

1. COURSE DESCRIPTION – GENERAL INFORMATION			
1.1. Course teacher	Professor Željko Maleš, PhD	1.6. Year of study	1.
1.2. Name of the course	<b>Pharmaceutical botany</b>	1.7. Credit value (ECTS)	7.5
1.3. Associate teachers	Associate Professor Kroatina Hazler Pilepić, PhD Maja Crkvenčić, Assistant	1.8. Type of instruction (number of hours L+E+S+e-learning)	30+30+15
1.4. Study programme (undergraduate, graduate, integrated)	Pharmacy integrated study programme	1.9. Expected enrolment in the course	130
1.5. Status of the course	Compulsory	1.10. Level of use of e-learning (1, 2, 3 level), percentage of instruction in the course on line (20% maximum)	2.
2. COURSE DESCRIPTION			
2.1. Course objectives	Students will learn the fundamentals of general and special botany with special emphasis on medicinal plants. The knowledge and skills obtained will serve as basis for courses Pharmacognosy I and Pharmacognosy II.		
2.2. Enrolment requirements and required entry competences for the course	There are no requirements for enrolment. However, it is expected that students have passed high school level course of biology.		
2.3. Learning outcomes at the level of the study programme to which the course contributes	Knowledge of pharmaceutical botany obtained is necessary in: <ul style="list-style-type: none"> <li>Defining procedures related to research, development, production, analysis and quality control of herbal medicines.</li> </ul>		
2.4. Expected learning outcomes at the level of the course (4-10 learning outcomes)	After passing the course the student will be able to: <ol style="list-style-type: none"> <li>Explain the basic concepts of botany;</li> <li>Define and compare the types and roles of plant tissues;</li> <li>Define the morphological and anatomical characteristics of vegetative and generative plant organs;</li> <li>Describe the functions of plant organs;</li> <li>Describe the processes of pollination, fertilization and dispersal of seeds and fruits;</li> <li>Differentiate and identify the species of selected families with special emphasis on medicinal plant species;</li> <li>Perform microscopic analysis of plant tissues and organs.</li> </ol>		
2.5. Course content broken down in detail by weekly class schedule (syllabus)	LECTURES: <ul style="list-style-type: none"> <li>Introduction to the course, Division of botany, Structure and secondary changes of the cell wall, Secondary metabolites;</li> </ul>		

- Aleurone granules, The crystals of calcium oxalate, Introduction to histology, Primary and secondary dermal tissues, Ground tissues;
  - Mechanical tissues, Vascular (transport) tissues, Glandular (secretory) tissues, The function of the root and root zones, Primary structure of root;
  - Secondary structure of root, Stem - function and types, Primary and secondary structure of stem;
  - Leaf - function, division and anatomy; Growth, development and reproduction of plants; The life forms of plants;
  - The function and parts of flower, Flower formula and diagram, Types of inflorescences, Pollination and fertilization;
  - Characteristics of fruits, Dispersal of seeds and fruits, Introduction to plant systematics, Prokaryotes;
  - Algae, Fungi, Lichens, Mosses, Ferns;
  - Gymnosperms, Characteristics and representatives of the orders Magnoliales, Piperales, Ranunculales, Papaverales and Fagales;
  - Characteristics and representatives of the orders Urticales, Rosales, Fabales, Myrtales, Rutales, Geraniales, Rhamnales, Euphorbiales and Santalales;
  - Characteristics and representatives of the orders Apiales, Theales, Capparales and Malvales;
  - Characteristics and representatives of the orders Ericales, Primulales, Caryophyllales, Polygonales and Gentianales;
  - Characteristics and representatives of the orders Dipsacales, Oleales, Polemoniales, Scrophulariales and Lamiales;
  - Characteristics and representatives of the order Asterales;
  - Monocotyledons – orders Zingiberales, Liliales, Orchidales, Poales and Arales;
- SEMINARS:
- Medicinal plant species – fresh plant material and herbarium material;
  - Root transformations, Above-ground stems, Stem position;
  - Above-ground and underground stem transformations, Phylloclades, Leaf - shapes and venation, Leaf disposition and transformations;
  - Eucarpia - dry fruits – dehiscent fruits;
  - Eucarpia - dry fruits – indehiscent fruits and lomentis;
  - Eucarpia - fleshy fruits and pseudocarpia (accessory fruits);
  - Brown and red algae, Cones of the species of the family Pinaceae, Fruits of the plants of the family Cupressaceae;
  - Fruits of the plants of the order Magnoliales, Fruits of the plants of the family Fagaceae;
  - Tropical plant species;
  - Pharmaceutical Botanical Garden "Fran Kušan" – getting acquainted with characteristics of the garden and disposition of plant species;
  - Pharmaceutical Botanical Garden "Fran Kušan" – study of Gymnosperms;
  - Pharmaceutical Botanical Garden "Fran Kušan" – study of Dicotyledons: orders Magnoliales, Piperales, Ranunculales, Papaverales, Fagales, Urticales, Rosales, Fabales, Myrtales, Rutales, Geraniales, Rhamnales,

	<p>Euphorbiales and Santalales;</p> <ul style="list-style-type: none"> <li>• Pharmaceutical Botanical Garden "Fran Kušan" – study of Dicotyledons: orders Apiales, Theales, Capparales, Malvales, Ericales, Primulales, Caryophyllales and Polygonales;</li> <li>• Pharmaceutical Botanical Garden "Fran Kušan" – study of Dicotyledons: orders Gentianales, Dipsacales, Oleales, Polemoniales, Scrophulariales, Lamiales and Asterales;</li> <li>• Pharmaceutical Botanical Garden "Fran Kušan" – study of Monocotyledons.</li> </ul> <p>LABORATORY EXERCISES:</p> <ul style="list-style-type: none"> <li>• Plant histology: ground tissue (<i>Ricinus, Clematis</i>);</li> <li>• Plant histology: dermal tissue (<i>Rheo, Vanilla, Elegendus, Verbascum, Sambucus</i>);</li> <li>• Plant histology: vascular (transport) tissue (<i>Cucurbita, Pinus</i>);</li> <li>• Plant histology: mechanical tissue (<i>Rumex, Pirus, Tilia</i>);</li> <li>• Plant histology: glandular (secretory) tissue (<i>Myrtus, Euphorbia, Mentha</i>);</li> <li>• Plant anatomy: stem (<i>Zea, Ranunculus, Tilia, Pinus</i>), root (<i>Iris</i>);</li> <li>• Plant anatomy: leaf (<i>Pinus, Iris, Helleborus</i>);</li> <li>• Plant systematics: algae (<i>Fucus</i>), lichens (<i>Cetraria</i>), mosses (<i>Politrichum</i>);</li> <li>• Plant systematics: ferns (<i>Equisetum, Polypodium</i>);</li> <li>• Plant systematics: gymnosperms (<i>Taxus, Juniperus</i>), angiosperms (<i>Magnolia</i>);</li> <li>• Plant systematics: angiosperms dicotyledons Papaverales, Fabales, Rosales (<i>Chelidonium, Laburnum, Crataegus</i>);</li> <li>• Plant systematics: angiosperms Rhamnales, Rutales, Capparales (<i>Frangula, Ruta, Alliaria</i>);</li> <li>• Plant systematics: angiosperms Primulales, Gentianales (<i>Primula, Vinca</i>);</li> <li>• Plant systematics: angiosperms Araliales, Lamiales, Scrophulariales (<i>Carum, Salvia, Digitalis</i>);</li> <li>• Plant systematics: angiosperms monocotyledons Liliales, Poales (<i>Allium, Secale, Iris</i>).</li> </ul>					
2.6. Type of instruction	<p><b>lectures</b> <b>seminars</b> and workshop <b>exercises</b> online in entirety mixed e-learning field work</p>	<p><b>independent study</b> multimedia and the internet <b>laboratory</b> work with the mentor (other)</p>	2.7. Comments:			
2.8. Student responsibilities	Attendance of lectures, seminars and laboratory exercises is mandatory.					
2.9. Screening of student's work (specify the proportion of ECTS credits for each activity so that the total number of CTS credits is equal to the credit value of the course)	Class attendance	1	Research	1	Practical training	
	Experimental work	1	Report			
	Essay		Seminar essay	0.5	(Other--describe)	
	Tests	1	Oral exam	4	(Other—describe)	
	Written exam		Project		(Other—describe)	

2.10. Grading and evaluation of student work over the course of instruction and at a final exam	<p>Practical and written preliminary exam.  Recognition of plant species present in the Pharmaceutical Botanical Garden "Fran Kušan".  Recognition of dry plant material (fruits, underground organs).  Oral exam.</p>
2.11. Required literature (available at the library and via other media)	<p style="text-align: center;"><b>Title</b></p> <p>1. D. Denffer, H. Ziegler, Udžbenik botanike za visoke škole - Morfologija i fiziologija, Školska knjiga, Zagreb 1991., tiskani oblik.  2. K. Mägdefrau, F. Ehrendorfer, Udžbenik botanike za visoke škole - Sistematika, evolucija i geobotanika, Školska knjiga, Zagreb 1997., tiskani oblik.</p>
2.12. Optional literature (at the time of the submission of the study programme proposal)	<p>1. R. Domac, Flora Hrvatske: priručnik za određivanje bilja, II. izdanje, Školska knjiga, Zagreb 2002., tiskani oblik.  2. W. Schaffner, B. Häfelfinger, B. Ernst, Ljekovito bilje: kompendij, Leo-commerce, Rijeka 2009., tiskani oblik.</p>
2.13. Methods of monitoring quality that ensure acquisition of exit competences	<p>Learning outcomes 1-5 are assessed by oral exam and learning outcomes 6-7 with practical exam after laboratory exercises.</p>