

MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY

Department of general and clinical pharmacology and pharmacognosy



WORKING PROGRAM OF EDUCATIONAL DISCIPLINE
«PHARMACEUTICAL BOTANY »
(full-time education)

Level of higher education: second (master's degree)

Field of knowledge: 22 «Health care»

Specialty: 226 «Pharmacy, industrial pharmacy»

Educational and professional program: Pharmacy, industrial pharmacy

The program was compiled on the basis of the educational and professional program "Pharmacy, industrial pharmacy", training of specialists of the second (master's) level of higher education in specialty 226 "Pharmacy, industrial pharmacy" field of knowledge 22 "Health care", approved by the Scientific Council of ONMedU (from 29.06.2023, protocol #8).

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The working program approved at the meeting department pharmacology and pharmacognosy
Protocol No. 1 from 28.08.2023.

Head of the Department,
Doctor of Medicine, Prof.  Yaroslav ROZHKOVSKEY

Agreed from guarantor of EPP  Liana UNGURYAN

Approved at the meeting objective cyclical commission on pharmaceuticals discipline ONMedU
Protocol No. 1 from 29.08. 2023

Head of subject cyclical methodical Commission
from pharmaceuticals discipline ONMedU  Natalia FIZOR

Reviewed and approved at the meeting departments _____
Protocol No. ___ of "___" _____ 20__

Head department _____
(signature) (Name SURNAME)

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Protocol No. ___ of "___" _____ 20__

Head departments _____
(signature) (Name SURNAME)

1. Description of the discipline:

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the discipline
Total number:	Field of knowledge 22 «Health care»	<i>Full-time (day) education</i>
Credits of ECTS: 4		<i>Required discipline</i>
Hours: 120	Specialty 226 « Pharmacy, industrial pharmacy »	<i>Course: II</i>
Content topics - 4		<i>Semester: III</i>
		<i>Lectures (10 hours)</i>
		<i>Seminars (0 hours)</i>
		<i>Practical classes (50 hours)</i>
	Level of higher education second (master's degree)	<i>Laboratories (0 hours)</i>
		<i>Independent work (60 hours)</i>
		<i>including individual tasks (0 hours)</i>
		<i>Form of final control – Exam</i>

2. The purpose and objectives of the discipline

Objective: to achieve an understanding of the structure, chemical composition and functions of plant cells, tissues, organs and organisms in general. Master the theoretical foundations of the structure, classification, taxonomy, ecology and geography of medicinal plants and fungi, their importance and use in medicine, pharmacy, etc. Master the methods and procedures of macro- and microscopic analysis of plant organs. Use knowledge of morphology, anatomy, ecology of medicinal plants in specific situations. Demonstrate the ability to draw conclusions about the life form, age of the plant, the peculiarities of ecological conditions of existence; to determine diagnostic signs of organs and medicinal plant raw materials on the basis of macro- and microscopic analysis of plant objects. To establish the ability to identify and describe the morphological and anatomical features of individual organs of medicinal plants as medicinal plant raw materials. Acquire the ability to form a holistic view of the plant and its ecology on the basis of a set of individual morphological-anatomical and ecological-geographical features.

Task:

- Study of medicinal plants, their anatomical and morphological structure.
- Study of the basics of life, reproduction, geographical distribution of medicinal plants.
- Study of the basics of plant classification, their use.
- Study of the basics of ecology, structure, development and location of plant groups on the globe.

The process of studying the discipline is aimed at forming elements of the following competencies:

- IC - Ability to solve typical and complex specialized problems and practical problems in professional activities in the field of health / pharmacy, or in the learning process, which involves research and / or innovation and is characterized by complexity and uncertainty of conditions and requirements.

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

- GC 8. Ability to communicate in the state language both orally and in writing, the ability to communicate in a foreign language (mainly English) at a level that ensures effective professional activity.

- GC 12. Ability to conduct research at the appropriate level.

- GC 16. Ability to organize and conduct procurement of medicinal plant raw materials, choose ways to solve the problem of conservation and protection of thickets of wild medicinal plants, in accordance with applicable law.

Program learning outcomes (PLO):

PLO 2. Apply knowledge from general and specialized disciplines in professional activity.

PLO 12. Analyze information obtained as a result of scientific research, summarize, systematize and use it in professional activities.

PLO 16. Determine the influence of factors that affect the processes of absorption, distribution, deposition, metabolism and excretion of the medicinal product and are caused by the condition, characteristics of the human body and the physico-chemical properties of medicinal products.

PLO 17. To use the data of clinical, laboratory and instrumental studies to monitor the effectiveness and safety of the use of medicinal products.

PLO 23. To take into account data on socio-economic processes in society for the pharmaceutical provision of the population, to determine the effectiveness and availability of pharmaceutical care in terms of medical insurance and reimbursement of the cost of medicines.

As a result of studying the discipline the student must:

Know:

- definition of pharmaceutical botany as a science, its tasks and connection with professionally oriented pharmaceutical disciplines and professional activity;
- the role and importance of plants in nature and human life, use in pharmacy and medicine;
- features of structure, classification, functioning of plant cells and tissues, their diagnostic features that are important in the identification of medicinal plant raw materials;
- qualitative histochemical reactions for determination of crystalline inclusions, stock products, secondary changes of the cell membrane, etc. ;
- morphological structure, functions of vegetative and generative organs of plants, their diversity;
- regularities of anatomical structure and types of vegetative organs of plants and their metamorphoses;
- general features of families and species morphological and anatomical features of medicinal plants, cyanobacteria, fungi; ecological conditions of their growth, resources, presence of certain groups of biologically active compounds, value, use;
- elements of ecology, coenology and geography of plants;

Be able:

- work with a microscope;
- manufacture, study and describe micropreparations, perform histochemical reactions;
- dissect, describe the generative organs of the plant, make flower formulas;
- determine, recognize by anatomical and morphological features of plant organs, their metamorphosis;
- identify the morphological characteristics of plants and their belonging to certain taxa;
- identify plants by herbarium specimens, drawings, photos, in nature;
- describe and reflect the external and internal structure of plant organs, summarize the results, formulate conclusions and argue them, design research results.

have:

- botanical terminology;
- methods of light microscopy, cyto- and histochemistry, morphological analysis, visual observation, identification, identification of plants;
- techniques and skills of imaging plant objects, production of temporary micropreparations (surface preparations of leaves, cross-sections of axial organs), preparation of generative organs.

3. The content of the work program

The program of the discipline "Pharmaceutical Botany" consists of 1 section, which is divided into 5 meaningful sections.

The sequence, content of lectures and laboratory classes are justified.

SECTION 1. Morphology and anatomy of plants. Flora system. Systematic position, morphological features, ecology and use of algae, fungi and medicinal plants. Elements of ecology, coenology and geography of plants.

Content sections:

1. Plant cells and tissues
2. Morphology of vegetative and generative organs. Reproduction and reproduction of plants and fungi
3. Anatomy of vegetative organs
4. Review of lower phototrophs, fungi, higher spore plants and their medicinal representatives.
5. Seed plants. Fundamentals of ecology, coenology and geography of plants.

SECTION 1. VEGETABLE CELLS AND TISSUES

Specific goals:

Master the features of the structure, classification, functioning of plant cells and tissues.

Distinguish plant cells from bacterial, fungal and animal.

Explain and interpret the relationship between the structure and functions of the main components of plant cells and tissues, the relationship and interaction of cells in the plant body.

Explain and confirm with examples the importance of structural components, chemical compounds of cells, features of morphostructure, topography of tissues in anatomical and histochemical analysis of medicinal plant raw materials, identification of plant species.

Have the methods of microscopic and microchemical study of plant objects, use them in anatomical examination.

Analyze and compare cells, tissues, argue their common and different features.

To determine, distinguish, identify by a set of features the components of cells, tissues, features of their structure, which have diagnostic value in microscopic analysis.

Determine the nature of crystalline and reserve inclusions, the chemical composition of the cell membrane by the results of microchemical reactions.

Have the rules of description and depiction of plant cells, tissues and their structures.

Summarize the obtained results and explain them, formulate conclusions.

Document the results of the study.

TOPIC 1. The structure of the plant cell. Plastids, vacuoles, and the composition of cell sap. Stock products, mineral inclusions of plant cells. Purpose, tasks and methods of general and pharmaceutical botany, their sections, development prospects and significance. General idea of the role and use of the plant. Cytology as a section of plant anatomy, its purpose, tasks, methods and objects of research, significance. Modern idea of the structure of a plant cell, its components - protoplast and derivatives of protoplast.

Plastids: their types, structure, functions. The value and use of pigments.

Vacuoles: formation, development, functions, significance. The composition of cell juice, its importance and use.

Inclusion of plant cells, their classification, diagnostic value in microscopic analysis.

Spare inclusions. Spare carbohydrates, their classification, places of accumulation. Starch, its formation, types, properties. Starch grains: formation, properties, types, structure, detection reactions. Spare proteins: chemical nature, places of accumulation. Aleyron grains: formation, properties, types, structure, detection reactions. Fatty oil: chemical nature, properties, shape and places of accumulation, differences from essential oil, detection reactions.

Excretory crystalline inclusions: formation, localization, morphostructure, chemical nature, detection reactions, diagnostic value in microscopic analysis.

TOPIC 2. The structure of the cell membrane. Changes in the cell membrane.

Cell membrane: formation, structure, chemical composition, properties, functions. Secondary chemical and structural changes of the shell, their significance, qualitative reactions. Pores, their types. Diagnostic value of the cell membrane in microscopic analysis

TOPIC 3 . Fabrics. Structure, functions of creative and integumentary tissues.

Plant tissues: definition, classification by origin, morphology, functions, location.

Generative tissues, or meristems: functions, features of a structure, classification, value for a structure and development of bodies of a plant.

Integumentary tissues: functions, classification. Epidermis, epiblem, periderm, crust: location, formation, structure, functioning, diagnostic value in microscopic analysis of plant objects.

TOPIC 4 . Structure and functions of the main, mechanical and excretory tissues.

Main tissues: assimilation, storage, water and gas storage: functions, features of structure, location in organs and their parts, diagnostic value in microscopic analysis.

Mechanical fabrics: functions, classification. Collenchyma, sclerenchymal fibers, scleroids: types, features of structure, location in organs, diagnostic value in microscopic analysis.

Excretory or secretory tissues and structures: functions, classification. Exogenous and endogenous secretory tissues and structures: features of structure and functioning, taxonomic and diagnostic value. Chemical nature, significance and use of biologically active secretions.

TOPIC 5. Structure and functions of conductive tissue. Xylem and phloem. Vascular-fibrous bundles.

Conductive tissues: vessels, tracheids, sieve-like cells and sieve-like tubes with satellite cells: formation, features of structure and functioning.

Phloem and xylem as complex tissues, their histological composition, significance.

Conducting bundles: types, location in organs, taxonomic and diagnostic value.

TOPIC 6. Final lesson on the studied topics in cytology and histology of plants.

SECTION 2. MORPHOLOGY AND ANATOMY OF VEGETATIVE AND GENERATIVE ORGANS OF PLANTS

Assimilate the signs and patterns of the external structure of the root, shoot, stem, leaf and metamorphosis of vegetative organs.

Explain the progressive features of the body structure of phototrophs, the interaction and relationship of vegetative organs with each other and with others, the dependence of the structure on function, ecology, age, etc., application in pharmacy and medicine.

To make an idea of the diversity of macro- and microstructure of vegetative organs, to illustrate with examples.

Assimilate the signs and patterns of the internal structure of the root, shoot, stem, leaf and metamorphosis of vegetative organs.

Explain the progressive features of the body structure of phototrophs, the interaction and relationship of vegetative organs with each other and with others, the dependence of the structure on function, ecology, age, etc., application in pharmacy and medicine.

To make an idea of the diversity of the microstructure of the autonomic organs, to illustrate with examples.

Have the methods of microscopic analysis of vegetative organs and use them in the study of plant objects.

Explain the patterns of external and internal structure of vegetative organs.

Identify, distinguish and identify by a set of anatomical features similar and homologous organs, root, shoot, stem, leaf, their morphological varieties and modifications, types of anatomical structure, belonging of plants to a life form, a certain taxonomic and ecological group, type of leaf blade.

Interpret the results and formulate conclusions.

Illustrate with examples of anatomical determination of vegetative organs, types of structure and varieties of shoots, stems, leaves.

Explain the influence of environmental factors on the structure of vegetative organs and vice versa, according to the peculiarities of the structure to determine and explain the conditions of growth.

Summarize the obtained results, formulate conclusions and argue them.

Have the rules of description and reflection of the internal structure of the autonomic organs.

Document the results of the study, display the structure in the form of a schematic or detailed drawing.

Master the signs and patterns of structure of inflorescences, flowers, fruits, fruits and seeds, types and methods of reproduction and reproduction of plants, fungi, lichens.

Explain the role and interaction of generative organs, the principles of their classification, the relationship between structure and function; application in pharmacy and medicine and other fields.

Explain the essence of the process of double fertilization of flowering plants, the formation of seeds and fruits.

Present a variety of inflorescences, flowers, fruits, seeds and forms of their components, illustrate with examples.

Have methods of macroscopic analysis of generative organs, demonstrate them and use in the study of plant objects.

Identify, distinguish and identify the morphostructure of inflorescences, flowers, fruits, their parts, types.

Analyze and compare the morphostructure of generative organs, distinguish between general and individual features.

Summarize the obtained results, document, formulate conclusions and argue them.

Have the rules of description and schematic representation of generative organs, drawing up the formula of a flower; interpret the flower formula.

Explain the essence and significance of natural and artificial reproduction.

To present a variety of forms and methods of reproduction, to illustrate with examples of reproduction of medicinal plants.

Distinguish forms and methods of reproduction, explain their relationships in the cycle of plant development.

Give arguments about the similarities and differences in the reproduction of different groups of higher plants.

TOPIC 7. The root. Types of roots. Types of root systems. Root changes.

Root: definitions, functions. Types of roots, their origin. Types of root systems. Specialization and metamorphosis of roots.

TOPIC 8. Anatomical structure of the root.

Root zones, their structure and function. Primary anatomical structure of roots of monocotyledonous and dicotyledonous plants; transition to a secondary structure in the roots of dicotyledonous plants. Secondary structure of roots of herbaceous and woody plants, its types. Root crops: types, structure, use.

TOPIC 9. Stem. Sprout. Kidneys. Shoot modifications.

Shoot: definition, functions, structure, difference from the root. Variety of morphological structure of a shoot on a way of growth, type of branching, length of internodes, position in space, the form of cross section of a stalk, etc. Components of the shoot. Kidneys: definition, structure, classification, meaning.

Characteristics of metamorphoses of the shoot and its components. The concept of life forms.

TOPIC 10. Anatomical structure of stems of monocotyledonous and dicotyledonous herbaceous plants. Anatomical structure of stems of woody plants and rhizomes.

Stem growth cone. Anatomical structure of stems of herbaceous dicotyledonous and monocotyledonous plants. Types of secondary structure of stems of herbaceous dicotyledonous plants.

General patterns and distinctive features of the anatomical structure of the stems of woody covered and bare-seeded plants.

General features and peculiarities of the anatomical structure of rhizomes of dicotyledonous and monocotyledonous plants.

TOPIC 11. Leaflet. Modifications of leaves . Anatomical structure of leaves.

Leaf: definition, functions, parts, methods of leaf placement and attachment of leaves to the stem; types of veining. Types of leaves: morphology of simple leaves with a whole and dissected leaf blade; complex leaves, their characteristics. Influence of ecological factors on leaf morphology.

Regularities of tissue location in leaves, types of anatomical structure of leaf plates. Histological composition of veins. Influence of ecological factors on the anatomical structure of leaves.

TOPIC 12. Flower. Inflorescence.

Flower: definition, origin, parts and their functions. Flower symmetry. Pedicel, perianth, location of parts of the flower on the perianth. Perianth: morphological and functional characteristics and species. The sex of the flower. Structure of stamens, their functions; purpose of pollen. Types of androceum. The structure of the pistil, its functions. The position of the ovary. Types of gynoecium. Plants are monoecious and dioecious. Flower formula and diagram.

Inflorescence: definition, origin, biological role, structure, classification, morphological characteristics of ice.

TOPIC 13. Seeds. Fruit

Evolution of reproductive organs. Generative organs of flowering plants: definition, origin, functions.

Types and methods of pollination. Double fertilization: the essence of the process, the formation of seeds and fruits.

Seeds: structure, classification by nature and place of accumulation of nutrients.

Fruit: definition, origin, function. Parts of the fruit. Classification and characterization of fruits by morphological and morpho-genetic characteristics. Fertility: origin, structure, meaning. Methods of fruit distribution and fruit.

TOPIC 14. Final lesson on the studied topics in morphological and plant anatomy.

SECTION 3. OVERVIEW OF LOWER PHOTOTROPHICS, MUSHROOMS, HIGHER DISPATHY PLANTS AND THEIR MEDICAL REPRESENTATIVES.

Specific goals:

Assimilate and explain the principles underlying the modern classification of phototrophs and fungi, botanical nomenclature and phylogenetics.

Assimilate the characteristics of the main taxonomic groups of plants and fungi, morphological characteristics of medicinal representatives, ecological conditions of their growth, resources, the presence of certain groups of biologically active compounds, importance, use.

Distinguish and explain the features of the structure and activity of cyanobacteria, algae, fungi, lichens, higher spores, gymnosperms and angiosperms, their primitive and progressive features of the organization.

Possess domestic and international botanical nomenclature of medicinal plants and fungi.

Conduct a morphological description of live and herbarium plants.

Use methods and techniques of working with herbarium and live plants in compiling their morphological characteristics.

Analyze and compare the morphological structure of medicinal plants, distinguish their diagnostic features.

Identify representatives of certain systematic groups by morphostructure; determine their systematic affiliation.

Identify taxa using a determinant.

Explain the importance of medicinal plants in human life, use in the pharmaceutical industry, medicine and other fields.

TOPIC 15. Prokaryotes. Blue-green algae, their representatives having medical application.

Purpose, tasks and methods of taxonomy, its sections. Taxonomic categories and taxa. Botanical nomenclature. Principles and methods of classification of plant organisms. Modern phylogenetic systems. The concept of chemosystemic features. The concept of lower and higher plants, their characteristics and classification. General characteristics of **cyanobacteria** (blue-green algae), features of structure, chemical composition, value and use of representatives (spirulina).

TOPIC 16. Algae, general characteristics, their representatives, having medical application.

General characteristics of algae. Department of green algae features the structure, chemical composition, value and use of representatives.

Departments of brown and red algae features the structure, chemical composition, value and use of representatives.

TOPIC 17. Kingdom of mushrooms, general characteristics. Lower mushrooms, their representatives having medical application.

General characteristics and classification of fungi. Class zygomycetes features the structure, significance and use of representatives.

TOPIC 18. Classes of ascomycetes and deuteromycetes, their representatives having medical application.

Classes ascomycetes and deuteromycetes features the structure, meaning and use of representatives.

TOPIC 19. Classes of basidiomycetes and lichens, their representatives having medical application.

Classes basidiomycetes and lichens feature structure, chemical composition, significance and use of representatives.

TOPIC 20. Higher spore avascular plants. The department is moss-like, its representatives having medical application.

Progressive signs of higher spores in connection with access to land, features of the development cycle, classification. General characteristics of the department: mosses, or bryophytes, morphology, ecology and use of representatives.

TOPIC 21. Higher spore vascular plants. Department of ferns, horsetails and plaunoids, their representatives having medical application.

General characteristics of the department are ferns, horsetails and plaunoids. Classification, features of the development cycle, morphology, ecology and use of representatives.

TOPIC 22. Final seminar on the studied topics of spore plants and fungi

SECTION 4. SEED PLANTS. FUNDAMENTALS OF ECOLOGY, CENOLOGY AND GEOGRAPHY OF PLANTS.

Specific goals:

Distinguish and explain the structure of gymnosperms and angiosperms, their primitive and progressive features of the organization.

Assimilate the general characteristics of families and species characteristics of medicinal plants, ecological conditions of their growth, resources, the presence of certain groups of biologically active compounds, importance, use.

Conduct a morphological description of living and herbarium specimens of plants.

Use methods and techniques of working with herbarium and live plants in compiling their morphological characteristics.

Analyze and compare the morphological structure of medicinal plants, distinguish their diagnostic features.

Identify representatives of certain systematic groups by morphostructure; determine their systematic affiliation.

Identify taxa using a determinant.

Explain the importance of medicinal plants in human life, use in the pharmaceutical industry, medicine and other fields.

Characterize environmental factors and explain their impact on plants.

Assimilate the characteristics of ecological groups of plants by anatomical and morphological characteristics of the species, determine the affiliation to a particular ecological group.

Assimilate the signs of seasonal changes in plant organisms, distinguish them and explain the need to take into account when harvesting and storing medicinal plant raw materials.

Assimilate the characteristics of the main types of plant groups, determine them by structure and floristic composition.

Characterize and determine the types of habitats and vegetation by a set of features.

Describe the main measures for the protection of phytodiversity and requirements for the rational use of plant resources.

Explain the scientific and practical importance of plant protection and the need for environmental measures to preserve and restore flora.

TOPIC 23. Seed plants. Department of gymnosperms. Class conifers, representatives of medical applications.

Progressive features of the structure, classification of gymnosperms. Features of the structure of the vegetative body, strobiles and seeds. General characteristics of the class of conifers. Morphological-anatomical and chemosystematic characteristics, ecology, resources, significance and use of representatives.

TOPIC 24. Department of angiosperms. General characteristics of classes.

Progressive features of the organization and the main directions of evolution of angiosperms, their classification on the basis of the system AL Takhtadzhiana. General

characteristics of the division angiosperms, comparative characteristics of classes dicotyledonous and monocotyledonous. Families that are widespread and include valuable medicinal plants.

TOPIC 25. Families of buttercups and poppies, their representatives having medical application.

General characteristics of the families of buttercups and poppies. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 26. Families of buckwheat and cabbage, their representatives having medical application.

General characteristics of buckwheat and cabbage families. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 27. Rosaceae and honeysuckle families, their representatives with medical applications.

General characteristics of the families Rosaceae and honeysuckle. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 28. Bean and heather families, their representatives with medical applications.

General characteristics of the legume and heather families. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 29. Families of celery and ragweed, their representatives with medical applications.

General characteristics of celery and ragweed families. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 30. Solanum and morning families, their representatives with medical applications.

General characteristics of families nightshade and morning. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 31. The labiatae family and its aster representatives, which have medical applications.

General characteristics of the labiate family. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

General characteristics of the aster family. Morphological and ecological characteristics, the presence of certain groups of biologically active substances, resources, importance, use of representatives.

TOPIC 32. Medicinal plants common in Ukraine.

Morphological and anatomical diagnostic features, ecology, resources, the presence of biologically active substances and the use of some common in Ukraine medicinal and edible plants (marshmallow, warty birch, periwinkle, elderberry, valerian, bitter chestnut, oak, St. John's wort common, viburnum, lily of the valley, nettle, buckthorn brittle, azalea, linden heart, sea buckthorn, plantain large).

TOPIC 33. Final seminar on the studied topics in the taxonomy of seed plants

EXAMINATION IN SECTION 1

MORPHOLOGY AND ANATOMY OF PLANTS. VEGETABLE SYSTEM. SYSTEMATIC SITUATION, MORPHOLOGICAL SIGNS, ECOLOGY AND USE OF ALGAE, MUSHROOMS AND MEDICINAL PLANTS. ELEMENTS OF ECOLOGY, CENOLOGY AND GEOGRAPHY OF PLANTS.

4. The structure of the discipline

Topic	Number of hours					
	Total	Including				
		lectures	seminars	practical	laboratory	IWS
Chapter 1. Plant cells and tissues						
Topic 1. The structure of a plant cell. Plastids, vacuole, and cell sap composition. Stock products, mineral inclusions of plant cells. The structure of the cell membrane. Changes in the cell membrane	10	2	0	4	0	4
Topic 2. Fabrics. Structure, functions of generative, excretory, covering, main, mechanical and excretory tissues	8	2	0	2	0	4
Topic 3. Structure and functions of conducting tissue. Xylem and phloem. Vascular-fibrous bundles.	6	0	0	2	0	4
Chapter 2. Morphology and anatomy of vegetative and generative organs of plants						
Topic 4. Root. Types of roots. Types of root systems. Modifications of the root. Anatomical structure of the root.	6	0	0	2	0	4
Topic 5. Stem. Sprout. Buds Modifications of the shoot. Anatomical structure of stems of monocotyledonous and dicotyledonous herbaceous plants. Anatomical structure of the stems and rhizomes of rhubarb plants	8	0	0	4	0	4
Topic 6. Shoot. Modifications of leaves. Anatomical structure of leaves	2	0	0	2	0	0
Topic 7. Flower. Inflorescence. The seed Fruit	6	0	0	2	0	4
Chapter 3. Review of lower phototrophs, fungi, higher spore plants and their medicinal representatives.						
Topic 8. Prokaryotes.	2	2	0	2	0	0

Blue-green algae, their representatives that have medical applications.						
Topic 9. Algae, general characteristics, their representatives with medical use.	2	0	0	2	0	0
Topic 10. Kingdom of mushrooms, general characteristics. Lower mushrooms, their representatives that have medical applications. Classes of ascomycetes and deuteromycetes, their representatives with medical applications. Classes of basidiomycetes and lichens, their representatives with medical applications	4	2	0	2	0	0
Topic 11. Higher sporeless vascular plants. Department of bryophytes, its representatives that have medical applications	4	0	0	2	0	0
Topic 12. Higher spore vascular plants. Department of ferns, horsetails and plauniformes, their representatives that have medical applications	2	0	0	2	0	0
Chapter 4. Seed plants. Basics of ecology, coenology and geography of plants.						
Topic 13. Seed plants. Department of gymnosperms. Class of conifers, representatives with medical use.	8	2	0	2	0	4
Topic 14. Division of angiosperms. General characteristics of classes	6	0	0	2	0	4
Topic 15. Buckwheat and cabbage families, their representatives	6	0	0	2	0	4

that have medical applications						
Topic 16. The sedum and poppy families, their representatives, which have medical applications	6	0	0	2	0	4
Topic 17. Rosaceae and honeysuckle families, their representatives with medical use	6	0	0	2	0	4
Topic 18. Legume and heather families, their representatives, which have medical applications	6	0	0	2	0	4
Topic 19. Celery and zoster families, their representatives that have medical applications	2	0	0	2	0	0
Topic 20. Solanaceae and morning glory families, their representatives that have medical applications.	6	0	0	2	0	4
Topic 21. The family of licorice and its representatives, which have medical applications	6	0	0	2	0	4
Topic 22. Medicinal flowering plants common in Ukraine	8	0	0	2	0	4
Hours in general:	120,0	10,0	0	50,0	0	60,0

5. Topics of lectures / seminars / practical / laboratory classes

5.1. Topics of lectures

№ p / p	TOPIC	hours
1	Topic 1. Lecture 1. Introduction to botany, anatomy, cytology of plants. A modern idea of the structure of a plant cell, its components that have diagnostic value.	2

2	Topic 2, 3. Lecture 2. Introduction to phytohistology. Plant tissues, their classification. Generating, covering, excretory, basic, mechanical, conductive tissues, phloem and xylem, conductive bundles.	2
3	Topic 8. Lecture 3. Introduction to systematics. Principles of modern botanical classifications; system of magnoliophytes adapted to the program. Characteristic features of prokaryotes and lower plants.	2
4	Topic 10. Lecture 4. Characteristic features of mushrooms and lichens, their representatives that have medical applications.	2
5	Topic 13,14. Lecture 5. Characteristic features of higher spore and seed plants, their representatives that have medical applications.	2
	TOGETHER:	10

5.2 Topics of seminar classes

Practical classes are not provided

5.3. Topics of practical classes

№ p / p	TOPIC	hours
1	Topic 1. Practical lesson 1,2. The structure of a plant cell. Plastids, vacuole, and cell sap composition. Stock products, mineral inclusions of a plant cell. Structure of the cell membrane. Changes in the cell membrane	4
2	Topic 2. Practical lesson 3. Fabrics. Structure, functions of generative, excretory, covering, main, mechanical and excretory tissues.	2
3	Topic 3. Practical lesson 4. Structure and functions of conducting tissue. Xylem and phloem. Vascular-fibrous bundles	2
4	Topic 4. Practical lesson 5. The root. Types of roots. Types of root systems. Modifications of the root. Anatomical structure of the root.	2
5	Topic 5. Practical lesson 6, 7. Stem. Sprout. Buds Modifications of the shoot. Anatomical structure of stems of monocotyledonous and dicotyledonous herbaceous plants. Anatomical structure of the stems and rhizomes of rhubarb plants	4
6	Topic 6. Practical lesson 8. Leaflet. Modifications of leaves. Anatomical structure of leaves	2
7	Topic 7. Practical lesson 9, 10. Flower. Inflorescence. The seed Fruit	4
8	Topic 8. Practical lesson 11. Prokaryotes. Blue-green algae, their representatives that have medical applications.	2
9	Topic 9. Practical lesson 12. Algae, general characteristics, their representatives that have medical applications.	2
10	Topic 10. Practical lesson 13. Kingdom of mushrooms, general characteristics. Lower mushrooms, their representatives that have medical applications. Classes of ascomycetes and deuteromycetes, their representatives with medical applications. Classes of basidiomycetes and lichens, their representatives with medical applications	2
11	Topic 11. Practical lesson 14. Higher sporeless vascular plants. Department of bryophytes, its representatives that have medical applications	2

12	Topic 12. Practical lesson 15. Higher spore vascular plants. Department of ferns, horsetails and plauniformes, their representatives that have medical applications	2
13	Topic 13. Practical lesson 16. Seed plants. Department of gymnosperms. Class of conifers, representatives with medical use.	2
14	Topic 14. Practical class 17. Department of angiosperms. General characteristics of classes	2
15	Topic 15. Practical lesson 18. Buckwheat and cabbage families, their representatives that have medical applications	2
16	Topic 16. Practical lesson 19. The families of the yellow and poppy families, their representatives that have medical applications	2
17	Topic 17. Practical lesson 20. Rosaceae and honeysuckle families, their representatives that have medical applications	2
18	Topic 18. Practical lesson 21. Legume and heather families, their representatives with medical use	2
19	Topic 19. Practical lesson 22. Celery and zoster families, their representatives that have medical applications	2
20	Topic 20. Practical lesson 23. Solanaceous and morning glory families, their representatives that have medical applications.	2
21	Topic 21. Practical lesson 24. The family Libosaceae and its representatives, which have medical applications	2
22	Topic 22. Practical lesson 25. Medicinal flowering plants common in Ukraine	2
	Total	50

5.4. Topics of laboratory classes

Laboratory classes are not provided.

6. Independent work

№ p / p	THEME, ITS CONTENT	hours
1.	Topic 1. The purpose and tasks of pharmaceutical botany, its connection with professionally oriented disciplines. Sections of botany. The role of plants in nature and human life. Use of plants in pharmacy, medicine, etc. Preparation for practical class 2.	4
2.	Topic 1. Asexual reproduction. Ways of vegetative reproduction. Reproduction process: definition, types, basic concepts (life cycle, gametophyte, sporophyte, alternation of generations, change of nuclear phases, etc.), biological significance. Forms of sexual reproduction. General schemes of the life cycle of lower and higher plants and fungi. Preparation for practical class 2.	4
3	Topic 1. Methods of studying the structure and functions of cells, their importance in pharmacy and other fields. Peculiarities of plant cell structure. Comparative analysis of plant, animal, fungal and bacterial cells. Preparation for practical class 2.	4
4	Topic 2. Basics of microscopic and microchemical analysis, its significance and use in pharmacognosy and pharmacy. Interrelationship and interaction of cells in the plant organism. Plant tissues: appearance and development during evolution, principles of classification. Preparation for practical class 3,4.	4

5	Topic 4. Introduction to morphology, basic concepts. Morphological-anatomical and functional integrity of the plant organism. Evolution of the plant body and organs. Preparation for practical class 5.	4
6	Topic 5. Vegetative organs of plants, their formation, development, general regularities, functional integrity. Preparation for practical class 6.	4
7	Topic 22. Morphological-anatomical diagnostic features, ecology, resources, presence of biologically active substances and the use of some medicinal and edible plants widespread in Ukraine (Althea altea, warty birch, periwinkle, black elder, valerian, lily of the valley). Preparation for the exam.	4
8	Topic 22. Morphological-anatomical diagnostic features, ecology, resources, presence of biologically active substances and the use of some medicinal and edible plants widespread in Ukraine (common bitter chestnut, common oak, cattail, common St. John's wort, common viburnum). Preparation for the exam.	4
9	Topic 22. Morphological-anatomical diagnostic features, ecology, resources, availability of biologically active substances and use of some medicinal and edible plants widespread in Ukraine (nettle dioecious, buckthorn brittle, common linden, heart-leaved linden, buckthorn buckthorn, large plantain). Preparation for the exam.	4
10	Topic 13. Plant ecology as a branch of botany: purpose, task, object of research. Basic conditions for the existence of organisms, environmental factors, their influence on plants. Preparation for practical class 16.	4
11	Topic 14. Phenology as a section of plant ecology. Vegetation phases of plants, their characteristics; significance for pharmacognosy. Preparation for practical class 17.	4
12	Topic 15. Types of forests, vegetation, main forest-forming species, their economic importance, use, protection. Preparation for practical class 18.	4
13	Topic 16. Geography of plants: purpose, tasks, objects of research. The concept of habitat, formation of habitats, types, sizes of habitats.	4
14	Topic 17. Flora and its main elements. The wealth and resources of the flora of Ukraine. Plants are relicts, endemics and cosmopolitans. Preparation for practical class 19.	4
15	Topic 18. Protection of flora and medicinal plants. Resources of medicinal plants in Ukraine, their rational exploitation, protection, renewal, regulatory documents. Preparation for practical lesson 20.	4
	TOTAL:	60

7. Teaching methods

Practical classes: conversation, solving situational problems, demonstration of collection and procurement of raw materials.

Independent work: independent work with the textbook, independent work with tests.

8. Methods of control and criteria for evaluating learning outcomes

Current control: oral examination, testing, assessment of practical skills, solving situational problems, assessment of activity in the classroom.

Final control: exam, testing.

Evaluation of the current educational activity in a practical session:

1. Evaluation of theoretical knowledge on the subject of the lesson:

- methods: survey, solving a situational problem
- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

2. Evaluation of practical skills and manipulations on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills
- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

3. Evaluation of practical work on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills
- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

The grade for one practical session is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

Current evaluation criteria in practical training

Rating	Evaluation criteria
Perfectly "5"	worked systematically during the semester, showed versatile and deep knowledge of the program material during the exam, was able to successfully perform the tasks provided for in the program, mastered the content of the main and additional literature, realized the interrelationship of individual sections of the discipline, their importance for the future profession, showed creative abilities in understanding and using educational program material, demonstrated the ability to independently update and replenish knowledge; the level of competence is high (creative);
Fine "4"	is presented to a student who has demonstrated complete knowledge of the curriculum material, successfully completes the tasks provided for by the program, mastered the basic literature recommended by the program, has shown a sufficient level of knowledge in the discipline and is capable of their independent updating and renewal in the course of further education and professional activity; the level of competence is sufficient (constructive and variable);
Satisfactorily "3"	is awarded to a student who has demonstrated knowledge of the main curriculum material in the amount necessary for further education and subsequent work in the profession, copes with the tasks provided for by the program, made some mistakes in the answers on the exam and when completing the exam tasks, but has the necessary knowledge for overcoming mistakes made under the guidance of a scientific and pedagogical worker; the level of competence is average (reproductive);
Unsatisfactorily "2"	is presented to a student who has not demonstrated sufficient knowledge of the main educational program material, has made fundamental mistakes in the performance of the tasks provided for by the program, cannot use the knowledge in further studies without the help of a teacher, has not managed to master the skills of independent work; the level of competence is low (receptive-productive).

The procedure for evaluating the student's educational activity

Current performance. Evaluation of the success of the study of subjects of the discipline is carried out according to the traditional 4-point scale.

In a practical (laboratory) class, students must be interviewed at least once in 2-3 practical (laboratory) classes (no more than 75% of students), and in a seminar - at least once in 3-4 classes (no more than 50 % of students). At the end of the semester (cycle), the number of grades of students in the group should be the same on average.

At the end of each class, the teacher must announce their grades to the students, make a corresponding entry in the Logbook of students' attendance and success and the Student Attendance and Class Attendance Record.

At the end of studying the discipline, the current success rate is calculated - the average current score (arithmetic average of all current grades on a traditional scale, rounded to two decimal places).

At the last practical lesson, the teacher is obliged to provide information to students about the results of their current academic performance and academic debt (if any), as well as to fill out the student's record book when completing the training program in the discipline.

Current grades of "3" or "4" are not transferred to increase the grade point average in the discipline.

In the student's record book, the teacher enters the assessment of the discipline according to the traditional and 200-point scales.

A student is admitted to the exam if he fulfills the requirements of the educational program and if he received at least 3.00 points for the current educational activity and passed the test control of the "Step-2" tests with at least 90% (50 tasks). The test control is held in the Educational and Production Complex of Innovative Technologies of Learning, Informatization and Continuous Education of ONMedU in the last class before the exam.

Exam structure

The content of the evaluated activity	Number
Questions from section 1	1
Questions from section 2	1
Questions from section 3	1
Questions from section 4	1
Identification of plants by herbarium specimens	5

Criteria for assessing the learning outcomes of students in the exam:

«5»	It is presented to a student who systematically worked during the semester, showed during the exam versatile and deep knowledge of the program, is able to successfully perform the tasks provided by the program, mastered the content of basic and additional literature, realized the relationship of individual sections of the discipline, their importance for future profession. showed creative abilities in understanding and using educational material, showed the ability to independently update and replenish knowledge; level of competence - high (creative);
«4»	It is presented to a student who has shown full knowledge of the curriculum, successfully performs the tasks provided by the program, mastered the basic literature recommended by the program, showed a sufficient level of knowledge in the discipline and is able to independently update and update during further study and professional activities; level of competence - sufficient (constructive-variable)
«3»	Exhibited to a student who has shown knowledge of the basic curriculum in the amount necessary for further study and further work in the profession, copes with the tasks provided by the program, made some mistakes in answering the exam and when

	performing exam tasks, but has the necessary knowledge to overcoming mistakes under the guidance of a research and teaching staff; level of competence - average (reproductive)
«2»	Exposed to a student who did not show sufficient knowledge of the basic curriculum, made fundamental mistakes in performing the tasks provided by the program, can not without the help of the teacher to use the knowledge in further study, failed to master the skills of independent work; level of competence - low (receptive-productive)

9. Distribution of points received by applicants for higher education

The grade for the discipline is 50.0% from the grade for current performance and 50.0% from the grade for exam.

The average score for the discipline is translated into a national grade and converted into scores on a multi-point scale.

Conversion of the traditional grade for the discipline in the 200-point is carried out by the information and computer center of the university program "Contingent".

Table for conversion of traditional assessment into multi-point:

national assessment	bali
«5»	185-200
«4»	151-184
«3»	120-150

Points from the discipline are independently converted into both the ECTS scale and the four-point scale. ECTS scale scores are not converted to a four-point scale and vice versa. Further accounts are carried out by the information and computer center of the university.

Conversion of traditional assessment in the discipline and the amount of points on the ECTS scale

ECTS assessment	Statistical indicator
«A»	the best 10% of students
«B»	the next 25% of students
«C»	the next 30% of students
«D»	the next 25% of students
«E»	the last 10% of students

The ECTS scale is given by the ONMedU educational subdivision or the dean's office after ranking the grades in the discipline among students studying in one course and in one specialty. The ranking of students - citizens of foreign countries is recommended by the decision of the Academic Council to be conducted in one array.

10. Methodical support of the discipline:

- Working program of the academic discipline
- Syllabus
- Lecture texts №№ 1-5 (attached);
- Methodical developments for teachers of educational classes (attached);
- Methodical instructions for students in educational classes (album for practical classes in pharmaceutical botany - attached);
- Methodical recommendations for students on independent extracurricular work (attached);
- Educational equipment, technical and didactic teaching aids

List of didactic teaching aids

№ p/ p	List of technical and didactic teaching aids (DZH), educational equipment	Number	Numbers of topics where it is used	Notes
1.	Multimedia projector	1	1-20	
2.	Educational videos (on electronic media)	2	7.8	
3.	Lecture presentations (on electronic media)	20	1-20	
4.	Overhead projector	1	1-20	
5.	Slides	70	1-20	
6.	Training tables	40	1-20	
7.	Color images of deficient LR	85	1-20	
8.	Thematic herbarium collections of LR	18	2-19	
9.	Thematic collections of LRS samples	18	1-20	
10.	Thematic collections of drugs based on LRS	18	2-19	
11.	Microscope	30	1-19	
12.	Distiller	1	1-20	
13.	Refractometer	1	3.5-7	
14.	Polarimeter	1	7	
15.	Muffle furnace	1	1,5,10	
16.	Soxhlet apparatus	2	3	
17.	Microtome	1	1-19	
18.	Desiccator	1	1,5,10	
19.	Refrigerator	5	7	
20.	Box	20	1,5,10	
21.	Petri dishes	35	1-20	
22.	Technochemical scales, equilibria	2	1-20	
23.	Test tubes	100	1-20	
24.	Electric stove	2	1-20	
25.	Evaporating cups	15	1-20	
26.	The flasks are different	30	1-20	
27.	The cylinders are different	25	1-20	
28.	Water bath	2	1,5,10	
29.	Set of sieves	2	20	
30.	Chromatographic plates "Sylufol"	50	1-19	
31.	Funnels separate cylindrical VD-1	2	3-	
32.	Laboratory funnels	30	9,15,17,18	
33.	Mortar and pestle	20	2-18	
34.	Beakers	10	1,3,5,17	
35.	Cover glass	100	2-19	
36.	Glass slide	50	1-19	
37.	The thermometer is laboratory	3	1-19	
38.	Indicator paper	30		
39.	Chromatographic paper	1	1-19	
40.	Filter paper	4	1-19	
41.	Etna	20	1-19	
42.	Tweezers	20	2,7,12,15	
43.	Scalpel	20	1-20	
44.	Dissecting needle	30	1-19	
44.	Agate stopwatch	30	1-19	

45.	Tripods	1	1-20	
46.	Bottles for solutions	10		
47.	Chemical reagents	20	1-19	

11. List of questions for the exam

1. Botany as a science, its purpose, tasks and sections. Discipline "Pharmaceutical Botany", its connection with pharmacognosy and other professionally oriented, special disciplines and professional activity of a pharmacist. The role and use of plants.
2. Plant anatomy: purpose, methods and objects of research, use in pharmacognosy, pharmacy and other fields.
3. Modern idea of the structure of a plant cell, its components - protoplast and protoplast derivatives. Plant cell components that have diagnostic value in microscopic analysis of plant objects.
4. Signs that distinguish plant cells from animal cells, fungi and cyanobacteria.
5. Plastids, their types, biological relationship, structure, chemical composition. Plastin pigments, their significance of use.
6. Vacuoles: formation, development, content and meaning. The composition of cell juice, its importance and use.
7. Cellular inclusions, their formation, classification, localization, diagnostic value.
8. Spare inclusions, their classification, places of accumulation, values.
9. Reserve carbohydrates (starch, inulin, sucrose, hemicellulose, etc.): chemical nature, properties, formation and accumulation in the cell, value, practical use.
10. Types of starch, form of accumulation, detection reactions. Starch grains: formation, structure, types, places of accumulation, diagnostic value, use.
11. Inulin: form of accumulation, detection reactions, diagnostic value.
12. Reserve proteins: differences from constitutional proteins, localization in the cell, form of accumulation. Aleuron grains: formation, structure, types, detection reactions, diagnostic value, use.
13. Fatty oil: chemical nature and properties, places and form of accumulation in the cell, differences from essential oil, detection reactions, significance and practical use.
14. Crystal inclusions of the cell: chemical nature, formation and localization, variety of forms, diagnostic value, detection reactions.
15. Cell membrane: functions, formation, structure, chemical composition, secondary changes; pores of the cell membrane: their formation, structure, varieties, purpose.
16. Characteristics, significance and use of cell membrane substances, qualitative microreactions.
17. Relationship and interaction of cells in the plant organism. Plant tissues: definition, classification by origin, morphology, functions, position in organs; diagnostic signs.
18. Generative tissues, or meristems: functions, features of cell structure, classification, derivatives and values of meristems.
19. Integumentary tissues: functions and classification.
20. Primary integumentary tissue - epidermis: functions, features of structure.
21. The main (basic) cells of the epidermis: structure, functions, diagnostic features.
22. Stomata: functions, structure, activity, location, position relative to the surface. The main types of respiratory tracts, their taxonomic and diagnostic value. Relationship between the structure and functioning of stomata with environmental factors.
23. Trichomes: functions, education, diversity, classification, morpho-physiological features, diagnostic value, practical use.
24. The integumentary tissue of the root is an epiblem, or rhizoderm: the formation of features of structure and functioning.
25. Secondary integumentary tissues - periderm and crust: their formation, composition, meaning, use. Structure and functions of lentils, their diagnostic features.

26. The main tissues - assimilation, storage, water and gas storage: functions, structural features, topography in the organs, diagnostic value.
27. Isolating or secretory structures: functions, classification, diagnostic value.
28. Exogenous secretory structures (glandular trichomes, nectaries, osmophores, hydathodes): localization, classification, features of structure and functioning, taxonomic and diagnostic value.
29. Endogenous excretory tissues and structures (idioblasts, containers of secretions, passages and channels, milkweeds): formation, placement in organs, classification, functioning, taxonomic and diagnostic value.
30. Mechanical tissues (collenchyma, scleroids, sclerenchymal fibers): functions, structure features, placement in organs, classification, types, taxonomic and diagnostic value.
31. Conductive tissues: functions, classification.
32. Leading tissues that provide the ascending flow of water and minerals - tracheids and vessels: formation, structure, types, taxonomic and diagnostic value.
33. Conductive tissues that provide the downward flow of organic matter - sieve cells, sieve tubes with satellite cells: education, features of structure and function, taxonomic and diagnostic value.
34. Complex tissues - phloem (bast) and xylem (wood): formation, histological composition, topography in organs.
35. Leading bundles: formation, composition, types, patterns of placement in organs, taxonomic and diagnostic value.
36. Morphology as a branch of botany: purpose, methods, basic morphological concepts and general laws of plant organisms (organ, polarity, symmetry, reduction, metamorphosis, similarity and homology, etc.).
37. Evolution of the body of plant organisms. Organs of higher plants. Vegetative organs, morphological-anatomical and functional integrity.
38. Root: definitions, functions, types of roots, types of root systems. Specialization and metamorphosis of roots.
39. Root zones, their structure and functions. Primary and secondary anatomical structure of roots and root crops: types, features of structure, features that are important for the description and diagnosis of roots.
40. Shoot: definition, functions, difference from the root; shoots components; variety of shoots depending on the length of the internodes, the method of growth, the degree and type of branching, position in space, the shape of the cross section of the stem, etc.
41. The main life forms of plants, their characteristics, examples.
42. Kidneys: definition, structure, classification by position, structure, functions.
43. Stem: definitions, functions, regularities of anatomical structure, types of structure, distinctions in the structure of the stem of herbaceous monocotyledonous and dicotyledonous plants, woody covered and gymnosperms. Signs that are important for the description and diagnosis of stems.
44. Leaf: definition, parts of the leaf, features of structure and function. Leaf placement, methods of attaching leaves. Types of leaves and their morphological diversity.
45. Metamorphosis of the shoot and its components. Aboveground metamorphoses of the shoot - thorns, whiskers, whips, tendrils, etc. ∴ origin, structure, functions, diagnostic value. Underground metamorphoses of the shoot - rhizome, tuber, bulb, bulb: structure, morphological types, meanings, uses.
46. Regularities of anatomical structure of leaves, types of anatomical structure of leaf plates. Influence of external factors on the morphological and anatomical structure of the leaf. Signs used for the description and microscopic diagnosis of leaves.
47. Anatomical features of the structure of rhizomes of monocotyledonous and dicotyledonous plants, diagnostic features.
48. Generative organs of a plant: definition, origin, functions.
49. Inflorescence as a specialized shoot that carries flowers: origin, biological role, parts, classification and characteristics. Signs used to describe and diagnose inflorescences.
50. Flower: definition, origin, functions, symmetry, parts of a flower.

51. Pedicel, perianth: definition, functions, forms of perianth and location of flower parts on it; formation of hypanthium, its participation in the formation of the fetus.
52. Perianth: its types, characteristics of the constituent parts - cups and corolla: their functions, designation in the formula, variety of types and forms, metamorphosis and reduction, diagnostic value.
53. Androcei: definition. The structure of the stamen, the purpose of its parts, their reduction; structure and purpose of pollen grain. Types of androceum, notation in the formula. Taxonomic significance of androcyte.
54. Gynoecium: definition, the concept of carpel and pistil; the structure of the pistil and the purpose of its parts. The position of the ovary. Types of gynoecium, its taxonomic significance. Structure and significance of the seed germ.
55. The sex of the flower. Dominance of plants.
56. Formulas and diagram of flowers, their composition and interpretation.
57. The value of flower morphostructure in plant taxonomy and in the diagnosis of medicinal plant raw materials.
58. Types and methods of pollination. Double fertilization: the essence of the process, the formation of seeds and fruits.
59. Fruit: definitions, parts, their origin and structure features. Fruit diversity, their morpho-genetic classification and morphological types. fruit, adaptation to distribution. Origin and structure of the fruit. Morphological description, diagnostic value and use of fruits and fruits.
60. Seed: definition, parts of seed, differences in the structure of seeds of gymnosperms, monocotyledonous and dicotyledonous angiosperms, classification by the presence and localization of nutrient tissue, by the nature of nutrients; value, use.
61. Reproduction and reproduction: definition, meaning, forms. Asexual reproduction by zoospores or spores. Vegetative reproduction, its essence, methods, meaning. Sexual reproduction, its types.
62. The concept of the life cycle, the alternation of generations. Significance and features of the life cycle of algae, fungi and higher plants.
63. Systematics as a section of botany: purpose, tasks, methods, connection with other sections of botany. Components of botanical taxonomy; modern phylogenetic systems; taxonomic categories and taxa, botanical nomenclature. The essence and significance in the pharmacy of chemisystemic features.
64. Superking of prokaryotes, *cyanobacteria* (*blue-green algae*): features of cell structure, distribution, nutrition, reproduction, importance, use of representatives (*spirulina*).
65. Eukaryotic superkingdom: features of cell structure, classification.
66. Kingdom of **fungi** : features of the structure of the fungal cell, ecology, nutrition, reproduction, classification, significance. Classes of ascomycetes and basidiomycetes: features of body structure, reproduction. Morphological features of representatives (*horns, birch mushroom, or chaga, boletus, mushrooms, shiitake, pale toadstool, red toadstool*), their meaning, use.
67. Department of **lichens** : distribution, features of living conditions, morphological and anatomical structure of frost, nutrition, reproduction, ecology, significance and use of representatives (*cladonia, parmelia, usneya, cetraria*).
68. The plant kingdom. **Algae** : distribution, body structure, nutrition, reproduction, importance; characteristics of *red, green, brown algae* : features of cell and body structure, distribution, significance, use of representatives (*anfeltsia, porphyry, phyllophora, spirogyra, chlorella, ulva, kelp*).
69. Higher spore plants. General characteristics of vascular and vascular departments: distribution, ecology, body structure, development cycle, generational alternation. Morphological and ecological features, significance and use of representatives of departments: **mosses, or bryophytes** (*sphagnum*) ; **plaunopodobny, or lycopodiophytes** (*plaun mace-shaped, lamb ordinary, plaunok plaunovidny, or selaginella*); **horsetail, or equisetophytes** (*horsetail*); **ferns, or polypodiophyte** (*male shield, or male fern*).

70. Higher seed plants: progressive traits, classification.
71. Department of *gymnosperms* : distribution, body structure, features of reproduction, classification. Morphological and anatomical features of families; species diagnostics, chemosystematic features, ecology, resources, significance and application of representatives of these families: **pine** (*Scots pine*, *European spruce*, *Siberian and white fir*, *Siberian larch*); **cypress** (*juniper*, *thuja western*); **yew** (*thousands of decayed wood*); **coniferous, or ephedra** (*ephedra dicotyledonous*) .
72. *Angiosperms* department : progressive traits, general characteristics, classification, comparative characteristics of classes and *dicotyledons* and *monocotyledons*
73. Morphological and anatomical features and distribution of some families. Species morphological and anatomical diagnostics, ecology, resources, the presence of certain groups of biologically active substances, the importance and use of representatives of families and genera:
- **Buttercup** (aconite poison, meadow buttercup, Adonis spring, hellebore, hellebore black);
 - **poppies** (sleeping poppy, yellow cat, celandine);
 - **cabbage** (genus mustard: white, Sarepta, black, common buckthorn, yellow jaundice, kale);
 - **buckwheat** (genus bitter: g. serpentine, g. pepper, g. pochechuyny, common knotweed, sowing buckwheat, genus rhubarb: Tangut, etc., genus sorrel: horse mackerel, sour sorrel);
 - **legumes** (peanut underground, astragalus woolly, clover, lupine, peas, common beans, robinia pseudoacacia, sweet naked, soy bristles);
 - **pink** (chokeberry, hawthorn genus: blood-red, etc., mountain ash, raspberry, almond, erect foxglove, geranium, prickly plum, wild strawberries, bird cherry, genus dog rose: sh. dog, sh. may etc., home apple tree);
 - **heather** (marsh, cranberry, bearberry, blueberry);
 - **celery** (anise), hemlock spotted, cumin, coriander, fragrant dill, carrots, parsley, celery, fennel, hemlock poisonous;
 - **morning** (genus strange: d. medicinal, d. bear, d. dense-flowered, genus foxglove: n. large-flowered, n. purple, n. woolly);
 - **nightshade** (belladonna ordinary, black black, datura, potatoes, genus tobacco: so real, so shag);
 - **labiate, or nettle** (genus lavender: l. narrow-leaved, etc., oregano, lemon balm, genus mint: m. pepper, etc., genus dog nettle: s. k. common, s. k. five-lobed , genus thyme: h creeping, etc., sage);
 - **Asteraceae** (family tree: d. the usual al., Echinacea purpurea, dandelion, burdock real, Calendula officinalis, elfwort, tussilago, tansy, wormwood, sunflower bulbystyy or Jerusalem artichoke, family hamomila: x. ragged x fragrant, sand cumin, three-part herd);
 - **onion** (garden onion, garlic);
 - **cereals or thin-legged** (corn, sowing oats, summer or soft wheat, creeping wheat, sowing rice).
 - **Morphological and anatomical diagnostic features, ecology, resources, the presence of biologically active substances and the use of some common in Ukraine medicinal and edible plants** (marshmallow, warty birch, periwinkle, elderberry, valerian, bitter chestnut, oak, St. John's wort common, viburnum, lily of the valley, nettle, buckthorn brittle, azalea, linden heart, sea buckthorn, plantain large).
74. Plant ecology as a branch of botany: purpose, tasks, object of research. Basic conditions of existence of organisms, ecological factors, their influence on plants.
75. Moisture as an ecological factor, ecological groups of plants - hydrophytes, hygrophytes, mesophytes, xerophytes, sclerophytes, succulents.
76. Heat as an environmental factor, heat and frost resistance, light regime, light-loving, shade-loving and shade-tolerant plants.
77. Soil or edaphic factors, physical properties and salt regime of the soil, plants psammophytes and halophytes.
78. Air as an environmental factor, its impact on plants.

79. Biotic factors. Anthropogenic factor. Introduction and acclimatization of plants.
80. Phenology as a section of plant ecology. Phases of plant vegetation, their characteristics; value for pharmacognosy.
81. Plant phenology: purpose, tasks, objects of research. Plant communities: formation and structure, plant zones and the main types of vegetation of the Earth.
82. Types of forests, vegetation, main forest-forming species, their economic importance, use, protection.
83. Steppe vegetation, medicinal species, their biological features.
84. Wet and dry subtropics; the phenomenon of vertical zonation; vegetation of mountainous regions of Crimea, Carpathians; protection of rare species, valuable subtropical crops.
85. Meadows and swamps, medicinal plants of these groups on the territory of Ukraine.
86. Weeds: definition, biological features, classification, adaptation to distribution, medicinal species of weeds, their use.
87. Geography of plants: purpose, tasks, objects of research. The concept of habitat, formation of habitats, types, sizes of habitats.
88. Flora and its main elements. Wealth and resources of flora of Ukraine.
89. Plants are relics, endemics and cosmopolitans.
90. Protection of flora and medicinal plants. Resources of medicinal plants in Ukraine, their rational operation, protection, renewal, normative documents.

12. Recommended literature

Basic

1. Serbin, AG Pharmaceutical botany: textbook. / AG Serbin, LM Sira, TO Slobodyanyuk; for order. LM Gray. - Vinnytsia: NEW BOOK, 2015. - 420 p.
2. Pharmaceutical botany. Module 1, III semester. Textbook in diagrams and tables for students of pharmaceutical faculties. / Kornievsky YI, Kornievskaya VG, Panchenko SV - ZSMU Zaporizhia Publishing House, 2016. - 94 p.
3. Anatomy and morphology of plants in drawings / TN Gontovaya, VP Rudenko, LM Seraya, VP Gaponenko, AG Serbin, TV Oproshanskaya, VV Mashtaler, OS Mala, SV Romanova - H. : NUPh, 2014. - 63 p.
4. Systematics of plants in drawings: [textbook. manual for students. higher education zakladiv] / [compiled by: TV Oproshanska, VP Rudenko, VV Mashtaler, OS Mala.] - Kh. : NUPh, 2015. - 65 p.
5. Pharmaceutical botany. Morphology of generative organs. / Kornievskaya VG, Kornievsky YI, Panchenko SV, Ivankina NM - ZSMU Publishing House, Zaporizhia, -2015. - 108 p.
6. Pharmaceutical botany: textbook / TMGontova, AHSerbin, SMMarchyshyn; edited by TMGontova. - Ternopil: TSMU, 2018 p. - 380 p.

Auxiliary:

1. Systematics of plants in questions and answers. Module 2. Textbook for students majoring in "Pharmacy" and "TPKZ". / Kornievsky YI, Kornievskaya VG, Shkrobotko P.Yu., Panchenko SV - ZSMU Publishing House, Zaporizhia, - 2015. - 111 p.
2. Pharmaceutical botany. Methodical recommendations for laboratory classes and self-training of students of pharmaceutical faculties. / Kornievskaya VG, Kornievsky YI, Panchenko SV - ZSMU Publishing House, Zaporizhia, 2016. - 82 p.
3. Botany. "Step 1. Pharmacy". Module 1, 2. Collection of tests with explanations for control of knowledge and preparation for the license exam of students of the II-III course of pharmaceutical faculties of the specialty "Pharmacy" and "TPKZ". / Kornievsky YI, Serbin AG, Kornievskaya VG, Panchenko SV - ZSMU Publishing House, Zaporizhia, 2016. - 216 p.

4. Anatomy of plants. Module 1. / YI Kornievsky, VG Kornievskaya, PY Shkrobotko / Recommended letter from the Ministry of Education and Science of Ukraine dated 27.11.2012 №23-01-25 / 308.-Zaporizhia: ZSMU, 2013.-103p.

5. Anatomy and morphology of vegetative organs of plants in questions and answers. A textbook for students of pharmaceutical faculties. / Kornievskaya VG, Kornievsky YI, Panchenko SV - Iz-vo ZGMU Zaporizhia, 2016. - 91 p.

6. Pharmaceutical botany. Step-1. Methodical recommendations for laboratory classes and self-training of students of pharmaceutical faculties. / Kornievskaya VG, Kornievsky YI, Panchenko SV - ZSMU Zaporizhia Publishing House, 2016. - 84 p.

7. Botanique medicale = Medical botany: учеб. for university students / AG Serbin, LM Seraya, NM Tkachenko, TA Slobo-dyanyuk; under common ed. LM Gray. - H.: Izd – vo NFaU: Zolotye strany-tsy, 2003. - 364 s.

8. Gulko RM Dictionary of medicinal plants of world medicine / Gulko RM - L.: Liga-Press, 2005. - 506 p.

13 Information resources

1. Botany in figures. Text & multimedia lectures [Electronic resource] / TN Gontovaya, VP Rudenko, Ya. S. Kichimasova, V. R. Gaponenko, M. A. Kulagina. - Electron. text, graph. data (1.31 GB). - H.: NUPh, 2012. - 1 electr. wholesale disk (CD-ROM); count system requirements: PC 486 and above; 8 MB RAM; Win 98, WinXP, Win 7; SVGA 32768 and more count. ; 640x480; 4x CD-ROM drive; 16 bits. zv. map. - Disk in a container 18x13 cm.

2. Materials for independent work of applicants for higher education in the discipline "Pharmaceutical Botany", which are posted on the website of the Center for Distance Learning Technologies ONMedU. - Access mode : <https://moodle.odmu.edu.ua/course/view.php?id=257>

3. Official site of the scientific library of ONMedU: <https://onmedu.edu.ua/biblioteka/>

4. Page of methodical work of the department on the site of ONMedU: <https://info.odmu.edu.ua/chair/pharmacognosy/files>