

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Napredna interdisciplinarna analitika v biomedicini
Course title:	Advanced multidisciplinary analytics in biomedicine

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Biomedicinska tehnologija, 3. stopnja		2.	3. ali 4.
Biomedical technology, 3rd Degree		2.	3. ali 4.

Vrsta predmeta / Course type

izbirni/elective

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
15	20	10			105	5

Nosilec predmeta / Lecturer:

doc. dr. Uroš Maver in doc. dr. Matjaž Finšgar

Jeziki /

Predavanja / Lectures:

slovenski / slovene

Languages:

Vaje / Tutorial:

slovenski / slovene

Pogoji za vključitev v delo oz. za opravljanje

Prerequisites:

študijskih obveznosti:

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:

Content (Syllabus outline):

- Uvod
 - Razvoj sodobnih metod v biomedicini
 - Biodiagnostika
 - Biomateriali
 - Multimodalno zdravljenje in teranostika
- Posebne tehnike
 - tehnika fotoelektronske spektroskopije
 - različne tehnike elektronske spektroskopije
 - tehnika masne spektrometrije sekundarnih ionov
 - mikroskopija na atomsko silo

- Introduction
 - Development of novel methods in biomedicine
 - Biodiagnostics
 - Biomaterials
 - Multimodal treatment and theranostics
- Advanced techniques:
 - X-ray photoelectron spectroscopy
 - different electron spectroscopy techniques
 - secondary ion mass spectrometry
 - atomic force microscopy (AFM)
 - scanning electron spectroscopy (SEM)

• vrstična tunelska mikroskopija • vrstična elektronska spektroskopija • tehnika elipsometrije • Ramanska in IR-spektroskopija • spektrometrija lasersko vzbujene plazme • tehnika GD-OES • 3D-profilometrija • konfokalna mikroskopija • analiza stičnega kota • pretočna citometrija • 3D-tisk 3. <i>In vitro</i> 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	• scanning tunnelling microscopy (TEM) • ellipsometry • Raman and IR spectroscopy • laser-induced breakdown spectroscopy (LIBS) • GD-OES • 3D-profilometry • confocal microscopy • contact angle analysis • flow cytometry • 3D-printing 3. <i>In vitro</i> 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
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Temeljni literatura in viri / Readings:

D. A. Skoog, F. J. Holler, S. R. Crouch, Principles of Instrumental Analysis, 6. izdaja, Thomson Brooks/Cole, 2007.

Tekoča periodika:

- Journal of Pharmaceutical and Biomedical Analysis (<https://www.journals.elsevier.com/journal-of-pharmaceutical-and-biomedical-analysis/>)
- Trends in Analytical Chemistry (<https://www.journals.elsevier.com/trends-in-analytical-chemistry/>)
- Biosensors and Bioelectronics (<https://www.journals.elsevier.com/biosensors-and-bioelectronics>)

Cilji in kompetence:

- spoznati osnove razvoja novih metod v biomedicini
- testiranje materialov s sodobnimi tehnikami
- interpretacija rezultatov
- simuliranje pogojev med uporabo biomedicinskih pripomočkov in priprava funkcionalnih testov
- spoznati principe in omejitve instrumentalne analize v medicini

Objectives and competences:

- learn the basics of new method development in biomedicine
- testing materials with modern techniques
- correct interpretation of results
- simulate the conditions of use of biomedical devices and preparation of functional tests
- Recognition of basic principles and limits of instrumental analysis in medicine

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:

- pravilna izbira analiznih metod in postopkov glede na vrsto vzorca

Prenesljive/ključne spretnosti in drugi atributi:

- Predmet se dopolnjuje s predmeti, ki vsebujejo kemijske vsebine, vsebine v

Knowledge and Understanding:

- selection of appropriate analytical methods based on the sample type

Transferable/Key Skills and other attributes:

povezavi s celično biologijo, fiziologijo, farmakologijo in farmacijo.	The subject is related to the chemistry courses, cell biology, physiology, pharmacology and pharmacy.
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Metode poučevanja in učenja:

Learning and teaching methods:

Interaktivna predavanja Seminarji Vaje	Interactive frontal method Seminars Lab work
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Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Seminar	50%	Seminar
Izpit	50%	Examination

Reference nosilca / Lecturer's references:

- FINŠGAR, Matjaž**, KEK-MERL, Darja. 2-mercaptobenzoxazole as a copper corrosion inhibitor in chloride solution : electrochemistry, 3D-profilometry, and XPS surface analysis. Corrosion science, ISSN 0010-938X. [Print ed.], March 2014, vol. 80, str. 82-95, doi: 10.1016/j.corsci.2013.11.022. [COBISS.SI-ID 17341718]
- FINŠGAR, Matjaž**, KEK-MERL, Darja. An electrochemical, long-term immersion, and XPS study of 2-mercaptobenzothiazole as a copper corrosion inhibitor in chloride solution. Corrosion science, ISSN 0010-938X. [Print ed.], June 2014, vol. 83, str. 164-175, doi: 10.1016/j.corsci.2014.02.016. [COBISS.SI-ID 17585686]
- MAVER, Uroš**, VELNAR, Tomaž, GABERŠČEK, Miran, PLANINŠEK, Odon, FINŠGAR, Matjaž. Recent progressive use of atomic force microscopy in biomedical applications. TrAC, Trends in analytical chemistry, ISSN 0165-9936, Jun. 2016, vol. 80, str. 96-111.
- NARANĐA, Jakob, GRADIŠNIK Lidija, GORENJAK Mario, VOGRIIN Matjaž, **MAVER Uroš**, Isolation and characterization of human articular chondrocytes from surgical waste after total knee arthroplasty (TKA), PeerJ, 2017.
- ORTHABER, Kristjan, PRISTOVNIK, Matevž, SKOK, Kristijan, PERIĆ, Barbara, **MAVER, Uroš**. Skin cancer and its treatment : novel treatment approaches with emphasis on nanotechnology. Journal of Nanomaterials, ISSN 1687-4129, 2017, vol. 2017, str. 1-20.