

<b>Course title:</b> Natural products isolation and characterization			<b>Subject code:</b> DSB614	
<b>Lecturer(s):</b> Dejan Orčić, Mirjana Popsavin				
<b>Status:</b> elective				
<b>ECTS:</b> 15				
<b>Requirements:</b> none				
<b>Learning objectives</b> To provide students with advanced knowledge of techniques for extraction and purification of natural products from biological materials, techniques for structural elucidation, and methods for bioactivity evaluation. To enable students to choose optimal isolation technique for selected natural products.				
<b>Learning outcomes</b> After completing the course, student is able to: (1) describe experimental techniques used for natural products isolation from biological materials, their advantages and shortcomings, (2) describe peculiarities of isolation of different biomolecule classes, (3) describe and apply techniques for chemical characterization and bioactivity assessment of raw fractions and isolated compounds.				
<b>Syllabus</b> <i>Theoretical instruction</i> Biological material processing – drying, size reduction, enzymes inhibition. Initial extraction and separation techniques – phase separation, solvent extraction, solid-phase extraction (SPE), supercritical fluid extraction (SFE), microwave extraction (MWE). Volatile compounds isolation. Chemical methods in isolation – enzymatic and chemical hydrolysis, derivatization. Raw extract purification. Liquid-liquid extraction. Chromatographic techniques in purification and isolation – chromatography modes, open-column chromatography, preparative HPLC, thin-layer chromatography (TLC), centrifugal partition chromatography (CPC). Isolation monitoring – chemical tests, bioactivity assays, activity-guided and chemical analysis-guided fractionation, dereplication. Final purification – desalting, drying, crystallization. Spectrometric methods for isolated product characterization –UV/VIS, MS, NMR, IR, XRD. <i>Practical instruction</i> Project: isolation and identification of natural products from selected plant or fungal material by chromatographic techniques (TLC, open-column chromatography, pHPLC, CPC, HPLC, GC) and spectrometry (UV/VIS, MS, NMR).				
<b>Literature</b> 1. Orčić D (2016): HPLC: Teorija i primena u biohemijskim naukama, University of Novi Sad, Novi Sad 2. Hostettmann K, Marston A, Hostettmann M (1998): Preparative chromatography techniques – Applications in natural products isolation, Springer-Verlag Berlin Heidelberg, Germany. 3. Colegnate SM, Molyneux RJ (eds.) (2008): Bioactive natural products: detection, isolation, and structural determination, CRC Press, Boca Raton, USA 4. Berger S, Sicker D (2009): Classics in Spectroscopy: Isolation and Structure Elucidation of Natural Products, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany 5. Sarker SD, Latif Z, Gray AI (eds.) (2006): Natural products isolation, Humana Press, Totowa, USA 6. Orčić D (2019): electronic materials developed within ERASMUS+ NETCHEM project, available at ( <a href="http://mdl.netchem.ac.rs/course/view.php?id=26">http://mdl.netchem.ac.rs/course/view.php?id=26</a> ): Qualitative analysis using LC-DAD-MS/MS Identification and quantification of secondary biomolecules in plant material by LC-DAD-MS/MS, Isolation of selected natural product from plant material by semi-preparative HPLC.				
<b>Weakly teaching load</b>				<b>Other:</b>
Lectures: 5	Exercises:	Other forms of teaching:	Student research: 5	
<b>Teaching methodology</b> Consultations, e-learning and flipped class methods ( <a href="http://mdl.netchem.ac.rs/course/view.php?id=26">http://mdl.netchem.ac.rs/course/view.php?id=26</a> ), student research, project writing and defense, remote lab exercises ( <a href="http://netchem.ac.rs/remote-access">http://netchem.ac.rs/remote-access</a> )				
<b>Grading method (maximal number of points 100)</b>				
Seminars	50 points	Oral exam	50 points	