

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Biokompatibilni materiali
Course title:	Biocompatible materials

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Bioznanosti	Bioinžinerling v zdravstvu	1,2	1,2,3,4
Biosciences	Bioengineering in Health Sciences	1,2	1,2,3,4

Vrsta predmeta / Course type teoretični predmet / theoretical course

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	15	10	/	/	90	5

Nosilec predmeta / Lecturer: Nosilka predmeta: prof. dr. Monika Jenko

Jeziki / Languages:	Predavanja / Lectures:	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Splošni pogoji za vpis na doktorski študij

General conditions for enrolment in doctoral studies.

Vsebina: _____

Content (Syllabus outline): _____

Sodobni trendi na področju biomaterialov (implanti kot podlaga za vzgojo celičnih kultur, kompatibilnost biomaterialov, tehnike za moduliranje biokompatibilnosti)

Modern trends in biomaterials (implants as a basis for bringing cell cultures compatibility of biomaterials, techniques to modulate the biocompatibility)

Temeljna literatura in viri / Readings:

Znanstveni članki na tem področju/ state of the art papers.

Cilji in kompetence:

Osnovni cilj predmeta je podati študentom teoretična in praktična znanja s področja tehnik za študij biokompatibilnosti in moduliranje biokompatibilnosti.

Objectives and competences:

The main objective of the course is to give students theoretical and practical knowledge in the field of biocompatibility and its modulation.

Predvideni študijski rezultati:

Znanje in razumevanje na področju inženirskih materialov in tkiv.

Intended learning outcomes:

Knowledge and understanding in the field of engineered materials and tissues.

Metode poučevanja in učenja:

- Predavanja
- Individualno delo na projektih
- Predstavitve in interpretacije rezultatov projektov ostalim študentom v skupini v seminarski obliki
- Diskusija o objavljenih člankih iz izbranih tem (kritično vrednotenje znanstvene literature, predstavitev »case studies«)

Learning and teaching methods:

- lectures
- Individual project work
- Presentation and interpretation of results of project work to the other students in open discussion
- Journal club – discussion of published research articles on selected topics (critical evaluation of scientific literature, presentation of the "case studies")

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Delež (v %) /
Weight (in %)

Načini ocenjevanja:

Assessment:

<p>Preverjanje znanja poteka v obliki projektne naloge na realnih primerih iz raziskovalne prakse, v kateri študentje pripravijo rešitve za izbrani predlog raziskovalnega projekta.</p> <p>Projektne naloge oddajo v pisni obliki in jih zagovarjajo v ustni obliki, v diskusiji z nosilcem predmeta in sodelujočimi profesorji ter ostalimi študenti.</p> <p>Študent pripravi tudi seminar iz tematike doktorata v povezavi z eno od vsebin predmeta. Pri tem sodelujeta mentor in nosilec predmeta oz. drugi izvajalci predmeta. Zagovor opravlja študent pred mentorjem in nosilcem in/ali drugim izvajalcem.</p>	50	<p>During the course students prepare individual projects of real cases from research practice, where students prepare solutions for determined research project proposal.</p> <p>They prepare final project work and defend it in the classroom in discussion with professors and other students.</p> <p>Student prepares a doctoral seminar on the topic related to one of the course. In this cooperate menthor and lecturer or/and other professors. Student defend the seminar in front of mentor and lecturer and/or other professors.</p>
<p>Študent pripravi tudi seminar iz tematike doktorata v povezavi z eno od vsebin predmeta. Pri tem sodelujeta mentor in nosilec predmeta oz. drugi izvajalci predmeta. Zagovor opravlja študent pred mentorjem in nosilcem in/ali drugim izvajalcem.</p>	50	

Reference nosilca / Lecturer's references:

Jenko Monika

1. VODOPIVEC, Franc, STEINER PETROVIČ, Darja, ŽUŽEK, Borut, JENKO, Monika. Coarsening rate of M23C6 and MC particles in a high chromium creep resistant steel. *Steel research international*, 2013, vol. 84, [5] str., doi: [10.1002/srin.201200150](https://doi.org/10.1002/srin.201200150). [COBISS.SI-ID [984490](#)]
2. KOCIJAN, Aleksandra, KEK-MERL, Darja, JENKO, Monika. The corrosion behaviour of austenitic and duplex stainless steels in artificial saliva with the addition of fluoride. *Corros. sci.*. [Print ed.], 2011, vol. 53, no. 2, str. 776-783. [COBISS.SI-ID [24275239](#)], [JCR, WoS do 8. 10. 2013: št. citatov (TC): 23, čistih citatov (CI): 20, normirano št. čistih citatov (NC): 26, Scopus do 6. 11. 2013: št. citatov (TC): 29, čistih citatov (CI): 25, normirano št. čistih citatov (NC): 33]
3. ČOLIĆ, Miodrag, RUDOLF, Rebeka, STAMENKOVIĆ, Dragoslav, ANŽEL, Ivan, VUČEVIĆ, Dragana, JENKO, Monika, LAZIĆ, Vojkan, LOJEN, Gorazd. Relationship between microstructure, cytotoxicity and corrosion properties of a Cu-Al-Ni shape memory alloy. *Acta biomaterialia*, Jan. 2010, vol. 6, iss. 1, str. 308-317, doi: [10.1016/j.actbio.2009.06.027](https://doi.org/10.1016/j.actbio.2009.06.027). [COBISS.SI-ID [13247254](#)], [JCR, WoS do 29. 10. 2013: št. citatov (TC): 6, čistih citatov (CI): 4, normirano št. čistih citatov (NC): 2, Scopus do 1. 10. 2013: št. citatov (TC): 11, čistih citatov (CI): 8, normirano št. čistih citatov (NC): 4]
4. GODEC, Matjaž, KOCIJAN, Aleksandra, DOLINAR, Drago, MANDRINO, Djordje, JENKO, Monika, ANTOLIČ, Vane. An investigation of the aseptic loosening of an AISI 316L stainless steel hip prosthesis. *Biomedical materials*, 2010, vol. 5, no. 4, 8 str., doi: [10.1088/1748-6041/5/4/045012](https://doi.org/10.1088/1748-6041/5/4/045012). [COBISS.SI-ID [817066](#)], [JCR, WoS do 12. 3. 2013: št. citatov (TC): 5, čistih citatov (CI): 3, normirano št. čistih citatov (NC): 2, Scopus do 23. 3. 2011: št. citatov (TC): 0, čistih citatov (CI): 0, normirano št. čistih citatov (NC): 0]

citatov (CI): 0, normirano št. čistih citatov (NC): 0]

5. AKESSO, Laurent, PETTITT, Michala E., CALLOW, James A., CALLOW, Maureen E., STALLARD, Joanne, TEER, Dennis, LIU, Chen, WANG, Su, ZHAO, Qi, D'SOUZA, Fraddy, WILLEMSEN, Peter R., DONNELLY, Glen T., DONIK, Črtomir, KOCIJAN, Aleksandra, JENKO, Monika, JONES, Lathe A., GUINALDO, Patricia Calvillo. The potential of nano-structured silicon oxide type coatings deposited by PACVD for control of aquatic biofouling. *Biofouling (Chur Switz.)*, 2009, vol. 25, iss. 1, str. 55-67, doi: [10.1080/08927010802444275](https://doi.org/10.1080/08927010802444275). [COBISS.SI-ID [707754](#)], [JCR, WoS do 18. 11. 2013: št. citatov (TC): 20, čistih citatov (CI): 18, normirano št. čistih citatov (NC): 12, Scopus do 5. 11. 2013: št. citatov (TC): 20, čistih citatov (CI): 18, normirano št. čistih citatov (NC): 12]

6. MILLAKU, Agron, LEŠER, Vladka, DROBNE, Damjana, GODEC, Matjaž, TORKAR, Matjaž, JENKO, Monika, MILANI, Marziale, TATTI, Francesco. Surface characteristics of isopod digestive gland epithelium studied by SEM. *Protoplasma*, 2010, vol. 241, no. 1-4, str. 83-89. <http://dx.doi.org/10.1007/s00709-010-0110-3>, doi: [10.1007/s00709-010-0110-3](https://doi.org/10.1007/s00709-010-0110-3). [COBISS.SI-ID [6240377](#)], [JCR, WoS do 12. 11. 2013: št. citatov (TC): 4, čistih citatov (CI): 4, normirano št. čistih citatov (NC): 2, Scopus do 5. 11. 2013: št. citatov (TC): 4, čistih citatov (CI): 4, normirano št. čistih citatov (NC): 2]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Biomehanika in biofizika v zdravstvenih znanostih
Course title:	Biomechanics and biophysics in health sciences

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Bioznanosti	Bioinženiring v zdravstvu	1,2	1,2,3,4
Biosciences	Bioengineering in Health Sciences	1,2	1,2,3,4

Vrsta predmeta / Course type

teoretični predmet / theoretical course

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
20	30	20	/	/	180	10

Nosilec predmeta / Lecturer:

Nosilka predmeta: prof. dr. Veronika Kralj-Iglič

Jeziki /
Languages:

Predavanja / Lectures:	slovenski / angleški Slovene / English
Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

Prerequisites:

Splošni pogoji za vpis na doktorski študij

General conditions for enrolment in doctoral studies.

Vsebina:

Content (Syllabus outline):

- Medcelična komunikacija v bioinženirstvu
- Biomehanika in biofizika endoprotez
- Interakcije različnih kemikalij z biološkimi sistemi (zwitterionske lipidne plasti, eksplicitni model vode, večvalentni ioni in korelacije, ionsko specifični pojavi, kondenzacija DNK na lipidne plasti, sila med naelektrenimi površinami)

- Intracellular communication in bioengineering
- Biomechanics of endoprostheses
- Interactions of different chemicals with biological systems (zwitterionic lipid layer, explicit water model, multivalent ions and correlations, ion specific effects, DNA condensation, force between charged surfaces)

Temeljni literatura in viri / Readings:

1. J. N. Israelachvili: Intermolecular and Surface Forces, Elsevier, Amsterdam, 2011
 2. Veronika Kralj-Iglič: DANIEL, Matej, IGLIČ, Aleš, KRALJ-IGLIČ, Veronika. *Human hip joint loading - mathematical modeling : reaction forces and contact pressures*. Saarbrücken: VDM Verlag Dr. Müller, cop. 2011. V, 133 str., ilustr. ISBN 978-3-639-26120-2.
 3. GONGADZE, Ekaterina, PERUTKOVÁ, Šárka, KRALJ-IGLIČ, Veronika, VAN RIENEN, Ursula, BECK, U., IGLIČ, Aleš, KABASO, Doron. Electromechanical basis for the interaction between osteoblasts and negatively charged titanium surface. V: IGLIČ, Aleš (ur.). *Advances in planar lipid bilayers and liposomes*, (Advances in planar lipid bilayers and liposomes, vol. 13). Amsterdam [etc.]; Elsevier: Academic Press, cop. 2011, str. 199-221, ilustr.
- Znanstveni članki na tem področju / state of the art papers.

Cilji in kompetence:

Osnovni cilj predmeta je podati študentom teoretična in praktična znanja s področja interakcije nanostrukturiranih površin s celično membrano in vloge biomehanike in biofizike pri funkciji endoprotez.

Objectives and competences:

The main objective of the course is to give students theoretical and practical knowledge in techniques for the study of biocompatibility and its modulation, interactions of nanostructured surfaces with the cell membrane and the role of biomechanics and biophysics in the function of endoprostheses.

Predvideni študijski rezultati:

- poznavanje biofizikalnih procesov in njihovih matematičnih modelov stika inženjskih materialov in tkiv
- uporaba matematičnih modelov pri načrtovanju zdravljenja z endoprotezamin in pri rehabilitaciji

Intended learning outcomes:

- knowledge on biophysical processes and their mathematical models of junction of engineered materials and tissues
- use of mathematical models of the interface between engineered materials and tissues in planning of treatment and rehabilitation

Metode poučevanja in učenja:

Learning and teaching methods:

<ul style="list-style-type: none"> - Predavanja - Individualno delo na projektih - Predstavitve in interpretacije rezultatov projektov ostalim študentom v skupini v seminarski obliki - Diskusija o objavljenih člankih iz izbranih tem (kritično vrednotenje znanstvene literature, predstavitev »case studies«) 	<ul style="list-style-type: none"> - lectures - Individual project work - Presentation and interpretation of results of project work to the other students in open discussion - Journal club – discussion of published research articles on selected topics (critical evaluation of scientific literature, presentation of the "case studies")
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Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<p>Preverjanje znanja poteka v obliki projektne naloge na realnih primerih iz raziskovalne prakse, v kateri študentje pripravijo rešitve za izbrani predlog raziskovalnega projekta.</p> <p>Projektne naloge oddajo v pisni obliki in jih zagovarjajo v ustni obliki, v diskusiji z nosilcem predmeta in sodelujočimi profesorji ter ostalimi študenti.</p> <p>Študent pripravi tudi seminar iz tematike doktorata v povezavi z eno od vsebin predmeta. Pri tem sodelujeta mentor in nosilec predmeta oz. drugi izvajalci predmeta. Zagovor opravlja študent pred mentorjem in nosilcem in/ali drugim izvajalcem.</p>	50	<p>During the course students prepare individual projects of real cases from research practice, where students prepare solutions for determined research project proposal.</p> <p>They prepare final project work and defend it in the classroom in discussion with professors and other students.</p> <p>Student prepares a doctoral seminar on the topic related to one of the course. In this cooperate mentor and lecturer or/and other professors. Student defend the seminar in front of mentor and lecturer and/or other professors.</p>
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Reference nosilca / Lecturer's references:

Veronika Kralj Iglič

1. GONGADZE, Ekaterina, VELIKONJA, Aljaž, PERUTKOVÁ, Šárka, KRAMAR, Peter, MAČEK LEBAR, Alenka, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš. Ions and water molecules in an electrolyte solution in contact with charged and dipolar surfaces. V: SCHUHMANN, Wolfgang (ur.). *Bioelectrochemistry 2013 : selection of papers from the 12th ISE Topical Meeting, 17-21 March 2013, Bochum, Germany : special volume*, (Electrochimica acta, ISSN 0013-4686, vol. 126). [S. l.]: Elsevier, 2014, vol. 126, str. 42-60.
2. BUDIME SANTHOSH, Poornima, VELIKONJA, Aljaž, PERUTKOVÁ, Šárka, GONGADZE, Ekaterina, KULKARNI, Mukta Vishwanath, GENOVA, Julia, ELERŠIČ, Kristina, IGLIČ, Aleš, KRALJ-IGLIČ, Veronika, POKLAR ULRIH, Nataša. Influence of nanoparticle-membrane electrostatic interactions on membrane fluidity and bending elasticity. *Chemistry and physics of lipids*, ISSN 0009-3084. [Print ed.], Feb. 2014, vol. 178, str. 52-62,
3. RIJAVEC, Boris, KOŠAK, Robert, DANIEL, Matej, KRALJ-IGLIČ, Veronika, DOLINAR, Drago. Effect of cup inclination on predicted contact stress-induced volumetric wear in total hip replacement. *Computer methods in biomechanics and biomedical engineering*, ISSN 1025-5842, 2014, str. 1-6.
4. KOCJANČIČ, Boštjan, MOLIČNIK, Andrej, ANTOLIČ, Vane, MAVČIČ, Blaž, KRALJ-IGLIČ, Veronika, VENĠUST, Rok. Unfavorable hip stress distribution after Legg-Calvé-Perthes

syndrome : a 25-year follow-up of 135 hips. *Journal of orthopaedic research*, ISSN 0736-0266. [Print ed.], 2014, iss. 1, vol. 32, str. 8-16.

5. GONGADZE, Ekaterina, VAN RIENEN, Ursula, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš. Spatial variation of permittivity of an electrolyte solution in contact with a charged metal surface : a mini review. *Computer methods in biomechanics and biomedical engineering*, ISSN 1025-5842, 2013, vol. 16, no. 5, str. 463-480.
6. GONGADZE, Ekaterina, VELIKONJA, Aljaž, SLIVNIK, Tomaž, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš. The quadrupole moment of water molecules and the permittivity of water near a charged surface. *Electrochimica Acta*, ISSN 0013-4686. [Print ed.], 2013, vol. 109, str. 656-662.
7. VELIKONJA, Aljaž, BUDIME SANTHOSH, Poornima, GONGADZE, Ekaterina, KULKARNI, Mukta Vishwanath, ELERŠIČ, Kristina, PERUTKOVÁ, Šárka, KRALJ-IGLIČ, Veronika, POKLAR ULRIH, Nataša, IGLIČ, Aleš. Interaction between dipolar lipid headgroups and charged nanoparticles mediated by water dipoles and ions. *International journal of molecular sciences*, ISSN 1422-0067, 2013, vol. 14, no. 8, str. 15312-15329.
8. VUKASINOVIC, Zoran, SPASOVSKI, Dusko, KRALJ-IGLIČ, Veronika, MARINKOVIC-ERIC, Jelena, SESLIJA, Igor, ZIVKOVIC, Zorica, SPASOVSKI, Vesna. Impact of triple pelvic osteotomy on contact stress pressure distribution in the hip joint. *International orthopaedics*, ISSN 0341-2695, 2013, vol. 37, no. 1, str. 95-98.
9. KOŠAK, Robert, KRALJ-IGLIČ, Veronika, IGLIČ, Aleš, DANIEL, Matej. Polyethylene wear is related to patient-specific contact stress in THA. *Clinical orthopaedics and related research*, ISSN 0009-921X, 2011, vol. 469, no. 12, str. 3415-3422.
10. KABASO, Doron, GONGADZE, Ekaterina, PERUTKOVÁ, Šárka, MATSCHEGEWSKI, Claudia, KRALJ-IGLIČ, Veronika, BECK, U., VAN RIENEN, Ursula, IGLIČ, Aleš. Mechanics and electrostatics of the interactions between osteoblasts and titanium surface. *Computer methods in biomechanics and biomedical engineering*, ISSN 1025-5842, May 2011, vol. 14, no. 5, str. 469-482.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Ekološki inženiring
Course title:	Ecological engineering

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Bioznanosti	Bioinženiring v zdravstvu	1,2	1,2,3,4
Biosciences	Bioengineering in Health Sciences	1,2	1,2,3,4

Vrsta predmeta / Course type teoretični predmet / theoretical course

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	15	10	/	/	90	5

Nosilec predmeta / Lecturer: Nosilka predmeta: doc. dr. Tjaša Griessler- Bulc

Jeziki / Languages:	Predavanja / Lectures:	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Splošni pogoji za vpis na doktorski študij

General conditions for enrolment in doctoral studies.

Vsebina: **Content (Syllabus outline):**

Ekološki inženiring (zelene tehnologije, vključujoč trajnostne stavbe, urbano kmetijstvo, okolju prijazne tehnologije v konceptih mest in vasi prihodnosti, ekosistemske storitve; ekonomski vidik za povečevanje kvalitete bivanja človeka-well being).

Ecological engineering (green technologies, including sustainable buildings, urban agriculture, green technology concepts in the towns and villages of the future, economic aspect for increasing the quality of living humans – well being).

Temeljni literatura in viri / Readings:

1. Sustainable Energy Technologies: Options and Prospects, eds. K. Hanjalić, R. van de Krol, A. Lekić, Springer, 2008.
2. Mitsch, W. J., Joergensen, S. E., 2003. Ecological Engineering and Ecosystem restoration John Wiley & Sons, Inc., 411 str.
3. Kangas P. C., 2004. Ecological Engineering. Principles and Practice. Lewis Publishers. 452 str.

Znanstveni članki na tem področju / state of the art papers.

Cilji in kompetence:

Poznavanje novosti na področju ekološkega inženirstva, ekosistemskih storitev, sprememb procesov v ekosistemih pod vplivom onesnaževanja in uporabe ekotehnologij pri ohranjanju ekološkega ravnotežja v naravi.

Objectives and competences:

Knowledge on recent advances in environmental engineering, ecosystem services, changes in ecosystem processes under the influence of pollution and in application of eco-technology in maintaining ecological balance in nature.

Predvideni študijski rezultati:

Razumevanje delovanja ekotehnologij (ekoremediacije, rastlinske čistilne naprave, druge zelene teh.; blažilna območja, zelene strehe, vertikalni vrtovi).
Razumevanje postopkov sanacij v okolju z uporabo ekotehnologij.

Intended learning outcomes:

Understanding of eco-technologies (ERM, wetlands, other green techol., buffer zones, green roofs, vertical gardens).
Understanding the processes of remediation in the environment by using eco-technologies.

Metode poučevanja in učenja:

Learning and teaching methods:

<ul style="list-style-type: none"> - Predavanja - Individualno delo na projektih - Predstavitve in interpretacije rezultatov projektov ostalim študentom v skupini v seminarski obliki - Diskusija o objavljenih člankih iz izbranih tem (kritično vrednotenje znanstvene literature, predstavitev »case studies«) 	<ul style="list-style-type: none"> - lectures - Individual project work - Presentation and interpretation of results of project work to the other students in open discussion - Journal club – discussion of published research articles on selected topics (critical evaluation of scientific literature, presentation of the "case studies")
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Delež (v %) /
Weight (in %)

Načini ocenjevanja:

Assessment:

<p>Preverjanje znanja poteka v obliki projektne naloge na realnih primerih iz raziskovalne prakse, v kateri študentje pripravijo rešitve za izbrani predlog raziskovalnega projekta.</p> <p>Projektne naloge oddajo v pisni obliki in jih zagovarjajo v ustni obliki, v diskusiji z nosilcem predmeta in sodelujočimi profesorji ter ostalimi študenti.</p>	<p>50</p>	<p>During the course students prepare individual projects of real cases from research practice, where students prepare solutions for determined research project proposal.</p> <p>They prepare final project work and defend it in the classroom in discussion with professors and other students.</p>
<p>Študent pripravi tudi seminar iz tematike doktorata v povezavi z eno od vsebin predmeta. Pri tem sodelujeta mentor in nosilec predmeta oz. drugi izvajalci predmeta. Zagovor opravlja študent pred mentorjem in nosilcem in/ali drugim izvajalcem.</p>	<p>50</p>	<p>Student prepares a doctoral seminar on the topic related to one of the course. In this cooperate menthor and lecturer or/and other professors. Student defend the seminar in front of mentor and lecturer and/or other professors.</p>

Reference nosilca / Lecturer's references:

Tjaša Griessler-Bulc

1. MAHNE, Dunja, LAVRENČIČ ŠTANGAR, Urška, TREBŠE, Polonca, GRIESSLER BULC, Tjaša. TiO₂-based photocatalytic treatment of raw and constructed-wetland pretreated textile wastewater. *International journal of photoenergy*, 2012, vol. 2012, str. 1-12, doi: [10.1155/2012/725692](https://doi.org/10.1155/2012/725692). [COBISS.SI-ID [2299643](#)]
2. GRIESSLER BULC, Tjaša, ISTENIČ, Darja, KRIVOGRAD-KLEMENČIČ, Aleksandra. The efficiency of a closed-loop chemical-free water treatment system for cyprinid fish farms. *Ecol. eng.* [Print ed.], 2011, vol. 37, str. 873-882, doi: [10.1016/j.ecoleng.2011.01.004](https://doi.org/10.1016/j.ecoleng.2011.01.004). [COBISS.SI-ID [4134251](#)]
3. GRIESSLER BULC, Tjaša, KRIVOGRAD-KLEMENČIČ, Aleksandra. Run-off treatment of highly fluctuating waters with subsurface vegetated drainage ditch and river bed with meanders. *Fresenius environ. bull.* [Print ed.], 2011, vol. 20, no. 4, str. 836-846. [COBISS.SI-ID [4145259](#)]
4. GRIESSLER BULC, Tjaša, ŠAJN-SLAK, Alenka. Ecoremediations - a new concept in multifunctional ecosystem technologies for environment protection. *Desalination*. [Print ed.], str. 2-10, doi: [10.1016/j.desal.2008.03.039](https://doi.org/10.1016/j.desal.2008.03.039). [COBISS.SI-ID [3749995](#)]

tipologija 1.08 -> 1.01

5. ZUPANČIČ JUSTIN, Maja, VRHOVŠEK, Danijel, STUHLBACHER, Arnold, GRIESSLER BULC, Tjaša. Treatment of wastewater in hybrid constructed wetland from the production of vinegar and packaging of detergents. *Desalination*. [Print ed.], 2009, str. 100-109, doi: [10.1016/j.desal.2008.03.045](https://doi.org/10.1016/j.desal.2008.03.045). [COBISS.SI-ID [25597401](#)]

tipologija 1.08 -> 1.01

6. GRIESSLER BULC, Tjaša, OJSTRŠEK, Alenka. The use of constructed wetland for dye-rich textile wastewater treatment. *J. hazard. mater.*. [Print ed.], June 2008, vol. 155, iss. 1/2, str. 76-82. <http://dx.doi.org/10.1016/j.jhazmat.2007.11.068>, doi: [10.1016/j.jhaymat.2007.11.068](https://doi.org/10.1016/j.jhaymat.2007.11.068). [COBISS.SI-ID [12026390](#)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Materiali za dezinfekcijo v zdravstvu
Course title:	Disinfection materials in health sciences

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Bioznanosti	Bioinženiring v zdravstvu	1,2	1,2,3,4
Biosciences	Bioengineering in Health Sciences	1,2	1,2,3,4

Vrsta predmeta / Course type teoretični predmet / theoretical course

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	15	10	/	/	90	5

Nosilec predmeta / Lecturer: prof. dr. Polonca Trebše

Jeziki / Languages:	Predavanja / Lectures:	slovenski / angleški Slovene / English
	Vaje / Tutorial:	slovenski / angleški Slovene / English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Splošni pogoji za vpis na doktorski študij

General conditions for enrolment in doctoral studies.

Vsebina: **Content (Syllabus outline):**

Razvoj in uporaba fotokatalitičnih materialov v zdravstvu (TiO₂, uporaba AOMs, desinfekcijski postopki).

Development and application of photocatalytic materials in health sciences (TiO₂ materials, AOMs, disinfection procedures).

Temeljna literatura in viri / Readings:

A. Mills, S. K. Lee: A web-based overview of semiconductor photochemistry-based current commercial applications, *Journal of Photochemistry and Biology A: Chemistry* 152 (2002) 233-247.

2. P. Boule, D. Bahnemann, P. Robertson, *Environmental Photochemistry Part II (The Handbook of Environmental Chemistry / Reactions and Processes)*, Springer 2010

Znanstveni članki/ state of the art scientific papers

Cilji in kompetence:

Osnovni cilj predmeta je podati študentom novosti na področju uporabe fotokatalitičnih materialov v zdravstvu.

Kompetence: poznavanje pretvorb organskih in anorganskih spojin z različno kemijsko strukturo; poznavanje fotokatalitskih procesov.

Objectives and competences:

The main objective of the course is to convey to students recent advances on application of photocatalytic materials in health sciences.

Competences: knowledge on the transformation of organic and inorganic compounds with different chemical structure and on photocatalytic processes.

Predvideni študijski rezultati:

Znanje in razumevanje: fotokatalitskih pretvorb (razumejo procese razgradnje onesnažil v okolju z uporabo polprevodniškega katalizatorja in ultravijoličnega sevanja), in z njimi povezanih naprednih analiznih metod detekcije (spektroskopske, biokemične, kontinuirne avtomatizirane metode).

Intended learning outcomes:

Knowledge and understanding: photocatalytic transformations (they understand degradation processes of pollutants in the environment with the application of semiconductors and UV irradiation), on novel analytical methods (spectroscopic, electrochemical, separation, radioanalytical, biochemical, continuous automated methods).

Metode poučevanja in učenja:

Learning and teaching methods:

<ul style="list-style-type: none"> - Predavanja - Individualno delo na projektih - Predstavitve in interpretacije rezultatov projektov ostalim študentom v skupini v seminarski obliki - Diskusija o objavljenih člankih iz izbranih tem (kritično vrednotenje znanstvene literature, predstavitev »case studies«) 	<ul style="list-style-type: none"> - lectures - Individual project work - Presentation and interpretation of results of project work to the other students in open discussion - Journal club – discussion of published research articles on selected topics (critical evaluation of scientific literature, presentation of the "case studies")
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Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<p>Preverjanje znanja poteka v obliki projektne naloge na realnih primerih iz raziskovalne prakse, v kateri študentje pripravijo rešitve za izbrani predlog raziskovalnega projekta.</p> <p>Projektne naloge oddajo v pisni obliki in jih zagovarjajo v ustni obliki, v diskusiji z nosilcem predmeta in sodelujočimi profesorji ter ostalimi študenti.</p>	50	<p>During the course students prepare individual projects of real cases from research practice, where students prepare solutions for determined research project proposal.</p> <p>They prepare final project work and defend it in the classroom in discussion with professors and other students.</p>
<p>Študent pripravi tudi seminar iz tematike doktorata v povezavi z eno od vsebin predmeta. Pri tem sodelujeta mentor in nosilec predmeta oz. drugi izvajalci predmeta. Zagovor opravlja študent pred mentorjem in nosilcem in/ali drugim izvajalcem.</p>	50	<p>Student prepares a doctoral seminar on the topic related to one of the course. In this cooperate mentor and lecturer or/and other professors. Student defend the seminar in front of mentor and lecturer and/or other professors.</p>

Reference nosilca / Lecturer's references:

<p>Polonca Trebše</p> <ol style="list-style-type: none"> 1. LAVTIŽAR, Vesna, GESTEL, Cornelis A. M. van, DOLENC, Darko, TREBŠE, Polonca. Chemical and photochemical degradation of chlorantraniliprole and characterization of its transformation products. <i>Chemosphere (Oxford)</i>. [Print ed.], 7 str., doi: 10.1016/j.chemosphere.2013.09.057. [COBISS.SI-ID 2922491] 2. ŽABAR, Romina, KOMEL, Tilen, FABJAN, Jure, BAVCON KRALJ, Mojca, TREBŠE, Polonca. Photocatalytic degradation with immobilised TiO [sub] 2 of three selected neonicotinoid insecticides : imidacloprid, thiamethoxam and clothianidin. <i>Chemosphere (Oxford)</i>. [Print ed.], 2012, vol. 89, iss. 3, str. 293-301, doi: 10.1016/j.chemosphere.2012.04.039. [COBISS.SI-ID 2351867] 3.. MAHNE, Dunja, LAVRENČIČ ŠTANGAR, Urška, TREBŠE, Polonca, GRIESSLER BULC, Tjaša. TiO[sub]2-based photocatalytic treatment of raw and constructed-wetland pretreated textile wastewater. <i>International journal of photoenergy</i>, 2012, vol. 2012, str. 1-12, doi: 10.1155/2012/725692. [COBISS.SI-ID 2299643] 4.. ŽABAR, Romina, DOLENC, Darko, JERMAN, Tina, FRANKO, Mladen, TREBŠE, Polonca.

Photolytic and photocatalytic degradation of 6-chloronicotinic acid. *Chemosphere (Oxford)*. [Print ed.], 2011, vol. 85, no. 5, str. 861-868, doi: [10.1016/j.chemosphere.2011.06.107](https://doi.org/10.1016/j.chemosphere.2011.06.107). [COBISS.SI-ID [1964027](#)]

5.. PRIYA, D. Neela, MODAK, Jayant M., TREBŠE, Polonca, ŽABAR, Romina, RAICHUR, Ashok M. Photocatalytic degradation of dimethoate using LbL fabricated TiO₂/polymer hybrid films. *J. hazard. mater.*. [Print ed.], 2011, vol. 195, str. 214-222, doi: [10.1016/j.jhazmat.2011.08.030](https://doi.org/10.1016/j.jhazmat.2011.08.030). [COBISS.SI-ID [1972987](#)]

6. PIECHA, Malgorzata, SARAKHA, Mohamed, TREBŠE, Polonca. Photocatalytic degradation of cholesterol-lowering statin drugs by TiO₂-based catalyst : kinetics, analytical studies and toxicity evaluation. *J. photochem. photobiol.,A Chem.*. [Print ed.], 2010, vol. 213, no. 1, str. 61-69. [COBISS.SI-ID [1492219](#)]

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Mikrofluidne naprave v bioinženirstvu
Course title:	Microfluidic devices in bioengineering

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Bioznanosti	Zdravstveni bioinženiring	1,2	1,2,3,4
Biosciences	Bioengineering in Health Sciences	1,2	1,2,3,4

Vrsta predmeta / Course type teoretični predmet / theoretical course

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
10	15	10	/	/	90	5

Nosilec predmeta / Lecturer: Nosilka predmeta: prof. dr. Polona Žnidaršič Plazl

Jeziki / Languages:	Predavanja / Lectures:	Slovene/English
	Vaje / Tutorial:	Slovene/English

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: **Prerequisites:**

Zaključen drugostopenjski ali star univerzitetni študij biotehnologije, kemijskega inženirstva, biokemije, kemije, farmacije, mikrobiologije, živilske tehnologije, medicine in sorodnih programov.

Completed university or 2nd level Bologna studies of biotechnology, chemical engineering, biochemistry, chemistry, pharmacy, microbiology, food technology, medicine and other related programmes.

Vsebina: **Content (Syllabus outline):**

Temeljna vsebinska področja predmeta so:

- splošni pojmi in definicije mikroreaktorske tehnologije (MRT) in mikrofluidnih naprav,
- sodobne tehnike izdelave mikrostrukturiranih naprav, obdelava in funkcionalizacija površin,
- dinamika tekočin v mikrofluidnih napravah: paralelni tok mešljivih in nemešljivih tekočin v mikrokanalih, tokovni režimi večfaznih sistemov (tvorba kapljic, segmentiran tok)
- prednosti miniaturiziranih naprav
- uporaba mikrofluidnih naprav za bioanalizo, μ TAS sistemi
- uporaba mikrofluidnih naprav za razvoj in proizvodnjo farmacevtskih učinkovin
- mikrobioreaktorji, encimski mikroreaktorji, imobilizacija encimov v mikrostrukturirane naprave
- lab-on-a-chip-sistemi
- uporaba mikrofluidnih naprav v zaključnih procesih in integracija procesov
- uporaba mikrofluidnih naprav v biomedicini (diagnostika, dostava zdravil, hemodializa)
- izbrani primeri biokatalitskih in separacijskih procesov v mikrofluidnih napravah, integrirani procesi

The basic contents of the subject are:

- general concepts and definitions of microreactor technology (MRT) and microfluidic devices
- contemporary techniques for manufacturing of microstructured devices; surface treatment and functionalization
- fluid dynamics in microfluidic devices: parallel flow of miscible and non-miscible fluids in microchannels (droplet formation, segmented flow)
- advantages of miniaturized devices
- use of microfluidic devices for bioanalysis, μ TAS systems
- use of microfluidic devices for drug development and production
- microbioreactors, enzymatic microreactors, enzyme immobilization in microstructured devices
- lab-on-a-chip systems
- use of microfluidic devices in downstream processing and process integration
- use of microfluidic devices in biomedicine (diagnostics, drug delivery, hemodialysis)
- selected case studies of biocatalytic and downstream processes in microfluidic devices, integrated processes

Temeljni literatura in viri / Readings:

Izbrana poglavja iz: Hessel, V., Renken, A., Schouten, J.C., Yoshida, J.-I., Eds., Micro Process Engineering: A Comprehensive Handbook, Vol. 1-3, Wiley-VCH Verlag GmbH & Co. KGaA, Weinheim, Germany, 2009

Izbrana poglavja iz: Dietrich, T.R., Ed., Microchemical engineering in practice, John Wiley & Sons, Hoboken, 2009

Izbrana poglavja iz: Wirth, T., Ed., Microreactors in Organic Chemistry and Catalysis, 2nd Ed., Completely Revised and Enlarged Edition, Wiley-VCH, Weinheim, 2013

Izbrana poglavja iz: Li, X., Zhou, Y., Eds., Microfluidic devices for biomedical applications, Woodhead Publishing, 2013

Tekoča znanstvena periodika./ Papers from current scientific journals.

Cilji in kompetence:

Temeljni izobraževalni cilj je pridobitev teoretičnih in praktičnih znanj za samostojno načrtovanje in izvedbo bioanaliz, bioprocsov in/ali bioseparacij v mikrofluidnih napravah ter integriranih lab-on-a-chip sistemih.

Objectives and competences:

The basic educational aim is gaining theoretical and practical knowledge for independent development and execution of bioanalysis, bioprocesses and/or bioseparations in microfluidic devices, as well as in integrated lab-on-a-chip systems.

Predvideni študijski rezultati:

Poznavanje osnovnih tehnik izdelovanja mikrofluidnih naprav, tokovnih režimov v njih in načinov obdelovanja površin. Poleg tega je predvideno razumevanje prednosti uporabe mikrofluidnih naprav v bioanalitiki, razvoju in proizvodnji farmacevtskih učinkovin ter drugih bioprosesov in v biomedicini. Poznavanje mikrobioreaktorjev, osnov bioseparacijskih procesov v mikrofluidnih napravah in lab-on-a-chip sistemov.

Intended learning outcomes:

The intended learning outcomes consider knowledge about technologies for fabrication of microfluidic devices, fluid flow within them and surface modifications. Besides, understanding of benefits of using microfluidic devices in bioanalysis, drug development and production, in other bioprocesses and in biomedicine is intended. Gaining of expertise in mikrobioreactors, basics of bioseparations in microfluidic devices and in lab-on-a-chip systems.

Metode poučevanja in učenja:

- Predavanja
- Priprava seminarja in predstavitev ostalim študentom v okviru rednih seminarjskih sestankov skupine (diskusija in kritično vrednotenje izbrane znanstvene literature).
- Laboratorijsko delo z mikrofluidnimi napravami – spoznavanje tokovnih režimov v mikrokanalih, separacijskih procesov in miniaturiziranih integriranih sistemov.

Learning and teaching methods:

- Lectures
- Preparation of seminar work and oral presentation within regular journal club meetings of the research group (discussion and critical evaluation of selected scientific papers).
- Laboratory work with microfluidic devices – observation of fluid flow within microchannels, separation processes and miniaturised integrated systems.

Načini ocenjevanja:

- Seminar (ocena teksta in predavitve)
- Ustni izpit

Delež (v %) /
Weight (in %)

Assessment:

- Seminar (text and presentation)
- Oral exam

50/50

Reference nosilca / Lecturer's references: prof. dr. Polona Žnidaršič Plazl

1. ŽNIDARŠIČ PLAZL, Polona. Enzymatic microreactors utilizing non-aqueous media. *Chimica oggi*, ISSN 0392-839X, 2014, vol. 32, no. 1, str. 54-61, ilustr. [COBISS.SI-ID [1681455](#)],
2. CVJETKO, M., SABOTIN, Izidor, RADOŠ, Ivan, VALENTIČIČ, Joško, BOSILJKOV, Tomislav, BRNČIĆ, Mladen, ŽNIDARŠIČ PLAZL, Polona. A comparative study of ultrasound-, microwave-, and microreactor-assisted imidazolium-based ionic liquid synthesis. *Green processing and synthesis*, ISSN 2191-9542. [Print ed.], 2013, vol. 2, no. 6, str. 579-590, ilustr. <http://www.degruyter.com/view/j/gps.2013.2.issue-6/gps-2013-0086/gps-2013-0086.xml?format=INT>, doi: 10.1515/gps-2013-0086. [COBISS.SI-ID 1656367],
3. POHAR, Andrej, ŽNIDARŠIČ PLAZL, Polona, PLAZL, Igor. Integrated system of a mikrobioreactor and a miniaturized continuous separator for enzyme catalyzed reactions. *Chem. eng. j.*, 2012, vol. 189/190, no. 1, 376-382, doi: 10.1016/j.cej.2012.02.035

4. CVJETKO, M., VORKAPIĆ-FURAČ, Jasna, ŽNIDARŠIČ PLAZL, Polona. Isoamyl acetate synthesis in imidazolium-based ionic liquids using packed bed enzyme microreactor. *Process biochemistry*, ISSN 1359-5113, 2012, vol. 47, no. 9, str. 1344-1350, doi: 10.1016/j.procbio.2012.04.028. [COBISS.SI-ID 35952389],
5. STOJKOVIČ, Gorazd, ŽNIDARŠIČ PLAZL, Polona. Continuous synthesis of L-malic acid using whole-cell microreactor. *Process biochem*, 2012, vol. 47, no. 7, 1102-1107, doi: 10.1016/j.procbio.2012.03.023.
6. ŽNIDARŠIČ PLAZL, Polona, PLAZL, Igor. Microbioreactors. V: MOO-YOUNG, Murray (ur.). *Comprehensive biotechnology*, 2nd Ed. Amsterdam [etc.]: Elsevier, cop. 2011, str. 289-301. [COBISS.SI-ID 35324421]
7. STOJKOVIČ, Gorazd, PLAZL, Igor, ŽNIDARŠIČ PLAZL, Polona. L-Malic acid production within a microreactor with surface immobilised fumarase. *Microfluid. nanofluid.* (Print), 2011, vol. 10, no. 3, str. 627-635, doi: 10.1007/s10404-010-0696-y. [COBISS.SI-ID 34517509],
8. CVJETKO, M., ŽNIDARŠIČ PLAZL, Polona. Ionic liquids within microfluidic devices. V: KOKORIN, Alexander (ur.). *Ionic liquids: theory, properties, new approaches*. Rijeka: Intech, 2011, str. 681-700. [COBISS.SI-ID 34846469]