



**CD 8.5.1 DISCIPLINE SYLLABUS FOR
UNIVERSITY STUDIES**

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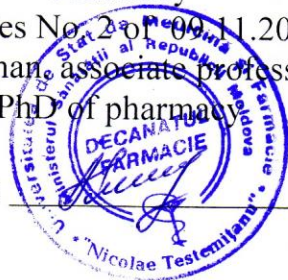
**FACULTY OF PHARMACY
STUDY PROGRAM PHARMACY
CHAIR OF PHARMACOGNOSY AND PHARMACEUTICAL BOTANY**

APPROVED

at the meeting of the Commission for Quality Assurance and Evaluation of the Curriculum in Pharmacy

Minutes No. 2 of 09.11.2021
Chairman, associate professor,
PhD of pharmacy

Uncu Livia

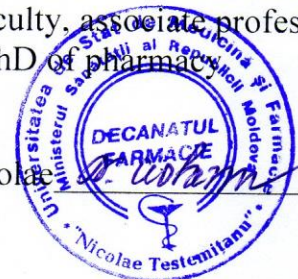


APPROVED

at the Council meeting of the Faculty of Pharmacy

Minutes No 3 of 16.12.2021
Dean of Faculty, associate professor,
PhD of pharmacy

Ciobanu Nicolae



APPROVED

at the meeting of the Chair of pharmacognosy and pharmaceutical botany

Minutes No. 27 of 30.06.2021

Head of chair, professor, Dr. hab. of biol.

Calalb Tatiana

SYLLABUS

DISCIPLINE PHARMACEUTICAL BOTANY

Integrated studies

Type of course: **Compulsory discipline**

Curriculum was elaborated by author:

Calalb Tatiana, Dr. hab. of biol., professor

Chisinau, 2021



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I. INTRODUCTION

- General presentation of the discipline: place and role of the discipline in the formation of the specific competences of the professional / specialty training program

The discipline of Pharmaceutical botany is an important component in pharmaceutical education with the major objective of studying and knowing the morpho-anatomical characteristics of the medicinal plant species in the local and world flora and their systematic classification. The role of Pharmaceutical botany is to familiarize the future pharmacist specialist with the local and global medicinal flora, the criteria for describing and identifying with certainty the species, the chorology, the ecological aspects and the potential for valorification on the pharmaceutical purpose by respecting the biodiversity and plant protection strategies.

Theoretical knowledge and practical skills will serve as basic support for the acquirement of the subjects: Pharmacognosy (3rd year), especially in macro- and microscopical analysis of vegetable products and identification of productive plants; Phytotherapy (3rd year); Pharmaceutical technology (3rd year) – sources of vegetable raw material in phytopreparations, medicinal species; Toxic plants (3th year) – the students will apply morpho-anatomical criteria for identifying plant species with different toxicity degree, Aromatherapy (2th year), Alternative and complementary phytotherapy, Biotechnologies on medicinal plants (3th year) etc. The knowledge and skills gained during the Pharmaceutical botany will contribute to the training of the pharmacist specialist for the pharmaceutical and research activities in the harnessing of local flora.

- Mission of the curriculum (aim) in professional training

Training of future specialists-pharmacists in the general concept of morphological and anatomical organization of plant organs and systematic affiliation of medicinal plants; formation of skills in order to describe and identify the plant species with pharmaceutical value from local and global flora.

Pharmaceutical botany is a fundamental discipline which will familiarize the students with the principles of structure organization of the vegetal organisms at cellular, tissue, organ and organism levels; highlighting morpho-anatomical clues with diagnostic character in the identification of medicinal plants; developing the skills of making and describing microscopic preparations, identifying the medicinal plants, developing critical thinking in addressing the basic problems of knowledge application in the plant pharmacy domain.

- Languages of the course: Romanian, Russian, English
- Beneficiaries: students of the Ist year, faculty of Pharmacy

II. ADMINISTRAREA DISCIPLINEI

| | | | |
|------------------------------------|---|--------------------|--------------|
| Code of discipline | F.01.O.003 F.02.O.016 | | |
| Name of the discipline | Pharmaceutical botany | | |
| Person in charge of the discipline | dr. hab. biol. sc, univ. prof., Tatiana Calalb | | |
| Year | I | Semester/Semesters | I, II |



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| | | | |
|---------------------------------|-----------------|----------------------------|------------|
| Numărul de ore total, inclusiv: | | | 240 |
| Lectures | 30 | Practical/laboratory hours | 90 |
| Seminars | - | Self-training | 120 |
| Form of assessment | Exam (2) | Number of credits | 4+4 |

III. TRAINING AIMS WITHIN THE DISCIPLINE

At the end of the discipline study the student will be able to:

- ✓ ***at the level of knowledge and understanding:***
 - general concept of vegetal cell structure organization;
 - principles of histological organization of vegetal organisms;
 - morpho-anatomical particularities of vegetal organs;
 - morphological criteria of recognition and identification of medicinal plants;
 - the principles of classifying the vegetal world;
 - scientific taxonomy;
 - notions and national/global policies on the biodiversity of the spontaneous and cultivated vegetal world, plant protection.
- ✓ ***at the application level:***
 - correct usage of terminology, symbolism and biological notions: cytological, histological, anatomical, morphological and taxonomical;
 - description and recognition of microscopic preparations, images, schemes, botanical exhibits, medicinal plants;
 - description and identification of medicinal plant species;
 - the detection and herborization of medicinal plants;
 - optimal and creative valorization of each student's own potential in practical activities during the laboratory works.
- ✓ ***at the integration level:***
 - determining the position and importance of the Pharmaceutical botany discipline in the whole set of disciplines provided by the study plan;
 - the subsequent usage of the skills for preparation and analysis of micropreparations during pharmacognosy study of the vegetable products;
 - applying the abilities in highlight the morphological criteria for describing and identifying medicinal plants;
 - correct application of the scientific nomenclature, the systematic classification of medicinal plants from the spontaneous and cultivated flora.
 - application and integration of knowledge for the subsequent knowledge's acquirement of the courses of Pharmacognosy, Toxic plants, Phytotherapy, Pharmacology.

IV. PROVISIONAL TERMS AND CONDITIONS

Students of the first year require the following:

- knowledge of the instruction language;



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- knowledge in biology, chemistry and physics at the lyceum level;
- competences in modern information technologies (using the Internet, document processing, electronic tables and presentations, using graphics software);
- teamwork skills;
- analytical and synthesis skills, generalization and communication skills;
- qualities – tolerance, compassion, autonomy, collegiality.

V. THEMES AND ESTIMATIVE ALLOCATION OF HOURS

Lectures, practical hours/ laboratory hours/seminars and self-training

| Or. no. | THEME | Number of hours | | |
|---------|--|-----------------|-----------------|---------------|
| | | Lectures | Practical hours | Self-training |
| 1. | Introduction. Short history. Pharmaceutical botany and compartments. Vegetal cytology. Basic notions of cell biochemistry. Microtechnique, macro- and microscopic analysis procedures. Cell wall. | 1 | 3 | 5 |
| 2. | Structural organization of the plant cell. Plastids. | 1 | 3 | 5 |
| 3. | Ergastic inclusions in the vegetal cell. Cellular diagnostic criteria in the vegetable products and plant identification. | 1 | 3 | 4 |
| 4. | Vegetal histology. Meristematic and protective tissues. | 1 | 3 | 4 |
| 5. | Vascular and mechanical tissues. | 1 | 3 | 3 |
| 6. | Fundamental and secretory tissues. | 1 | 3 | 6 |
| 7. | Diagnostic cyto- and histological criteria in plant identification. Analysis and identification of micropreparations. | - | 3 | 3 |
| 8. | Organography. Root. Morphology and anatomy. Root – source of medicines. | 1 | 3 | 4 |
| 9. | Stem. Morphology and anatomy. Stem – source of medicines. | 1 | 3 | 2 |
| 10. | Leaf. Types and classification. Morphology and anatomy. Morpho-anatomical criteria in plant identification. Leaf and flower – source of medicines. | 2 | 3 | 4 |
| 11. | Flower. Inflorescences. Types and classification. Morphology and anatomy. Morpho-anatomical criteria in plant identification. Leaf and flower – source of medicines. | 1 | 3 | 6 |
| 12. | Fruit. Seed. Morphology and anatomy. Fruit and seed – source of medicines. Multiplication of plants. Morpho-anatomical criteria in plant identification. | 1 | 3 | 6 |
| 13. | Morpho-anatomical analysis of plant organs based on diagnostic criteria on micropreparations, preserved and herborized materials. | - | 3 | |
| 14. | Vegetal systematic. Short history. Taxonomy. Morpho-anatomical characteristics of species with pharmaceutical value from divisions: <i>Cyanophyta</i> , <i>Chlorophyta</i> , <i>Phaeophyta</i> , <i>Rhodophyta</i> , <i>Mycota</i> , <i>Lichenophyta</i> . | 1 | 6 | 6 |
| 15. | Morpho-anatomical characteristics of species with pharmaceutical value from divisions: <i>Bryophyta</i> , <i>Lycopodiophyta</i> , <i>Equisetophyta</i> , <i>Polypodiophyta</i> , <i>Pinophyta</i> . Spontaneous and cultivated species. | 2 | - | - |



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| Or. no. | THEME | Number of hours | | |
|---------|--|-----------------|-----------------|---------------|
| | | Lectures | Practical hours | Self-training |
| 16. | Total: Ist semester 180 hours | 15 | 45 | 60 |
| 17. | Identification of the species with pharmaceutical value from div.: <i>Bryophyta</i> , <i>Lycopodiophyta</i> , <i>Equisetophyta</i> , <i>Polypodiophyta</i> and <i>Pinophyta</i> on preserved and herborized materials. | - | 3 | 6 |
| 14. | Fil. <i>Magnoliophyta</i> . General characteristics. Cl. <i>Magnoliopsida</i> (<i>Dicotyledonatae</i>) and Cl. <i>Liliopsida</i> (<i>Monocotyledonatae</i>). Cl. <i>Magnoliopsida</i> . Families: <i>Berberidaceae</i> , <i>Schisandraceae</i> , <i>Nymphaeaceae</i> , <i>Ranunculaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 2 | 3 | 4 |
| 18. | Families: <i>Papaveraceae</i> , <i>Cannabaceae</i> , <i>Urticaceae</i> , <i>Fagaceae</i> , <i>Betulaceae</i> , <i>Juglandaceae</i> , <i>Caryophyllaceae</i> , <i>Chenopodiaceae</i> , <i>Polygonaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 10 |
| 19. | Families: <i>Theaceae</i> , <i>Passifloraceae</i> , <i>Violaceae</i> , <i>Cucurbitaceae</i> , <i>Brassicaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 4 |
| 20. | Families: <i>Salicaceae</i> , <i>Ericaceae</i> , <i>Primulaceae</i> , <i>Tiliaceae</i> , <i>Malvaceae</i> , <i>Hypericaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 4 |
| 21. | Families: <i>Rosaceae</i> and <i>Saxifragaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 2 | 3 | 4 |
| 22. | Morpho-anatomical characteristics of species with pharmaceutical value from studied families. Identification of species on preserved and herborized materials. | - | 3 | 2 |
| 23. | Families: <i>Fabaceae</i> , <i>Myrtaceae</i> , <i>Onagraceae</i> , <i>Anacardiaceae</i> , <i>Rutaceae</i> , <i>Hippocastanaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 4 |
| 24. | Families: <i>Linaceae</i> , <i>Araliaceae</i> , <i>Apiaceae</i> , <i>Rhamnaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 5 |
| 25. | Families: <i>Elaeagnaceae</i> , <i>Apocynaceae</i> , <i>Gentianaceae</i> , <i>Rubiaceae</i> , <i>Caprifoliaceae</i> , <i>Valerianaceae</i> , <i>Boraginaceae</i> , <i>Solanaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 5 |
| 26. | Families: <i>Scrophulariaceae</i> , <i>Plantaginaceae</i> , <i>Lamiaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 2 | 3 | 3 |
| 27. | Family <i>Asteraceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 1 | 3 | 3 |
| 28. | Cl. <i>Monocotyledonatae</i> . Families <i>Asparagaceae</i> , <i>Liliaceae</i> , <i>Alliaceae</i> , <i>Iridaceae</i> , <i>Dioscoreaceae</i> , <i>Araceae</i> , <i>Poaceae</i> . Morpho-anatomical criteria. Species with pharmaceutical value. | 2 | 3 | 4 |
| 29. | Morpho-anatomical characteristics of species with pharmaceutical value from studied families. Identification of species on preserved and herborized materials. | - | 3 | - |
| 30. | Evaluation of practical skills in describing and identifying of flowering plant species on herborized materials. | - | 3 | - |



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| Or. no. | THEME | Number of hours | | |
|---------|--|-----------------|-----------------|---------------|
| | | Lectures | Practical hours | Self-training |
| 31. | Medicinal plants from the R. of Moldova flora: autochthonous and alohtone plants; spontaneous and cultivated. Collections of medicinal plants. Ecological aspects. Plant protection. | 1 | - | 2 |
| 32. | Total IInd semester 120 hours | 15 | 45 | 60 |
| 33. | Total: 240 hours | 30 | 90 | 120 |

VI. PRACTICAL ABILITIES PURCHASED AT THE END OF THE COURSE

Purchased practical tools:

- correct usage of terminology, symbolism and biological notions: cytological, histological, anatomical, morphological and taxonomical;
- description and recognition of microscopic preparations, images, schemes, botanical exhibits, medicinal plants;
- description and identification of medicinal plant species;
- to be able to detect, identify, determine and herbalize species of medicinal plants;
- to be able to capitalize creatively and rationally their own potential in practical activities, research activities and application of knowledge in the field of phytotherapy.

VII. REFERENCE OBJECTIVES AND CONTENT UNITS

| Objectives | Content units |
|--|---|
| Theme 1. Vegetal cytology | |
| <ul style="list-style-type: none"> • To define the cell. • To know the characteristics of cell organelles and their role. • To know the living and non-living constituents of the plant cell. • To differentiate the specific structures of plant cell. • To know the principles of cell compartmentalization and interaction between different compartments. • To develop skills for observing, making and analyzing micropreparations. • To be able to analyze micropreparations in a microscope and to highlight specific cellular structures. | Cell - the elementary structural and functional unit of the vegetal organisms. Cellular organelles and their role. Examples of living /non-living constituents and their role. Primary cell wall and types of secondary modifications. Plastids and their role in cell metabolic activity. Vacuole and their role. Types of ergastic inclusions and their role in identifying the vegetable products. Microscopic microtechnique and micropreparations made by different techniques. Technique of application of chemical reagents on micropreparations. Cellular diagnostic criteria in the identification of vegetable products and medicinal plants. |



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| Objectives | Content units |
|--|---|
| Theme 2. Vegetal histology | |
| <ul style="list-style-type: none"> To define the notion of tissue and criteria for tissue classification. To know the types of definitive tissues. To demonstrate that they can highlight specific structures for each type of tissue. To be able to apply histological diagnostic criteria in the identification of samples of plant products. To integrate the histological criteria into the specific of plant organ organization. To be able to highlight unitary histological types structures and their combinations for different medicinal plants. | <p>Tissue as a component of plant organs. Principles of histological zonality in plant organs. Types of meristematic tissues and their role. Types of definitive tissues, role and location. Types of specific structures for each tissue category. Chemical reagents for highlighting different histological constituents. Histological criteria with diagnostic role in the identification of vegetable products and medicinal plants. Examples of histological structures with diagnostic role for medicinal plants.</p> |
| Theme 3. Organography | |
| <ul style="list-style-type: none"> To define the notion of vegetative and reproductive organs. To know the terminology and specific symbols for plant morphology and anatomy. To understand criteria for morphological classification of organs. To know the morphological characteristics of the root, stem, leaf, flower, inflorescence, fruit and seed. To know the primary and secondary anatomical structures of the organs. To demonstrate that they can highlight specific morpho-anatomical structures for each organ. To be able to apply morpho-anatomical criteria in the description of plant organs. | <p>Vegetative organs: root, stem, leaf. Reproductive organs: flower, fruit, seed. Morphological types of roots. Morphological types of stem. Morphological types of leaf. Anatomy of the leaf. Morphological types of flowers and inflorescences. Morphological types and classifications of fruits. Morphological types of seed. Primary and secondary anatomy of root and stem. Specific morpho-anatomical criteria in the description of plant organs.</p> |
| Theme 4. Plant systematics. Thallophyte organisms | |
| <ul style="list-style-type: none"> To define the notion of species. To define the notion of binary nomenclature. To know the taxa and understand the principles of plant organisms classification. To know the morphological characteristics of thallophytes. To highlight specific morphological criteria for algae, fungi and lichens. To know the morphology, the distribution of species with pharmaceutical value from divisions <i>Cyanophyta</i>, <i>Chlorophyta</i>, <i>Phaeophyta</i>, <i>Rhodophyta</i>, <i>Mycota</i>, and <i>Lichenophyta</i>. | <p>Taxons: species, genus, family, order, class, division, regnum. Binary nomenclature. Classification of the vegetable world. The notion of thallophytes. Morphological features specific to thallophytes and divisions. The characteristic of species with pharmaceutical value and systematic affiliation. Description and identification of thallophyte</p> |



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| Objectives | Content units |
|--|---|
| <ul style="list-style-type: none"> To know the Latin taxonomy of species. To be able to apply morphological characteristics in the description of the species. | species on herborized materials. |
| Theme 5. Plant systematics. Cormophytes spore organisms | |
| <ul style="list-style-type: none"> To define the notion of vascular and avascular cormophytes, spores cormophytes. To know the morphological characteristics of spore cormophytes organisms. To highlight the morphological criteria specific to bryophytes, lycophytes, equisetophytes and polypodiophytes. To know the morphology, the distribution of species with pharmaceutical value from divisions Bryophyta, Lycopodiophyta, Equisetophyta, Polypodiophyta. To know the Latin taxonomy of species. To be able to apply morphological characteristics in the description of herborized species. | <p>Notions: vascular/avascular cormophytes, spore cormophytes.</p> <p>Morphological features of spore cormophytes.</p> <p>Morphological characteristics of spore cormophytes</p> <p>Morphological characteristics, ecology and systematic classification of spore cormophytes species: <i>Sphagnum acutifolium</i>, <i>Lycopodium clavatum</i>, <i>Equisetum arvense</i>, <i>Dryopteris filix-mas</i>.</p> <p>Morphological description and identification of spore cormophytes species on herborized material.</p> |
| Theme 6. Plant systematics. Cormophyte organisms with naked seed | |
| <ul style="list-style-type: none"> To define the notion of spermatophytes and gymnosperms. To know the morphological characteristics of the cormophytes organisms with the naked seed. To highlight the specific morphological criteria for gymnosperms. To know the morphology, the distribution of species with pharmaceutical value from division <i>Pinophyta</i>, fam. Ginkgoaceae, Pinaceae, Cupressaceae, Taxaceae, Ephedraceae. To know the Latin taxonomy of species. To be able to apply morphological characteristics in the description of herborized species. | <p>Notions: spermatophytes, plants with naked seed (gymnosperms).</p> <p>The morphological characteristics of gymnosperms, division <i>Pinophyta</i> and selected families.</p> <p>Ecology and distribution.</p> <p>Morphological characteristic, ecology and systematic classification of the gymnosperm species: <i>Ginkgo biloba</i>, <i>Pinus sylvestris</i>, <i>P. montana</i>, <i>Larix decidua</i>, <i>Abies alba</i>, <i>Picea abies</i>, <i>Juniperus communis</i>, <i>J. sabina</i>, <i>Thuja sp.</i>, <i>Ephedra sp.</i></p> <p>Description and identification of gymnosperm species on herborized material.</p> |
| Theme 7. Plant systematics. Flower cormophyte organisms | |
| <ul style="list-style-type: none"> To define the notion of flower-bearing cormophytes. To know the morphological characteristics of flower-bearing cormophytes. To highlight the morphological criteria for distinguishing dicotyledones and monocotyledons. To know the morphological characteristics and ecological aspects of selected dicotyledones families: Berberidaceae, Schisandraceae, Nymphaeaceae, Ranunculaceae, Papaveraceae, Cannabaceae, Urticaceae, Fagaceae, Betulaceae, Juglandaceae, Caryophyllaceae, Chenopodiaceae, Polygonaceae, Theaceae, Passifloraceae, Salicaceae, Ericaceae, | <p>Notions: superior flowering plants or plants with covered seed.</p> <p>Morphological characteristics of flowering plants <i>Magnoliophyta</i>.</p> <p>Ecology and chorology.</p> <p>Specific morphological characteristics of dicotyledones and monocotyledons.</p> <p>Specific morphological characteristics and ecology of selected families from the</p> |



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| Objectives | Content units |
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| <p>Primulaceae, Tiliaceae, Malacea, Saxifragaceae, Fabaceae, Myrtaceae, Onagraceae, Anacardiaceae, Rutaceae, Hippocastanaceae, Linaceae, Araliaceae, Apiaceae, Rhamnaceae, Elaeagnaceae, Apocynaceae, Gentianaceae, Solanaceae, Scrophulariaceae, Plantaginaceae, Lamiaceae, Asteraceae.</p> <ul style="list-style-type: none">• To know the morphological characteristics and ecological aspects of selected monocotyledones families: Asparagaceae, Liliaceae, Alliaceae, Iridaceae, Dioscoreaceae, Araceae, Poaceae.• To know the Latin taxonomy of species.• To be able to apply morphological characteristics in the description of herborized species. | <p><i>Dicotyledonatae</i> and <i>Monocotyledonatae</i> classes.</p> <p>Plant species of spontaneous and cultivated flora from the selected families of flowering plants <i>Magnoliophyta</i> and systematic classification.</p> <p>Description, identification and taxonomy of flowering plant species on herborized material. Medicinal plants and biodiversity. Medicinal plants and their protection.</p> |

VIII. PROFESSIONAL (SPECIFIC (SC) AND TRANSVERSAL (TC) COMPETENCES AND STUDY OUTCOMES

✓ Professional (specific) (SC) competences

- SC 1. Understanding and using the terminology/symbols of pharmaceutical botany, to know the morpho-anatomical peculiarities of organizing plant organs, classification of vegetal organisms and scientific taxonomy of plant species in spontaneous and cultivated medicinal flora.
- SC 2. Developing the skills of making and analyzing micropreparations, knowledge and ability to highlight specific cytological, histological and morphological structures with a diagnostic character in the identification of plant and plant products, development of practical skills for identification the plant species from different systematic categories on herborized materials.
- SC 3. Using the theoretical and practical knowledge in pharmacist specialist formation, applying knowledge for the efficient use of local medicinal flora through the national and global biodiversity and plant protection strategies.

✓ Transversal competences (TC)

- TC 1. Forming the personal attitude by promoting of logical reasoning and compliance with pharmaceutical ethics and deontology rules at the release of phytodrugs.
- TC 2. Forming the right personal attitude towards the study process, promoting initiative spirit, ability to work in group and respect for colleagues.

✓ Study outcomes

- To know the particularities of the cellular and histological organization of the organs of the vegetal organisms.
- To be able to highlight specific cellular, histological and morphological structures for the identification of vegetable products and plant species.
- To know the criteria of classifying living organisms and correct taxonomic units.
- To know the morphological characteristics of the divisions, classes and selected plant families.
- To be able to apply theoretical knowledge in the morpho-anatomical description of the species.



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- To know the scientific taxonomy of medicinal plants from spontaneous, cultivated local and global flora.
- To be able to assess the place and role of pharmaceutical botany in the formation of the pharmacist specialist.
- To be competent to use the knowledge of pharmaceutical botany in the later study of pharmacognosy, toxic plants and phytotherapy.
- To be able to implement the knowledge gained in the research activity.
- To be competent to use critically and confidently the scientific information obtained, using the new information and communication technologies.

Note. Study outcomes (are deduced from the professional competencies and formative valences of the informational content of the discipline).

IX. STUDENT'S SELF-TRAINING

| No. | Expected product | Implementation strategies | Assessment criteria | Implementation terms |
|-----|--|---|--|----------------------|
| 1. | Working with different informational sources | Carefully read the notes or the material from manual for theme. Familiarize yourself with the questions on the analyzed subject. It is necessary to read the recommended reference sources, to explore the current electronic sources (schemes, botanical drawings, texts, etc.) on the subject under discussion. Through the analytical analysis, to highlight the generalities, the main postulates and formulate conclusions on the studied subject. | The ability to systematize and highlight the essence; skills of generalization and specification, interpretive, presentation and communication skills of the studied material. | Throughout the year |
| 2. | Working with the practical notebook | Analysis and graphic presentation (schemes, botanical drawings, tables) of the analyzed material for the respective subject from the lecture and manual. Solving the tasks consecutively. Conclusion formulation for each topic. Selection of additional information, using electronic addresses and additional bibliography. | Analytical and graphic presentation capabilities. Solving case problems. Ability of systematization and formulation of the conclusions. | Throughout the year |



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| 3. | Preparation and support of thematic papers (presentations) | <p>Selection of the topic of the paper, setting the plan, terms of achievement and presentation.</p> <p>Analysis of relevant sources on the topic of the paper.</p> <p>Analysis, systematization of information on the topic.</p> <p>Establishing the components of the PowerPoint project / presentation – theme, purpose, results, conclusions, practical applications and bibliography.</p> <p>Preparation of the report in accordance with the requirements in force at the department.</p> | <p>The volume of work, the degree of argumentation of the necessity of the topic approached, the quality of the systematization of the materials and the formulation of the conclusions, the elements of creativity presentation, the personal attitude, the coherence of the exposure, the correctness and the expressiveness, the graphic presentation, the way of presentation.</p> | Throughout the year |
| 4. | Creating thematic portfolio (eg: metamorphosed roots of MP, MP in the Red Book of the R. of Moldova, prominent personalities in the medicinal plant study, etc.). | <p>Realization involves 3 formats: paper (maps with informative materials), hybrids (maps with informative materials, photos, herborized materials, etc.) and electronic/digital format (images, photos, audio, video and graphics).</p> | <p>Volume of accumulated material;</p> <p>Quality and degree of relevance on the topic;</p> <p>Way of presentation, accuracy, correctitude;</p> <p>Level of accumulated theoretical knowledge and practical skills.</p> | May month |

X. METHODOLOGICAL SUGGESTIONS FOR TEACHING-LEARNING-ASSESSMENT

• ***Teaching and learning methods used***

The Pharmaceutical Botany discipline is taught in classical way: lectures and practical works. Lectures are read by the course holder through *Multimedia*. In practical work, students will prepare and study micropreparations under the photonic microscope, analyze electronics, botanical schemes and drawings, herberia, fresh, dried and preserved plant products, and will complete the practical workbooks. Teachers combine different teaching methods, when analyze the thematic material: disputes, interactive discussion, mini-conferences, individual discussions, problem situations, etc.

• ***Recommended learning methods***

✓ **Observation** - Identification of the characteristics of structures and biological phenomena and their description.



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- ✓ **Analysis** - Imaginary decomposition of the whole into component parts. Highlighting the essential elements. Studying each element as part of the whole.
- ✓ **Scheme/figure analysis** - Familiarization with the symbols and accompanying explanations. Recognition of constituent elements, their position and purpose.
- ✓ **Comparison** - Analysis of different objects in a group and determination of specific, common and distinctive features. Formulation of conclusions.
- ✓ **Classification** - Identification of structures requiring classification. Determining the criteria on which is to be made classification. Distribution of structures by groups according to established criteria.
- ✓ **Elaboration of the scheme** - Selection of elements and their rendering through different symbols/colors and indication of the relations between them. The formulation of a concrete title and the legend of the used symbols.
 - **Applied teaching strategies / technologies (specific to the discipline)**
Frontal work, in microgroups and individually. Interactive discussions "Round table"; debates "Case study"; "Creative controversy"; "Portfolio".
 - **Methods of assessment (including the method of final mark calculation)**
 - ✓ **Current:** frontal or/and individual control of theoretical knowledge assessments (by docimological tests, written topics, oral discussions); assessment of practical skills (identification the micropreparations, dry/preserved botanical material, hebraized plants; evaluation of individual work (presentation of thematic project/ thematic portfolio).
 - ✓ **Final:** exam at the end of 1st semester
Final mark will be made up of the average semestrial mark of the theoretical knowledge evaluations and individual work, practical skills, and SIMU test.
 - ✓ **Final:** exam at the end of 2nd semester
Final mark will be made up of the average semestrial mark of the theoretical knowledge evaluations and individual work, practical skills, and SIMU test.

Method of mark rounding at different assessment stages

| Intermediate marks scale (annual average, marks from the examination stages) | National Assessment System | ECTS Equivalent |
|--|----------------------------|-----------------|
| 1,00-3,00 | 2 | F |
| 3,01-4,99 | 4 | FX |
| 5,00 | 5 | E |
| 5,01-5,50 | 5,5 | |
| 5,51-6,0 | 6 | D |
| 6,01-6,50 | 6,5 | |
| 6,51-7,00 | 7 | C |
| 7,01-7,50 | 7,5 | |
| 7,51-8,00 | 8 | B |
| 8,01-8,50 | 8,5 | |
| 8,51-8,00 | 9 | A |
| 9,01-9,50 | 9,5 | |
| 9,51-10,0 | 10 | |

The average annual mark and the marks of all stages of final examination (computer assisted, test, oral) - are expressed in numbers according to the mark scale (according to the table), and the final mark obtained is expressed in number with two decimals, which is transferred to student's record-book.

Absence on examination without good reason is recorded as "absent" and is equivalent to 0 (zero). The student has the right to have two re-examinations.



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XI.RECOMMENDED LITERATURE:

A. Compulsory:

1. Dutta A.C. Botany. Oxford University press, 1999.
2. Calalb T., Nisteanu A. Pharmaceutical botany. Practical guide for laboratory works, Chisinau, Tipog. Centrală, 2018.
3. Calalb T. Bodrug M. Botanica farmaceutică. CEP Medicina, Chișinău, 2009.

B. Additional:

1. Calalb T. Indicații metodice pentru lucrări de laborator și lucru independent la Botanica farmaceutică, Chișinău, CEP „Medicina”, 2005.
2. Negru A. Determinator de plante din flora Republicii Moldova, Ed. „Universul”, Chișinău, 2007.
3. Kruger A. The pocket to guide herbs, London, 2012.