

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	IZBRANA POGlavJA IZ BIOPROCESNEGA INŽENIRSTVA
Course Title:	SELECTED TOPICS IN BIOPROCESS ENGINEERING

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
DR Kemijske znanosti, 3. stopnja	/	1.	1. in 2.
Doctoral programme in Chemical Sciences, 3 rd Cycle	/	1 st	1 st and 2 nd

Vrsta predmeta / Course Type:

izbirni/Elective

Univerzitetna koda predmeta / University Course Code:

KZ318A

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
5	25	/	/	90	30	5

Nosilec predmeta / Lecturer:

prof. dr. Polona Žnidaršič Plazl / Dr. Polona Žnidaršič Plazl, Full Professor

Jeziki / Languages:**Predavanja / Lectures:** slovenski / angleški
Slovene / English**Vaje / Tutorial:** /**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Vpis na doktorski študij.

Prerequisites:

Enrolment in a doctoral study programme.

Vsebina:

Izbrana poglavja iz biotehnoških procesov:

- specifičnosti submerznih bioprocsov z nitastimi mikroorganizmi,
- biotehnoško pridobivanje encimov in njihova uporaba
- kontinuirno vodenje bioprocsov.

Izbrana poglavja iz biotransformacij:

- kinetični opis biokatalitskih procesov
- biotransformacije v nekonvencionalnih topilih

- sodobne tehnike imobilizacije biokatalizatorjev.

Miniaturizacija naprav v biotehnologiji:

Content (Syllabus outline):

Selected topics in bioprocessing:

- specifics of submerged bioprocesses with filamentous microorganisms
- biotechnological production of enzymes and their applications
- continuous bioprocess operation.

Selected topics in biocatalytic processing:

- kinetic description of biocatalytic processes
- biotransformations in non-conventional media
- novel techniques for biocatalyst immobilization.

Miniaturization in biotechnology:

- microbioreactors

- mikrobioreaktorji
- encimski mikroreaktorji
- uporaba mikrostrukturiranih sistemov v zaključnih procesih
- matematični opis izbranega biokatalitskega procesa/separacije v mikrofluidni napravi.
Integracija bioprocsov z zaključnimi procesi.

- enzymatic microreactors
- application of microstructured systems in downstream processing
- mathematical description of selected biocatalytic process/separation in a microfluidic device.
Integration of bioprocesses with separation processes.

Temeljna literatura in viri / Readings:

Izbrana poglavja iz:/Selected topics in:

J. Nielsen, J. Villadsen, G. Liden, Bioreaction Engineering Principles, 2nd Ed. Kluwer Academic/Plenum Press, New York, 2002

W.-D. Fessner, T. Anthonsen (eds.), Modern Biocatalysis: Stereoselective and Environmentally Friendly Reactions, Wiley-VCH, Weinheim, 2009

P. J. Dunn, A. S. Wells, M. T. Williams, Green Chemistry in the Pharmaceutical Industry, Wiley-VCH, Weinheim, 2010

M. Moo-Young (ed.), Comprehensive Biotechnology. Amsterdam [etc.]: Elsevier, 2011

Buchholz, K., Kasche, V., Bornscheuer, U.T. Biocatalysts and Enzyme Technology, 2nd Edition. Wiley-VCH, Weinheim, 2012

Tekoča znanstvena periodika/Current scientific literature

Cilji in kompetence:

Cilj predmeta je poglobitev znanja za načrtovanje, vodenje in optimizacijo bioprocsov in tehnologij.

Kompetence: spoznavanje izbranih biotehnoških procesov in njihova inženirska analiza, razumevanje pomena kontinuirnega delovanja procesov in vpeljave miniaturiziranih naprav v biotehnologijo.

Objectives and Competences:

Deepening knowledge for an independent design and optimization of bioprocesses and technologies.

Competences: comprehension of selected biotechnological processes and their engineering analysis, understanding of the significance of continuous process operation and implementation of micro-scale devices in biotechnology.

Predvideni študijski rezultati:

Znanje in razumevanje

Študent bo usvojil integriran pristop k razvoju, vodenju in analizi biotehnoških procesov na osnovi sinteze biokemijskega inženirstva, mikrobiologije in biokemije.

Uporaba

Študent bo razvil sposobnost sodelovanja pri razvoju, vodenju in analizi biotehnoških procesov.

Refleksija

Intended Learning Outcomes:

Knowledge and Comprehension

Student will become familiar with integration of biochemical engineering, microbiological and biochemical principles in development, operation and monitoring of biotechnological processes.

Application

Student will develop the ability to participate in the development, control and analysis of biotechnological processes.

Analysis

Študent bo predstavil in analiziral pridobljena znanja o izbranih biotehnoških procesih.

Prenosljive spretnosti

Iskanje in analiza ustreznih virov podatkov, priprava seminarja in ustne predstavitve.

Student will interpret and analyse the knowledge on selected bioprocesses.

Skill-transference Ability

Search and analysis of adequate sources of data, seminar preparation, oral presentation.

Metode poučevanja in učenja:

- Predavanja
- Priprava seminarja in predstavitev ostalim študentom v okviru rednih seminarjskih sestankov skupine (diskusija in kritično vrednotenje izbrane znanstvene literature)

Learning and Teaching Methods:

- Lectures
- Preparation of seminars and presentation to other students within obligatory seminar meetings of the group (discussion and critical evaluation of selected scientific literature)

Delež (v %) /

Načini ocenjevanja:

Weight (in %) **Assessment:**

- Seminar (ocena teksta in predstavitve)	50	- Seminar (evaluation of text and presentation)
- Ustni izpit	50	- Oral exam

Reference nosilca / Lecturer's references:

P. Žnidaršič-Plazl. Biocatalytic process intensification via efficient biocatalyst immobilization, miniaturization, and process integration. *Curr. Opin. Green Sustain. Chem.*, 2021, **32**, 100546, doi: [10.1016/j.cogsc.2021.100546](https://doi.org/10.1016/j.cogsc.2021.100546).

F. A. Vicente, I. Plazl, S.P.M. Ventura, P. Žnidaršič-Plazl. Separation and purification of biomacromolecules based on microfluidics. *Green Chem.*, 2020, **22**, 4391-4410, doi: [10.1039/c9gc04362d](https://doi.org/10.1039/c9gc04362d).

M. Tišma, P. Žnidaršič-Plazl, G. Šelo, I. Tolj, M. Šperanda, A. Bucić-Kojić, M. Planinić. *Trametes versicolor* in lignocellulose-based bioeconomy : state of the art, challenges and opportunities. *Bioresour. Technol.*, 2021, **330**, 124997, doi: [10.1016/j.biortech.2021.124997](https://doi.org/10.1016/j.biortech.2021.124997).