

Study program: Integrated academic studies of Pharmacy			
Type and level of the study program: integrated academic studies			
Course title: ANALYSIS OF NATURAL PRODUCTS (PhV-NATPR)			
Teacher: Jelena M. Cvejić Hogervorst, Milica T. Atanacković Krstonošić, Mira P. Mikulić			
Course status: elective			
ECTS Credits: 3			
Condition: Pharmacognosy II			
Course aim Main goal of Natural Products Analysis course is introduction to different analytical techniques, which can be used in analysis of natural products. Learning about procedures of analysis and quality control of natural products, as well as regulatory rules in this domain. Application of instrumental methods in natural products analysis and biologically active ingredients. Concerning the wide range of natural products and the biologically active ingredients it is necessary to learn different approaches of analysis and to understand the relation between the goal of the analysis and selection of analytical technique. Practical application of knowledge. In laboratory, practical measurements are applied in order to analyze real samples using verified or adapted specifications. Students also learn how to statistically analyze obtained data and make significant conclusions, which leads to development of critical judgment and ability for work in science research studies.			
Expected outcome of the course: Student learns about applications and selection of appropriate method in analysis of real samples. Techniques and stages in analysis of natural products. Regulatory rules. Different approaches to the analysis concerning different characteristics of products and their active ingredients. Estimation of errors and statistical analysis. Sample preparation. Application of knowledge in practical laboratory work. Selection of proper method of analysis. Searching, understanding and usage of information necessary for proper analysis of samples. Preparation and defining of procedure concerning the goal and purpose of analysis. Performing the analysis. Managing the data, error estimation and expression of results in proper form.			
Course description <i>Theoretical education</i> Introduction to natural products analysis. Application of instrumental methods in the natural products analysis. Application of separation methods in the natural products analysis. Summary of separation methods. LC-MS, HPLC, GC. Solid phase extraction. Derivatization methods. Regulatory rules. <i>Practical education: exercises, other forms of education, research related activities</i> Qualitative and quantitative chromatography analysis of biologically active ingredients. Analysis of natural products and pharmaceutical supplements. Separation, qualitative and quantitative analysis, optimization of method concerning the parameters of accuracy, precision and selectivity. Selection of technique for sample preparation. Quantification of different ingredients in selected sample and their correlation. Quantification of active ingredients in commercial preparation based on natural products and dissolution testing. Statistical analysis of results and correlation of obtained values. Determination of the biologically active components of natural origin in pharmaceutical formulations, foods, raw materials. Analysis of dietary supplements. Analysis of natural products of different origin. Analysis of selected herbal extracts.			
Literature <i>Compulsory</i> 1. Braithwaite A, Smith FJ. Chromatographic methods 5 th ed. Springer; 2001. <i>Additional</i> 1. Schreier P, Herderich M, Humpf HU, Schwab W. Natural Product Analysis. Vieweg, Braunschweig, 1998. 2. Niessen WMA. LC/MS 3 rd ed. 2006. 3. Kromidas S. More practical problem solving in HPLC. Weinheim: Wiley-VCH; 2005.			
Number of active classes			Other:
Lectures: 30	Practice: 15	Other types of teaching:	Research related activities:
Teaching methods Lectures; laboratory work.			
Student activity assessment (maximally 100 points)			
Pre-exam activities	points	Final exam	points
Lectures	10	Written	70
Practices	20	Oral	
Colloquium		
Essay			