

NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Botany, Dendrology and Forest Tree Breeding

«CONFIRMED»

Dean of the Faculty Plant Protection,  
Biotechnology and Ecology

  
Yuliia KOLOMIETS  
“ ” 2025

«APPROVED»

at the meeting of the department of Botany,  
Dendrology and Forest Tree Breeding  
Protocol № 10 dated « 19<sup>th</sup> of 05 » 2025

  
Head of Department  
Yurii MARCHUK

«REVIEWED»

Guarantor of EP

  
Myroslav PIKOVSKYI

PROGRAM OF THE STUDY DISCIPLINE

BOTANY

Branch of knowledge H Agriculture, forestry, fisheries and veterinary medicine

Specialty H1 Agronomy (Plant protection and quarantine)

Educational program Plant protection and quarantine

Faculty of Plant Protection, Biotechnology and Ecology

Developer: Associate Professor, PhD in Biological Sciences Anatolii TERTYSHNYI

## Description of the study discipline «Botany»

Discipline «Botany» (OK13) is a mandatory component of the educational and professional program of the cycle of special (professional) training (Educational and professional program Plant Protection and Quarantine of the first (bachelor's) level of higher education in the specialty H1 «Agronomy» field of knowledge H "Agriculture, forestry, fisheries and veterinary medicine". Qualification: Bachelor of Plant Protection and Quarantine. Protocol No. 10 of April 25, 2025 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, phylogenetic relations and value for agriculture.

| Branch of knowledge, direction of training, study quality level                          |                                               |            |
|------------------------------------------------------------------------------------------|-----------------------------------------------|------------|
| Educational degree                                                                       | Bachelor                                      |            |
| Specialty                                                                                | H1 Agronomy (Plant protection and quarantine) |            |
| Educational program                                                                      | Plant protection and quarantine               |            |
| Characteristics of the course                                                            |                                               |            |
| Type                                                                                     | Compulsory                                    |            |
| Total number of hours                                                                    | 120 <i>hr</i>                                 |            |
| Number of ECTS credits                                                                   | 4                                             |            |
| Number of content modules                                                                | 3                                             |            |
| Course project (work) (if applicable)                                                    |                                               |            |
| Form of assessment                                                                       | <i>Exam</i>                                   |            |
| Indicators of the course for full-time and part-time forms of obtaining higher education |                                               |            |
|                                                                                          | Form of obtaining higher education            |            |
|                                                                                          | Full-time                                     | Part-time  |
| Course (year of study)                                                                   | 1                                             |            |
| Semester                                                                                 | 1                                             |            |
| Lecture classes                                                                          | 15 <i>hr.</i>                                 | <i>hr.</i> |
| Practical, seminar classes                                                               | 30 <i>hr.</i>                                 | <i>hr.</i> |
| Laboratory classes                                                                       |                                               | <i>hr.</i> |
| Self-study                                                                               | 75 <i>hr.</i>                                 | <i>hr.</i> |
| Individual assignments                                                                   |                                               | <i>hr.</i> |
| Number of weekly classroom hours for the full-time form of study                         | 3 <i>hr.</i>                                  |            |

## 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.

**Acquisition of competencies:**

### Integrated competency (IC):

The ability to solve complex specialized tasks and practical problems of professional activity in plant protection and quarantine or in the learning process, characterized by complexity and uncertainty of conditions, using theories and methods of biology and agricultural sciences.

### General competencies (GC):

GC 2. Ability to apply knowledge in practical situations

GC 3. Knowledge and understanding of the subject area and understanding of professional activity.

### Special (professional) competences (SC): –

### Program learning outcomes (PLO):

PLO 4. Know and understand mathematics and natural sciences to the extent necessary for professional activities in plant protection and quarantine.

## 2. Program and structure of the course for:

| Names of content modules and topics                                                                                                                                      | Hours          |       |           |    |     |     |      |                |           |    |     |     |      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------|-----------|----|-----|-----|------|----------------|-----------|----|-----|-----|------|
|                                                                                                                                                                          | Full-time form |       |           |    |     |     |      | Part-time form |           |    |     |     |      |
|                                                                                                                                                                          | week           | total | including |    |     |     |      | total          | including |    |     |     |      |
|                                                                                                                                                                          |                |       | l         | p  | lab | ind | self |                | l         | p  | lab | ind | self |
| 1                                                                                                                                                                        | 2              | 3     | 4         | 5  | 6   | 7   | 8    | 9              | 10        | 11 | 12  | 13  | 14   |
| Module 1. Anatomy and Morphology of Plants. Propagation of plants. Introduction to plant systematic. Non-vascular and vascular seedless Embryophyta. Gymnospermatophyta. |                |       |           |    |     |     |      |                |           |    |     |     |      |
| Topic 1. Introduction to Botany.                                                                                                                                         | 1              | 3,5   | 0,5       | 1  |     |     | 2    |                |           |    |     |     |      |
| Topic 2. Plant cell                                                                                                                                                      | 2              | 3,5   | 0,5       | 1  |     |     | 2    |                |           |    |     |     |      |
| Topic 3. Plant tissues.                                                                                                                                                  | 3              | 3,5   | 0,5       | 1  |     |     | 2    |                |           |    |     |     |      |
| Topic 4. Vegetative organs of plants.                                                                                                                                    | 4              | 3,5   | 0,5       | 1  |     |     | 2    |                |           |    |     |     |      |
| Topic 5. Propagation of plants.                                                                                                                                          | 5              | 5     | 1         | 2  |     |     | 2    |                |           |    |     |     |      |
| Topic 6. Genarative organs of angiosperm plants.                                                                                                                         | 6              | 5     | 1         | 2  |     |     | 2    |                |           |    |     |     |      |
| Topic 7. Introduction to plant systematic. LUCA, Bacteria, Arkarya. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae.                             | 7              | 7     | 1         | 2  |     |     | 4    |                |           |    |     |     |      |
| Topic 8. Marschantiophyta, Bryophyta, Anthocerotophyta, Lycophyta Euphyllrophyta, Monilophyta, Spermatophyta: Gymnospermatophyta. Structure, life cycles, biology.       | 8, 9           | 7     | 1         | 2  |     |     | 4    |                |           |    |     |     |      |
| Total for content module 1                                                                                                                                               |                | 38    | 6         | 12 |     |     | 20   |                |           |    |     |     |      |
| Module 2. Angiosperms: ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS                                                                                            |                |       |           |    |     |     |      |                |           |    |     |     |      |
| Topic 1. Angiosperm plants. (Magnoliophyta, APG IV): ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS.                                                             | 10, 11, 12     | 53    | 6         | 12 |     |     | 35   |                |           |    |     |     |      |
| Total for content module 2                                                                                                                                               |                | 53    | 6         | 12 |     |     | 35   |                |           |    |     |     |      |
| Module 3. SUPERASTERIDS, ASTERIDS. Phytogeography. Phytocoenology                                                                                                        |                |       |           |    |     |     |      |                |           |    |     |     |      |
| Topic 1. SUPERASTERIDS, ASTERIDS                                                                                                                                         | 13             | 22    | 2         | 4  |     |     | 16   |                |           |    |     |     |      |
| Topic 2. Phytogeography. Flora. Areal of plants. Main ecological factors and its                                                                                         | 14             | 3,5   | 0,5       | 1  |     |     | 2    |                |           |    |     |     |      |

|                                                                                             |    |     |     |    |  |  |    |  |  |  |  |  |  |
|---------------------------------------------------------------------------------------------|----|-----|-----|----|--|--|----|--|--|--|--|--|--|
| influence on plants.                                                                        |    |     |     |    |  |  |    |  |  |  |  |  |  |
| Topic 3. Phytocoenology.<br>Vegetation. Types of vegetation.<br>Systematic of phytocenoses. | 15 | 3,5 | 0,5 | 1  |  |  | 2  |  |  |  |  |  |  |
| Total for content module 3                                                                  | 15 | 29  | 3   | 6  |  |  | 20 |  |  |  |  |  |  |
| Total hours                                                                                 |    | 120 | 15  | 30 |  |  | 75 |  |  |  |  |  |  |

### 3. Lecture topics

| №  | Topic title                                                                                                                                                | Number of hours |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1  | Introduction to Botany.                                                                                                                                    | 0,5             |
| 2  | Plant cell                                                                                                                                                 | 0,5             |
| 3  | Plant tissues.                                                                                                                                             | 0,5             |
| 4  | Vegetative organs of plants.                                                                                                                               | 0,5             |
| 5  | Propagation of plants.                                                                                                                                     | 1               |
| 6  | Genarative organs of angiosperm plants.                                                                                                                    | 1               |
| 7  | Introduction to plant systematic. LUCA, Bacteria, Arkarya. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae.                        | 1               |
| 8  | Marschantiophyta, Bryophyta, Anthocerotophyta, Lycopphyta Euphylllophyta, Monilophyta, Spermatophyta: Gymnospermatophyta. Structure, life cycles, biology. | 1               |
| 9  | Angiosperm plants. (Magnoliophyta, APG IV): ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS                                                         | 6               |
| 10 | SUPERASTERIDS, ASTERIDS                                                                                                                                    | 2               |
| 11 | Phytogeography. Flora. Areal of plants. Main ecological factors and its influence on plants.                                                               | 0,5             |
| 12 | Phytocoenology. Vegetation. Types of vegetation. Systematic of phytocenoses.                                                                               | 0,5             |

### 4. Practical class topics

| №  | Topic title                                                                                                                                                                                                                                                                                                              | Number of hours |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1  | Structure of microscope. Structure of plant cell. Plastids. Storage materials. Starch and aleirone grains.                                                                                                                                                                                                               | 2               |
| 2  | Dermal tissues. Primary dermal tissue. Secondary and tertiary dermal tissues.                                                                                                                                                                                                                                            | 2               |
| 3  | Morphological structure of the root and its modifications. Regions of the root, primary anatomical structure. Secondary anatomical structure of the root. Peculiarities of the anatomical structure of root crops.                                                                                                       | 2               |
| 4  | Morphological structure of the shoot. Anatomical structure of the stem of monocot. Anatomical structure of the herbal dicot plants. Bundle type of structure. Anatomical structure of spinning plants stem. Macroscopic structure of the woody stem. Anatomical structure of the leafy plant stem.                       | 2               |
| 5  | Anatomical structure of the <i>Zea mays</i> and <i>Camellia japonica</i> leaves. Peculiarities of the structure of the <i>Pinus sylvestris</i> needle.                                                                                                                                                                   | 2               |
| 6  | Fungi. Chytridomycota, Chytridiomycetes. Oomycota, Oomycetes. Zygomycota. Ascomycota, Ascomycetes. Basidiomycota, Basidiomycetes. Lichens                                                                                                                                                                                | 2               |
| 7  | Algae. Chlorophyta, Charophyta, Charophyceae                                                                                                                                                                                                                                                                             | 2               |
| 8  | Marchantiopsida, Bryopsida. Structure of vegetative and reproductive organs of <i>Lycopodium clavatum</i> , <i>Selaginella selaginoides</i> . Morphological structure of <i>Equisetum arvense</i> . Strobile and spore structure. Polypodiophyta. Structure of sporophyte and gametophyte of <i>Dryopteris filix-mas</i> | 2               |
| 9  | Pinophyta. Pinopsida.                                                                                                                                                                                                                                                                                                    | 2               |
| 10 | Flower morphology. Formula of flower. Types of inflorescences.                                                                                                                                                                                                                                                           | 2               |
| 11 | Anatomy of flower. Structure of stamen, ovary and seed embryo. Seed                                                                                                                                                                                                                                                      | 2               |

|    |                                                                                                                                      |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------|---|
|    | formation. Seed structure of monocots and dicots plants.                                                                             |   |
| 12 | Fruit formation. Structure and classification of fruits. Collective fruit.                                                           | 2 |
| 13 | Methodology of herbarization. Plan of morphological analysis. Plant identifying. Plant identifying of Ranunculaceae species.         | 2 |
| 14 | Plant identifying of Boraginaceae, Rosaceae, Brassicaceae, Fabaceae.                                                                 | 2 |
| 15 | Notion of phytocenosis and its structure. Elements of Agrophytocenology Plant identifying of Liliaceae, Poaceae, Cyperaceae species. | 2 |

### 5. Self-study topics

| №  | Topic title                                                                                                                                                         | Number of hours |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| 1  | Theme 1. Introduction to Botany.                                                                                                                                    | 2               |
| 2  | Topic 2. Plant cell                                                                                                                                                 | 2               |
| 3  | Topic 3. Plant tissues.                                                                                                                                             | 2               |
| 4  | Theme 4. Vegetative organs of plants.                                                                                                                               | 2               |
| 5  | Theme 5. Propagation of plants.                                                                                                                                     | 2               |
| 6  | Theme 6. Genarative organs of angiosperm plants.                                                                                                                    | 2               |
| 7  | Theme 7. Introduction to plant systematic. LUCA, Bacteria, Arkarya. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae.                        | 9               |
| 8  | Theme 8. Marschantiophyta, Bryophyta, Anthocerotophyta, Lycopphyta Euphylllophyta, Monilophyta, Spermatophyta: Gymnospermatophyta. Structure, life cycles, biology. | 9               |
| 9  | Theme 1. Angiosperm plants. (Magnoliophyta, APG IV): ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS.                                                        | 20              |
| 10 | Theme 1. SUPERASTERIDS, ASTERIDS                                                                                                                                    | 11              |
| 11 | Theme 2. Phytogeography. Flora. Areal of plants. Main ecological factors and its influence on plants.                                                               | 7               |
| 12 | Theme 3. Phytocenology. Vegetation. Types of vegetation. Systematic of phytocenoses.                                                                                | 7               |

### 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 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| <b>Module 1. Plant anatomy and morphology. Plant reproduction. Introduction to plant taxonomy. Seedless Embryophytes. Gymnosperms.</b>                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |
| Lecture 1 Introduction to Botany.                                                                                                                                                                                                                                                                                           | <p>PLO 4. Including knowing: the tasks, goals and objects of the academic discipline, the structure and vital activity of cells and tissues, their structural organization, the morphology and anatomy of vegetative and generative organs, the floristic and coenotic diversity of natural, field ecosystems: ecological, geographical and sociological features of the vegetation cover of Ukraine and adjacent territories; be able to: independently make permanent and temporary preparations of botanical objects, identify plants of different systematic groups.</p> | -          |
| Self-study topic 1. Introduction to Botany.                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Lecture 2 Plant cell.                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Practical class topic 1. Structure of microscope. Skills at using of microscope. Structure of plant cell. Plastids. Storage materials. Starch and aleirone grains.                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Self-study topic 2. Plant cell                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Lecture 3 Plant tissues.                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Practical class topic 2. Dermal tissues. Primary dermal tissue. Secondary and tertiary dermal tissues.                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Self-study topic 3. Plant tissues.                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Lecture 4. Vegetative organs of plants.                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Practical class topic 3. Morphological structure of the root and its modifications. Regions of the root, primary anatomical structure, morphological and anatomical regions of the root. Anatomical structure of the root. Peculiarities of the anatomical structure of root crops.                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Practical class topic 4. Morphological structure of the shoot. Anatomical structure of the stem of monocot. Anatomical structure of the herbal dicot plants. Bundle type of structure. Anatomical structure of spinning plants stem. Macroscopic structure of the woody stem. Anatomical structure of the leafy plant stem. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Practical class topic 5. Anatomical structure of the maize leaf and <i>Camellia japonica</i> . Peculiarities of the structure of the <i>Pinus sylvestris</i> needle.                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Self-study topic 4. Vegetative organs of plants.                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Lecture 5. Propagation of plants.                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Lecture 6. Genarative organs of angiosperm plants.                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Lecture 7. Introduction to plant systematic. LUCA, Bacteria, Arkarya. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae.                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Practical class topic 6. Fungi. Chytridiomycota, Chytridiomycetes. Oomycota, Oomycetes. Zygomycota. Ascomycota, Ascomycetes. Basidiomycota, Basidiomycetes. Lichens                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Practical class topic 7. Practical class topic Algae. Chlorophyta, Charophyta, Charophyceae                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5          |
| Self-study topic 5. Propagation of plants.                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5          |
| Self-study topic 6. Genarative organs of angiosperm plants.                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Self-study topic 7. Introduction to plant systematic. LUCA, Bacteria, Arkarya. Amorphea: Fungi. Archaeplastida: Glaucophyta, Rhodophyta, Viridiplantae.                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |
| Lecture 8. Marschantiophyta, Bryophyta, Anthocerotophyta, Lycophyta Euphyllophyta, Monilophyta, Spermatophyta: Gymnospermatophyta. Structure, life cycles, biology.                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | -          |
| Practical class topic 8. Marchantiopsida, Bryopsida. Structure of vegetative and reproductive organs of <i>Lycopodium clavatum</i> , <i>Selaginella selaginoides</i> . Morphological structure of <i>Equisetum arvense</i> . Strobile and spore structure. Polypodiophyta. Structure of                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6          |

|                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| sporophyte and gametophyte of <i>Dryopteris filix-mas</i>                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |
| Practical class topic 9. Pinophyta. Pinopsida.                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6          |
| Self-study topic 8. Marschantiophyta, Bryophyta, Anthocerotophyta, Lycophyta Euphylllophyta, Monilophyta, Spermatophyta: Gymnospermatophyta. Structure, life cycles, biology. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6          |
| <b>Module 1.</b>                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>20</b>  |
| <b>Total by module 1</b>                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>100</b> |
| <b>Module 2. Angiosperms: ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS.</b>                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |
| Lecture 9. Angiosperm plants. (Magnoliophyta, APG IV): ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS                                                                 | PLO 4. Including knowing: the tasks, goals and objects of the academic discipline, the structure and vital activity of cells and tissues, their structural organization, morphology and anatomy of vegetative and generative organs, floristic and coenotic diversity of natural, field ecosystems: ecological, geographical and sociological features of the vegetation cover of Ukraine and adjacent territories;<br>be able to: independently make permanent and temporary preparations of botanical objects, identify plants of different systematic groups.                                                   | -          |
| Practical class topic 10. Flower morphology. Formula and diagram of flower. Types of inflorescences.                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 25         |
| Practical class topic 11. Anatomy of flower. Structure of stamen, ovary and seed embryo. Seed formation. Seed structure of monocots and dicots plants.                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 25         |
| Practical class topic 12. Fruit formation. Structure and classification of fruits. Collective fruit.                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 25         |
| Self-study topic 9. Angiosperm plants. (Magnoliophyta, APG IV): ANA GRADE, MAGNOLIIDS, MONOCOTS, EUDICOTS, SUPERROSIDS.                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 25         |
| <b>Module 2.</b>                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>20</b>  |
| <b>Total by module 2</b>                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>100</b> |
| <b>Module 3. SUPERASTERIDS, ASTERIDS. Phytogeography and phytocoenology.</b>                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |            |
| Lecture 10. SUPERASTERIDS, ASTERIDS                                                                                                                                           | PLO 4. Including knowing: Including knowing: the tasks, goals and objects of the academic discipline, the structure and vital activity of cells and tissues, their structural organization, morphology and anatomy of vegetative and generative organs, floristic and coenotic diversity of natural, field ecosystems: ecological, geographical and sociological features of the vegetation cover of Ukraine and adjacent territories;<br>be able to: independently make permanent and temporary preparations of botanical objects, identify plants of various systematic groups. Collect and herbariumize plants, | -          |
| Practical class topic 13. Methodology of herbarization. Plan of morphological analysis. Plant identifying. Plant identifying of Ranunculaceae species.                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 14         |
| Self-study topic 10. SUPERASTERIDS, ASTERIDS                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 14         |
| Lecture 11. Phytogeography. Flora. Areal of plants. Main ecological factors and its influence on plants.                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -          |
| Practical class topic 14. Plant identifying of Boraginaceae, Rosaceae, Brassicaceae, Fabaceae.                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 18         |
| Self-study topic 11. Phytogeography. Flora. Areal of plants. Main ecological factors and its influence on plants.                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 18         |
| Lecture 12. Phytocoenology. Vegetation. Types of vegetation. Systematic of phytocenoses.                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | -          |

|                                                                                                                                                                |                                                                                                                                            |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Practical class topic 15. Notion of phytocenosis and its structure. Elements of Agrophytocenology Plant identifying of Liliaceae, Poaceae, Cyperaceae species. | analyze flora and vegetation, give an economic assessment of natural or cultural lands and develop ways of rational use of plant products. | 18         |
| Self-study topic 12. Phytocenology. Vegetation. Types of vegetation. Systematic of phytocenoses.                                                               |                                                                                                                                            | 18         |
| <b>Module 3.</b>                                                                                                                                               |                                                                                                                                            | <b>30</b>  |
| <b>Total by module 3</b>                                                                                                                                       |                                                                                                                                            | <b>100</b> |
| <b>Study work</b>                                                                                                                                              | <b>(M1 + M2)/2*0,7 ≤ 70</b>                                                                                                                |            |
| <b>Exam/test</b>                                                                                                                                               | <b>30</b>                                                                                                                                  |            |
| <b>Total for the course</b>                                                                                                                                    | <b>(Study work + exam) ≤ 100</b>                                                                                                           |            |

## 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

|                                         |                                                                                                                                                                                                     |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Deadline and resubmission policy</b> | 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). |
| <b>Academic Integrity Policy</b>        | Cheating during tests and exams is prohibited (including using mobile devices). Essays must have correct text references to the used literature                                                     |
| <b>Attendance Policy</b>                | 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 202 «Plant protection and quarantine». Kyiv: Lira-K, 2022. 182 p.
3. Tertyshnyi A.P. Botany. Current system of flowering plants. Part II. Methods handbook for students of the educational degree «Bachelor» of the specialty 202 «Plant protection and quarantine». Kyiv: Lira-K, 2024. 170 p.
4. Tertyshnyi A.P. Botany. Part I (second edition). Study aid. Kyiv: Lira-K, 2024. 742 p.
5. Тертишний А.П. Ботаніка. Квіткові рослини Лісостепу України. Частина 1: навчально-методичний посібник для студентів освітнього ступеня «Бакалавр» спеціальності 202 «Захист і карантин рослин». Київ: Видавництво Ліра-К, 2022. 165 с.
6. Тертишний А.П. Покритонасінні рослини Лісостепу України. Частина 1: Навчальний посібник. Київ: Видавництво Ліра-К, 2021. 706 с.

7. Тертишний А.П. Покритонасінні рослини Лісостепу України. Частина 2: Навчальний посібник. Київ: Видавництво Ліра-К, 2022. 312 с.
8. Тертишний А.П. Покритонасінні рослини Лісостепу України. Частина 3: Навчальний посібник. Київ: Видавництво Ліра-К, 2023. 758 с.
9. Якубенко Б.Є., Алейніков І.М., Шабарова С.І., Машковська С.П. Ботаніка. Підручник (перевидання). Київ, Видавництво Ліра-К, 2021, 436 с.
10. Якубенко Б.Є., Попович С.Ю., Григорюк І. П., Устименко П.М. Геоботаніка: тлумачний словник. Навчальний посібник. (перевидання), Київ, Ліра-К, 2021, 485 с.
11. Якубенко Б.Є., Тертишний А.П. Ботаніка. Методичні вказівки щодо виконання лабораторних робіт і самостійної роботи студентів освітнього ступеня «Бакалавр» спеціальності 202 «Захист і карантин рослин», К: Український фітосоціологічний центр, 2023, 144 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-world/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/>