**DESCRIPTION OF THE COURSE OF STUDY**

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| **Course Code:** |  | 0916.4.FAR.B/C.BOTFAR |
| **Course Name:** | Polish : | **Botanika farmaceutyczna** |
| English: | Pharmaceutical botany |

**1. USYTUOWANIE PRZEDMIOTU W SYSTEMIE STUDIÓW**

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| **1.1. Field of study** | **PHARMACY** |
| **1.2. Mode of study** | **Full-time** |
| **1.3. Level of study:** | **Integrated Master’s Degree** |
| **1.4. Profile of study** | **Practical** |
| **1.5. Person/s preparing the course description** | prof. dr hab. Renata Piwowarczyk |
| **1.6. Contact** | piwowarczyk@ujk.edu.pl |

# 2. GENERAL COURSE CHARACTERISTICS

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| **2.1. Language of instruction** | Polish |
| **2.2. Prerequisites** | knowledge of the basics of plant physiology and plant anatomy |

**3. DETAILED COURSE CHARACTERISTICS**

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| **3.1. Form of classes** | | Lectures, Exercises, Laboratory Sessions |
| **3.2. Place of classes** | | Teaching facilities at UJK, field activities |
| **3.3. Form of assessment** | | Examination  Graded credit |
| **3.4. Teaching methods** | | Lecture: conventional lecture, multimedia presentation.  Laboratories: multimedia presentation, searching methods – laboratory,  observation, practical, preparations, live and herbarium plant material.  Exercises: multimedia presentation, classes in the Herbarium of the IB UJK, in the Centre for Research and Protection of Biological Diversity of the IB UJK; field classes: learning about plants in the Botanical Garden in Kielce and in the surroundings of Kielce |
| **3.5. Bibliography** | **Primary:** | 1. Broda B. Zarys botaniki farmaceutycznej. PZWL, Warszawa, 2011.  2. Broda B., Mowszowicz J.. Przewodnik do oznaczania roślin leczniczych,  trujących i użytkowych. PZWL, 2002.  3. Budzianowska A., Budzianowski J. Botanika farmaceutyczna.  Przewodnik. Wydawnictwo Naukowe Uniwersytetu Medycznego im.  Karola Marcinkowskiego w Poznaniu, 2020.  4. Drobnik J. Zielnik i zielnikoznawstwo. PWN, Warszawa, 2007. |
| **Supplementary:** | 1. Lamer-Zarawska E., Kowal-Gierczyk B, Niedworok J. Fitoterapia i leki  roślinne. PZWL, Warszawa, 2012.  2. Malepszy S.(pod.red.). Biotechnologia roślin. PWN, Warszawa 2009.  3. Olszowska O., Józefowicz J. Gajdzis-Kuls D. Botanika Farmaceutyczna.  Suplement do skryptu: „Materiały do ćwiczeń z botaniki  farmaceutycznej” wraz z tematami ćwiczeń dla studentów I roku  Wydziału Farmaceutycznego, kierunek Farmacja WUM Warszawa  2013/2014. |

**4. OBJECTIVES, CONTENT, AND LEARNING OUTCOMES**

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| **4.1. Course Objectives**  C1-Learning the morphological and anatomical structure of fungi, algae and plants that provide medicinal substances (raw materials) and materials used in pharmacy (L,E,Lab).  C2-Getting to know the research methods used in taxonomy and searching for new species and varieties of medicinal plants (W).  C3-Getting to know the systems of plant protection and biodiversity (L, E).  C4-Getting to know the methods of identifying and describing the structural components of plant cells, tissues and organs using microscopic and histochemical methods and recognizing plants based on morphological and anatomical features (especially species of pharmaceutical importance) (L,E,Lab).  C5-Getting to know the importance of herbaria for pharmacy and the methods of their preparation (L,E,Lab). |
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| **4.2. Course Content**    **Lectures** familiarize students with the scope and branches of botany, the importance of plants, the ultrastructure of plant cells, diagnostic elements of plant cells and tissues, basic concepts in organography, ecological groups of plants, taxonomy and diversity of bacteria, cyanobacteria, fungi, lichens, algae, mosses, liverworts, clubmoss, horsetails, ferns, gymnosperms and angiosperms (including exotic plants, medicinal and useful), basics of plant biotechnology, protection of natural plant resources.  **Laboratories** mainly cover practical issues in the field of structure, function and composition of plant cells and tissues, anatomical and morphological structure of vegetative organs, morphological structure of generative organs,  as well as taxonomy and morphological features of fungi, lichens, mosses, pteridophytes and seed plants. The student also acquires the ability to make anatomical preparations and recognize plant cellular structures and tissues under a microscope in order to identify plant substances; document microscopic observations in the form of hand-drawn botanical drawings; determine the affiliation of plants occurring in the Polish flora to specific systematic groups based on morphological features; use keys to identify plants in order to identify them; use the nomenclature of plants and medicinal substances.  During the **exercises,** the student learns the principles of microscopy and preparation of plant microscopic slides  and making a botanical drawing. He/she gains theoretical and practical knowledge concerning the structure of plant cells and tissues, the anatomical structure of vegetative organs and the morphological structure of vegetative and generative organs. He/she learns the importance of herbaria and herbalism. Fieldwork familiarizes the student with the issues of morphology, biology, ecology and systematics of selected families within vascular plants, as well as with the morphological diagnostic features of important medicinal plants.  **Lectures:** 1. The aim of teaching pharmaceutical botany. Principles and methods of plant classification. Systematic units of various ranks. Principles of botanical nomenclature. 2. Sources of obtaining plant material - medicinal plants, from which medicinal raw materials are obtained. Cultivation and collection from natural sites. Search for new species and varieties of medicinal plants. 3. Plant cell. Diagnostic elements of plant cells. 4. Histology. Diagnostic elements of plant tissues. 5. Root morphology. Stem and leaf morphology. 6. Flower morphology, types of inflorescences. 7. Fruits and seeds. 8. Life forms of plants. Ecological types of plants. 9. Plant systematics - general issues. 10. Characteristics of bacteria and cyanobacteria. 11. Fungi, lichens and algae. 12. Mosses and liverworts. 13. Fork mosses, horsetails, ferns. 14. Gymnosperms. 15. Angiosperms. 16. Exotic medicinal and other useful plants.  17. Protection of biodiversity and natural plant resources. 18. Outline of directions of development of plant biotechnology:  micropropagation, biosynthesis and biotransformation of secondary metabolites in vitro.  **Laboratories**: 1. Plant cell and tissue and its diagnostic elements. 2. Reserve and mineral substances. 3. Creative tissue. 4. Covering tissue. 5. Strengthening tissue, conducting tissue. 6. Parenchyma tissue, secretory and excretory tissue. 7. Root structure. 8. Structure of underground and above-ground stem, woody stems and spore-bearing plants. 9. Leaf structure. 10. Seeds, fruits. 11. Flowers, inflorescences, pollen analysis. 12. Taxonomy – fungi, lichens, mosses, pteridophytes, seed plants. 13. Review of selected medicinal plants. 14. Principles of using the key to identification. 15. Elements of plant biotechnology. Plant in vitro cultures in pharmacy. Exercises: 1. Observation of plants in the Botanical Garden in Kielce, learning about medicinal, poisonous, useful, domestic and foreign plants. 2. Fieldwork – learning about local plants from selected systematic groups with emphasis on medicinal plants and practical exercises and collection of herbarium materials in selected habitats in the vicinity of Kielce. Importance and preparation of a scientific herbarium. 3. Classes on herbarium studies in the Herbarium of the Institute of Biology. Classes in the Centre for Research and Protection of Biological Diversity of the Institute of Biology of the Jan Kochanowski University, in the Seed Bank Workshop and the Plant Breeding and In Vitro Culture Workshops. |

## 4.3. Subject learning outcomes

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| **Code** | **A student, who passed the course** | **Relation to learning**  **outcomes** |
|  | within the scope of KNOWLEDGE: |  |
| W01 | morphological and anatomical characterization of prokaryotic organisms, fungi  and plants providing medicinal raw materials and materials used in pharmacy; | FAR\_A.W24. |
| W02 | research methods used in taxonomy and the search for new species and varieties of medicinal plants and medicinal mushrooms; | FAR\_A.W25. |
| W03 | principles of keeping a herbarium, as well as its importance and usefulness in pharmaceutical sciences. | FAR\_A.W26. |
|  | within the scope of **ABILITIES:** |  |
| U01 | measure or determine physical, biophysical and physicochemical quantities using appropriate laboratory equipment and perform physical and chemical calculations; | FAR\_A.U16. |
| U02 | identify inorganic substances; | FAR\_A.U17. |
|  | within the scope of SOCIAL COMPETENCE: |  |
| K01 | formulating conclusions from your own measurements or observations; | FAR\_K.08. |
| K02 | using objective sources of information. | FAR\_K.07. |

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| **4.4. Methods of assessment of the intended learning outcomes** | | | | | | | | | | | | | | | |  | | |  | | |
| **Teaching**  **outcomes**  **(code)** | **Method of assessment (+/-)** | | | | | | | | | | | | | | |  | | |  | | |
| **Exam oral/written**  **\*** | | | **Colloquium\* written or oral** | | | **Project\*** | | | **Effort**  **in class\*** | | | **Self-study\*** | | | **Group**  **work\*** | | | **Others\* e.g.**  **standardized test**  **used in elearning** | | |
| Form of classes | | | Form of classes | | | Form of classes | | | Form of classes | | | Form of classes | | | Form of classes | | | Form of classes | | |
| *L* | *E* | *Lab* | *L* | *E* | *Lab* | *L* | *E* | *Lab* | *L* | *E* | *Lab* | *L* | *E* | *Lab* | *L* | *E* | *Lab* | *L* | *E* | *Lab* |
| W01 | **+** |  |  |  | **+** | **+** |  |  |  |  | **+** | **+** |  |  |  |  |  |  |  |  |  |
| W02 | **+** |  |  |  | **+** | **+** |  |  |  |  | **+** | **+** |  |  |  |  |  |  |  |  |  |
| W03 | **+** |  |  |  | **+** |  |  |  |  |  | **+** |  |  |  |  |  |  |  |  |  |  |
| U01 |  |  |  |  |  | **+** |  |  |  |  |  | **+** |  |  |  |  |  |  |  |  |  |
| U02 |  |  |  |  | **+** | **+** |  |  |  |  | **+** | **+** |  |  |  |  |  |  |  |  |  |
| K01 |  |  |  |  | **+** | **+** |  |  |  |  | **+** | **+** |  |  |  |  |  |  |  |  |  |
| K02 |  |  |  |  | **+** | **+** |  |  |  |  | **+** | **+** |  |  |  |  |  |  |  |  |  |

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| **4.5. Criteria of assessment of the intended learning outcomes** | | |
| **Form of**  **classes** | **Grade** | **Assessment criterion** |
| **(lecture (L) \*** | **3** | the result of the written exam is 61-68% |
| **3,5** | the result of the written exam was 69-76% |
| **4** | the result of the written exam was 77-84% |
| **4,5** | the result of the written exam is 85-92% |
| **5** | the result of the written exam is 93-100% |
| **Eexercises (E)** | **3** | Attendance and activity during practical classes. Preparation of a herbarium.  Obtaining 61-68% of the total number of points possible to obtain in the written colloquium. |
| **3,5** | Attendance and activity during practical classes. Preparation of a herbarium.  Obtaining 69-76% of the total number of points possible to obtain in the written colloquium |
| **4** | Attendance and activity during practical classes. Preparation of a herbarium.  Obtaining 77-84% of the total number of points possible to obtain in the written colloquium |
| **4,5** | Attendance and activity during practical classes. Preparation of a herbarium.  Obtaining 85-92% of the total number of points possible to obtain in the written colloquium |
| **5** | Attendance and activity during practical classes. Preparation of a herbarium.  Obtaining 93-100 % of the total number of points possible to obtain in the written colloquium |
| **laboratory**  **(L)** | **3** | Attendance and activity during practical classes. Obtaining 61-68% of the total number of points possible to obtain in the written colloquium. |
| **3,5** | Attendance and activity during practical classes. Obtaining 69-76 % of the total number of points possible to obtain in the written colloquium. |
| **4** | Attendance and activity during practical classes. Obtaining 77-84% of the total number of points possible to obtain in the written colloquium. |
| **4,5** | Attendance and activity during practical classes. Obtaining 85-92 % of the total number of points possible to obtain in the written colloquium. |
| **5** | Attendance and activity during practical classes. Obtaining 93-100 % of the total number of points possible to obtain in the written colloquium. |

# 5. BALANCE OF ECTS CREDITS – STUDENT’S WORK INPUT

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| **Kategoria** | **Student's workload** | |
| **Full-time**  **studies** | **Extramural studies** |
| *NUMBER OF HOURS WITH THE DIRECT PARTICIPATION OF THE TEACHER*  */CONTACT HOURS/* | ***100*** |  |
| *Participation in lectures* | 20 |  |
| *Participation in exercises* | 15 |  |
| *Participation in laboratories* | 65 |  |
| *SAMODZIELNA PRACA STUDENTA /GODZINY NIEKONTAKTOWE/* | 50 |  |
| *Preparation for exercises, laboratory* | 15 |  |
| *Preparation for the exam/colloquium* | 15 |  |
| *Other (Preparation for the exam and practical exam)* | 20 |  |
| ***TOTAL NUMBER OF HOURS*** | ***150*** |  |
| **ECTS credits for the course of study** | **6** |  |

***I accept for implementation (date and legible signatures of persons teaching the subject in a given academic year)***

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