



Univerza v Mariboru

Medicinska fakulteta

UČNI NAČRT PREDMETA / COURSE SYLLABUS								
Ime predmeta:	Napredna interdisciplinarna analitika v biomedicini							
Course title:	Advanced Multidisciplinary Analytics in Biomedicine							
Študijski program in stopnja Study programme and cycle	Študijska smer Study option			Letnik Year of study	Semester Semester			
Biomedicinska tehnologija/3. stopnja				2	3 ali 4			
Biomedical Technology/3rd Degree								
Vrsta predmeta (obvezni ali izbirni) / Course type (compulsory or elective)				Izbirni Elective				
Univerzitetna koda predmeta / University course code:								
Predavanja Lectures	Seminar Seminar	Vaje Tutorial			Klinične vaje Clinical training	Druge oblike študija Other forms of study	Samost. delo Individual work	ECTS
15	20	10					135	6
		SV	LV	RV				
Nosilec predmeta / Course coordinator:				Izr. prof. dr. Uroš Maver Izr. prof. dr. Matjaž Finšgar				
Jeziki /Languages:		Predavanja / Lectures:		Slovenski / Slovene				
		Vaje / Tutorial:		Slovenski / Slovene				
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:				Prerequisites for enrolling in the course or for performing study obligations:				
Pogoji za vključitev v delo: Osnovna znanja iz kemije, biokemije, kemijskega inženirstva in biomedicinske tehnologije (kombinacija fiziologije, farmacije, farmakologije, celične biologije itd.).  Pogoji za opravljanje študijskih obveznosti: Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno. Pozitivna ocena iz seminarjev je pogoj za pristop k izpitu.				Prerequisites for attending the course: Basic knowledge of chemistry, biochemistry, chemical engineering and biomedical technology (combination of physiology, pharmacy, pharmacology, cell biology, etc.).  Prerequisites for completing the course: Each of the mentioned commitments must be assessed with a passing grade. Passing grade for the seminars is required for attending the final exam.				
Vsebina (kratek pregled učnega načrta):				Content (syllabus outline):				
1. Uvod Razvoj sodobnih metod v biomedicini a. Biodiagnostika b. Biomateriali c. Multimodalno zdravljenje in teranostika 2. Posebne tehnike • tehnika fotoelektronske spektroskopije • različne tehnike elektronske spektroskopije • tehnika masne spektrometrije sekundarnih				1. Introduction Development of novel methods in biomedicine a. Biodiagnostics b. Biomaterials c. Multimodal treatment and theranostics 2. Advanced techniques: • X-ray photoelectron spectroscopy • different electron spectroscopy techniques • secondary ion mass spectrometry				

<p>ionov</p> <ul style="list-style-type: none"> <li>• mikroskopija na atomsko silo</li> <li>• vrstična tunnelska mikroskopija</li> <li>• vrstična elektronska spektroskopija</li> <li>• tehnika elipsometrije</li> <li>• Ramanska in IR-spektroskopija</li> <li>• spektrometrija lasersko vzbujene plazme</li> <li>• tehnika GD OES</li> <li>• 3D-profilometrija</li> <li>• konfokalna mikroskopija</li> <li>• analiza stičnega kota</li> <li>• pretočna citometrija</li> <li>• 3D-tisk</li> </ul> <p>3. In vitro testiranje (posebni primeri)          Funkcionalni celični testi in razvoj celičnih modelov/testov – razvoj modelov bolezni          Funkcionalno testiranje v simuliranem fiziološkem okolju (npr. korozija za ortopedske pripomočke)          Razvoj ogrodij za tkivno inženirstvo</p>	<ul style="list-style-type: none"> <li>• atomic force microscopy (AFM)</li> <li>• scanning electron spectroscopy (SEM)</li> <li>• scanning tunnelling microscopy (TEM)</li> <li>• ellipsometry</li> <li>• Raman and IR spectroscopy</li> <li>• laser-induced breakdown spectroscopy (LIBS)</li> <li>• GD-OES</li> <li>• 3D-profilometry</li> <li>• confocal microscopy</li> <li>• contact angle analysis</li> <li>• flow cytometry</li> <li>• 3D-printing</li> </ul> <p>3. In vitro testing (special examples)          Functional cell testing and development of cell models/assays – development of disease models          Functional testing in simulated physiological environments (e.g. corrosion of orthopaedic implants...)          Scaffold development for tissue engineering</p>
<p><b>Temeljna literatura in viri / Reading materials:</b></p>	
<p><b>Temeljna literatura:</b></p>	
<ul style="list-style-type: none"> <li>– D. A. Skoog, F. J. Holler, S. R. Crouch, Principles of Instrumental Analysis, 6. izdaja, Thomson Brooks/Cole, 2007.</li> </ul>	
<p>Tekoča periodika:</p>	
<ul style="list-style-type: none"> <li>– Journal of Pharmaceutical and Biomedical Analysis (<a href="https://www.journals.elsevier.com/journal-of-pharmaceutical-and-biomedical-analysis/">https://www.journals.elsevier.com/journal-of-pharmaceutical-and-biomedical-analysis/</a>)</li> <li>– Trends in Analytical Chemistry (<a href="https://www.journals.elsevier.com/trends-in-analytical-chemistry/">https://www.journals.elsevier.com/trends-in-analytical-chemistry/</a>)</li> <li>– Biosensors and Bioelectronics (<a href="https://www.journals.elsevier.com/biosensors-and-bioelectronics">https://www.journals.elsevier.com/biosensors-and-bioelectronics</a>)</li> </ul>	
<p><b>Dopolnilna literatura:</b></p>	
<ul style="list-style-type: none"> <li>– ROŽANC, Jan, MAVER, Uroš. Methods for analyzing the biological and biomedical properties of biomaterials. V: MOHAN, Tamilselvan (ur.), STANA-KLEINSCEK, Karin (ur.). Functional biomaterials : design and development for biotechnology, pharmacology, and biomedicine. Weinheim: Wiley-VCH, cop. 2023. Str. 165-197, ilustr. ISBN 978-3-527-82764-0, ISBN 978-3-527-35157-2, ISBN 978-3-527-82766-4, ISBN 978-3-527-82765-7.</li> <li>– ZIDARIČ, Tanja, STANA-KLEINSCEK, Karin, MAVER, Uroš, MAVER, Tina. Function-oriented bioengineered skin equivalents : Continuous development towards complete skin replication. Cham: Springer, cop. 2023. 1 spletni vir (1 datoteka PDF XVII, 156 str.). Springer briefs in molecular science (Internet). ISBN 978-3-031-21298-7. ISSN 2191-5415</li> <li>– MAVER, Tina, MAVER, Uroš, PIVEC, Tanja, KUREČIČ, Manja, PERŠIN FRATNIK, Zdenka, STANA-KLEINSCEK, Karin. Bioactive polysaccharide materials for modern wound healing. Cham: Springer, 2018. XIII, 95 str. Springer briefs in molecular science (Print), Springer briefs in molecular science (Internet). ISBN 978-3-319-89607-6, ISBN 978-3-319-89608-3. ISSN 2191-5407, ISSN 2191-5415.</li> </ul>	
<p><b>Cilji in kompetence:</b></p>	<p><b>Objectives and competences:</b></p>
<p>spoznati osnove razvoja novih metod v biomedicini          testiranje materialov s sodobnimi tehnikami          interpretacija rezultatov</p>	<p>learn the basics of new method development in          biomedicine          testing materials with modern techniques          correct interpretation of results</p>

simuliranje pogojev med uporabo biomedicinskih pripomočkov in priprava funkcionalnih testov		simulate the conditions of use of biomedical devices and preparation of functional tests	
spoznati principe in omejitve instrumentalne analize v medicini		Recognition of basic principles and limits of instrumental analysis in medicine	
<b>Predvideni študijski rezultati:</b>		<b>Intended learning outcomes:</b>	
<b>Znanje in razumevanje:</b> pravilna izbira analiznih metod in postopkov glede na vrsto vzorca		<b>Knowledge and understanding:</b> selection of appropriate analytical methods based on the sample type	
<b>Prenosljive/ključne spretnosti in drugi atributi:</b> Predmet se dopolnjuje s predmeti, ki vsebujejo kemijske vsebine, vsebine v povezavi s celično biologijo, fiziologijo, farmakologijo in farmacijo.		<b>Transferable/key competences and other abilities:</b> The subject is related to the chemistry courses, cell biology, physiology, pharmacology and pharmacy.	
<b>Metode poučevanja in učenja:</b>		<b>Learning and teaching methods:</b>	
Interaktivna predavanja Seminarji Vaje Samostojno delo		Lectures (interactive frontal method) Seminars Tutorial (lab work) Individual work	
<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Share (in %)</b>	<b>Assessment methods:</b>	
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Method (written or oral exam, coursework, project):	
Seminar	50 %	Seminar	
Izpit	50 %	Examination	
<b>Reference nosilca / Course coordinator's references:</b>			
<b>Izr. prof. dr. Uroš Maver:</b>			
1. ELVEREN, Beste, KUREČIČ, Manja, MAVER, Tina, <b>MAVER, Uroš</b> . Cell electrospinning: a mini-review of the critical processing parameters and its use in biomedical applications. Advanced biology. March 2023, 10 str.			
2. VIHAR, Boštjan, ROŽANC, Jan, KRAJNC, Boštjan, GRADIŠNIK, Lidija, MILOJEVIĆ, Marko, ČINČ ČURIĆ, Laura, <b>MAVER, Uroš</b> . Investigating the viability of epithelial cells on polymer based thin-films. Polymers. 2021, vol. 13, iss. 14, str. 1-17.			
3. SKOK, Kristijan, GRADIŠNIK, Lidija, ČELEŠNIK, Helena Sabina, MILOJEVIĆ, Marko, POTOČNIK, Uroš, JEZERNIK, Gregor, GORENJAK, Mario, SOBOČAN, Monika, TAKAČ, Iztok, KAVALAR, Rajko, <b>MAVER, Uroš</b> . MFUM-BrTNBC-1, a newly established patient-derived triple-negative breast cancer cell line : molecular characterisation, genetic stability, and comprehensive comparison with commercial breast cancer cell lines. Cells. 2022, vol. 11, issue 1, str. [1]-23.			
4. FINŠGAR, Matjaž, KOVAČ, Janez, <b>MAVER, Uroš</b> . The development and characterization of bioactive coatings for local drug delivery in orthopedic applications. Progress in organic coatings. [Print ed.]. Sep. 2021, vol. 158, str. 1-16			
<b>Izr. prof. dr. Matjaž Finšgar:</b>			
1. MASTNAK, Tinkara, MOHR, Gerhard J., <b>FINŠGAR, Matjaž</b> . The use of a novel smartphone testing platform for the development of colorimetric sensor receptors for food spoilage : Elektronski vir. Analytical methods. First published 10 Mar 2023, 13 str.			
2. BAJT LEBAN, Mirjam, KOSEC, Tadeja, <b>FINŠGAR, Matjaž</b> . Corrosion characterization and ion release in SLM-manufactured and wrought Ti6Al4V alloy in an oral environment. Corrosion science. [Print ed.]. 2022, vol. 209, str. 1-15.			



Univerza v Mariboru

Medicinska fakulteta

3. MAJER, David, FINŠGAR, Matjaž. An L-cysteic acid-modified screen-printed carbon electrode for methyl parathion determination. *Microchemical journal*. [Print ed.]. 2022, vol. 183, 10 str.