae SUPERROSIDS Saxifragales Grossulariaceae ROSIDS Vitales Vitaceae Fabales Fabaceae Rosales Cannabaceae Elaeagnaceae Moraceae Rosaceae Urticaceae Fagales Betulaceae Fagacea Juglandaceae Cucurbitales Cucurbitaceae Malpighiales Euphorbiaceae Myrtales Lythraceae Sapindales Rutaceae Malvales Malvaceae Brassicales Brassicaceae Resedaceae		4

Lecture 6. Characteristic of Magnoliophyta families (APG IV). SUPERASTERIDS. ASTERIDS.		-
Laboratory work 15. Plant identifying of family Moraceae, Cannabaceae, Urticaceae, Euphorbiaceae		3
Laboratory work 16. Plant identifying of family Lythraceae, Adoxaceae		3
Laboratory work 17. Plant identifying of family Fabaceae, Rutaceae, Elaeagnaceae		3
Laboratory work 18. Plant identifying of family Vitaceae, Apiaceae, Caprifoliaceae		3
Laboratory work 19. Plant identifying of family Boraginaceae, Solanaceae, Pedaliaceae		3
Laboratory work 20. Plant identifying of family Lamiaceae, Asteraceae		3
Laboratory work 21. Plant identifying of family Iridaceae, Liliaceae		3
Laboratory work 22. Plant identifying of family Amaryllidaceae		3
Laboratory work 23. Plant identifying of family Asparagaceae, Orchidaceae, Bromeliaceae		3
Laboratory work 24. Plant identifying of family Zingiberaceae, Juncaceae, Cyperaceae		3
Laboratory work 25. Plant identifying of family Poaceae		3
Self-study topic 6. Characteristic of families (APG IV). SUPERASTERIDS Caryophyllales Amaranthaceae Caryophyllaceae Polygonaceae Portulacaceae ASTERIDS Ericales Actinidiaceae Ericaceae Gentianales Apocynaceae Boraginales Boraginaceae Solanales Solanaceae Lamiales Lamiaceae Oleaceae Orobanchaceae Pedaliaceae Asterales Asteraceae Dipsacales Adoxaceae Caprifoliaceae Apiales Apiaceae		3
Lecture 7. Elements of Phytocenology		-
Laboratory work 26. Flora. Main ecological factors. Plant distribution.		3
Self-study topic 7. Elements of Phytocenology		3
Lecture 8. Elements of Phytogeography		-
Laboratory work 27. Elements of Phytocenology		3
Self-study topic 8. Elements of Phytogeography		3
Module 2.		35
Total by module 2		100
Study work	$(M1 + M2)/2 \cdot 0,7 \leq 70$	
Exam/test	30	
Total for the course	$(\text{Study work} + \text{exam}) \leq 100$	

8.2. Scale for assessing knowledge of a higher education applicant

Higher education applicant rating, points	National system grade (exams/credits)
90-100	excellent
74-89	good
60-73	satisfactory
0-59	unsatisfactory

8.3. Assessment 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 are good reasons (for example, sick leave).
Academic Integrity Policy	Cheating during tests and exams is prohibited (including using mobile devices). Essays must have correct text references to the used literature
Attendance Policy	Attendance at classes is mandatory. For objective reasons (e.g. illness, international internship), studies may be conducted individually (online upon agreement with the dean of the faculty).

9. Educational and methodological support:

- electronic educational course of the academic discipline (on the educational portal of NUBiP of Ukraine eLearn - <https://elearn.nubip.edu.ua/course/view.php?id=2674>;
- 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;
- the program of educational (industrial) practice of the academic discipline (if it is provided for by the curriculum).

10. Recommended sources of information

- basic:

1. Simpson M. G. Plant Systematics. 3rd Edition, Academic Press, 2019.
2. Tertyshnyi A.P. Botany. Current system of flowering plants. Part I. Methods handbook for students of the educational degree "Bachelor" of the specialty 201 "Agronomy". Kyiv: Lira-K, 2023. 182 p.
3. Tertyshnyi A.P. Botany. Part 1: tutorial. Kyiv: Lira-K, 2020, 250 p.
4. Tertyshnyi A.P. Botany. Part I (second edition). Study aid. Kyiv: Lira-K, 2024. 742 p.
5. Тертишний А.П. Покритонасінні рослини Лісостепу України. Частина 1: Навчальний посібник. Київ: Видавництво Ліра-К, 2021. 706 с.
6. Тертишний А.П. Покритонасінні рослини Лісостепу України. Частина 2: Навчальний посібник. Київ: Видавництво Ліра-К, 2022. 312 с.
7. Тертишний А.П. Покритонасінні рослини Лісостепу України. Частина 3: Навчальний посібник. Київ: Видавництво Ліра-К, 2023. 758 с.
8. Якубенко Б.Є., Алейніков І.М., Шабарова С.І., Машковська С.П. Ботаніка. Підручник (перевидання). Київ, Видавництво Ліра-К, 2021, 436 с.
9. Якубенко Б.Є., Попович С.Ю., Григорюк І. П., Устименко П.М. Геоботаніка: тлумачний словник. Навчальний посібник. (перевидання), Київ, Ліра-К, 2021, 485 с.

- additional:

1. Ellison A.M., Adamec L. Carnivorous Plants: Physiology, Ecology, and Evolution. Oxford: Oxford University Press; 2018.

-Internet sources:

1. Angiosperm phylogeny website version <http://www.mobot.org/MOBOT/research/APweb/>
2. Catalogue of life <https://www.catalogueoflife.org>
3. Eurasian Dry Grassland Group <https://edgg.org/>
4. European Vegetation Archive (EVA) <http://euroveg.org/eva-database>
5. European Vegetation Survey <http://euroveg.org/>
6. Global Biodiversity Information Facility (GBIF) <https://www.gbif.org>
7. Global Index of Vegetation-Plot Databases (GIVD) <http://www.givd.info/>
8. National Biodiversity Information Network <http://ukrbin.com>

9. National Vegetation Classification (NVC) <https://incc.gov.uk/our-work/nvc/>
10. Open data about biodiversity <https://www.inaturalist.org>
11. Society for ecological restoration (SEP) <https://www.ser.org/default.aspx>
12. The Gymnosperm Database <https://www.conifers.org/index.php>
13. The International Association for Vegetation Science (IAVS) <http://iavs.org/>
14. The WFO <http://www.worldfloraonline.org/>
15. U.S. National Plant Germplasm System <https://npgsweb.ars-grin.gov/>
16. Ukrainian geobotanical site <http://geobot.org.ua/>