



<b>Study program:</b> Integrated Academic Studies in Pharmacy
<b>Course title:</b> Pharmacognosy I
<b>Teacher:</b> Neda S. Gavarić, Nebojša V. Kladar
<b>Course status:</b> compulsory
<b>ECTS Credits:</b> 7
<b>Condition:</b> Organic Chemistry II
<p><b>Course aim</b></p> <p>The main objective of the course is to provide students basic knowledge about the most important biologically and pharmacologically active compounds of natural origin, through learning about their biological (ecological) role in organisms that synthesize them, biogenetic origin and pathways of biosynthesis of main classes of secondary biomolecules, as well as about their chemical characteristics and pharmacological activities. Additional goal of the course is that students acquire a range of skills in the basic experimental methods for the isolation and determination of main classes of pharmacologically active biomolecules, as well as for the chemical characterization of certain isolated bioactive compounds of natural origin. Through this course, students should develop the ability of critical thinking, analysis and interpretation of certain problems in this scientific discipline.</p>
<p><b>Expected outcome of the course:</b></p> <p>It is expected that after completion of the course, students are able to explain the biosynthetic pathways of different classes of biologically active compounds, their structural characteristics and pharmacological activity. The gained knowledge is the basis for their active participation in the higher courses of Pharmacognosy and Phytotherapy.</p> <p>Furthermore, it is expected that students acquire the skills to work in laboratories and master the experimental techniques for isolation and analysis of selected pharmacologically active classes of secondary biomolecules from natural resources. In addition, it is expected also to develop skills for critical evaluation and interpretation of results of specific analysis.</p>
<p><b>Course description</b></p> <p><i>Theoretical education</i></p> <ol style="list-style-type: none"> <li>1. Pharmacognosy as a science. Definition and history.</li> <li>2. Secondary metabolism, relationship between the primary and secondary metabolism and the role of secondary biomolecules (SB) in plants. Basic biosynthetic pathways of bioactive molecules in drugs.</li> <li>3. Biologically active primary plant metabolites.</li> <li>4. Basic mechanisms of biosynthetic reactions. Biological and physiological functions of SB. Pharmacological role. Classification of secondary biomolecules.</li> <li>5. Definition of alkaloids. Basic structural characteristics. Classification of alkaloids based on their structure, biosynthetic origin and biological activity.</li> <li>6. Alkaloids derived from L-ornithine. Alkaloids derived from L-lysine.</li> <li>7. Alkaloids derived from phenylalanine and tyrosine; Alkaloids derived from L-tryptophan. Indole alkaloids. Biosynthesis, structure and pharmacological activity.</li> <li>8. Alkaloids derived from L-histidine, terpene, steroid and purine alkaloids.</li> <li>9. Plant phenols. Generally. Simple phenolics.</li> <li>10. Phenols synthesized by elongation of the side chain.</li> <li>11. Polyphenols.</li> <li>12. Phenolic polymers. Anthraquinones.</li> <li>13. Isoprenoids- terpenoids.</li> <li>14. Iridoids. Diterpenes.</li> <li>15. Triterpenes: saponines and cardiac glycosides (cardenolides and bufadienolides).</li> </ol> <p><i>Practical education (labs):</i></p> <ol style="list-style-type: none"> <li>1. Work in the laboratory of Pharmacognosy; determination of sugars, the value of mucilage drugs and fatty oil analysis in herbal drugs.</li> <li>2. Determination of proteins and vitamins, cyanogenic and sulphur glycosides. Quality control of bandage material.</li> <li>3. Isolation, qualitative analysis of alkaloids - tropane, purine, morphinan and nicotine type.</li> <li>4. Isolation, quantitative analysis of alkaloids – tropane and purine type.</li> <li>5. Determination and quantification of phenolic and coumarin glycosides in herbal extracts.</li> </ol>

6. Determination and quantification of flavonoid glycosides.
7. Determination and quantification of anthocyanins
8. Qualitative reactions and quantification of tannins in herbal extracts.
9. Quantitative determination and quantification of anthraquinone glycosides in herbal extracts.
10. Isolation and analysis of essential oils from aromatic drugs.
11. Determination of proazulenes; determination of the value of bitter drugs and their composition.
12. Determination of cardiac glycosides and analysis of saponins.

#### Literature

##### *Compulsory*

1. Dewick PM. Medical Natural products (third edition). John Wiley and sons, Ltd 2009.
2. Wagner H, Bladt S. Plant Drug Analysis, 2nd edition. Springer-Verlag, Berlin, Heidelberg, New York, 2001.
3. Laboratory classes in Pharmacognosy, script for internal use. Department of Pharmacy, Faculty of Medicine, Novi Sad.
4. European Pharmacopoea. 2014. 8th ed. Strasbourg: European Directorate for the Quality of Medicines & Health Care, Council of Europe.

##### *Additional*

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**Number of active classes**

**Theoretical classes: 45**

**Practical classes: 60**

**Teaching methods:** 1. Theoretical education. 2. Practical education (labs)

**Student activity assessment** (maximally 100 points)

<b>Pre-exam activities</b>	<b>points</b>	<b>Final exam</b>	<b>points</b>
Lectures	10	Written	20
Practices	10	Oral	20
Colloquium	2x20	.....	
Essay			