

BIOTEHNOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Biotehnologija
Course title:	Biotechnology
Članica nosilka/UL Member:	UL FKKT

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Kemijsko inženirstvo, prva stopnja, univerzitetni	Ni členitve (študijski program)	2. letnik, 3. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0072126
Koda učne enote na članici/UL Member course code:	INSI1

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
45	15	15 LV			75	5

Nosilec predmeta/Lecturer:	prof. dr. Polona Žnidaršič Plazl
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Vrsta predmeta/Course type:	izbirni strokovni/Elective Professional
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Jeziki/Languages:	Predavanja/Lectures:	Angleščina, Slovenščina
	Vaje/Tutorial:	Angleščina, Slovenščina

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

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Biotehnologija, njen pomen in interdisciplinarnost. Zgodovina biotehnologije. Vloga biotehnologije v družbi. Bioekonomija, krožno gospodarstvo. Osnove mikrobiologije in tehnologije rekombinantne DNA. Osnove pripravljanih, produkcijskih in zaključnih procesov. Stopnje razvoja bioprocasa. Uporaba mikrobioreaktorjev pri razvoju in intenzifikaciji bioprocasa. Uporaba biotehnologije v kemijski, farmacevtski in živilski industriji, v medicini, kmetijstvu in okoljevarstvu. Industrijska biotehnologija. Izbrani primeri industrijskih bioprocasa: proizvodnja piva, organskih kislin, aminokislin, antibiotikov, vitaminov, biogoriv, biofarmacevtikov. Bioprocasi z mikroorganizmi, rastlinskimi in živalskimi celicami. Valorizacija lignocelulozne biomase z bioprocasi. Bioplastika.

Content (Syllabus outline):

Biotechnology, its importance and interdisciplinarity. The history of biotechnology and its role in the society. Bioeconomy, circular economy. Basic aspects of microbiology and DNA recombinant technology. Basic aspects of upstream, production and downstream processing. Bioprocess development stages. Microbioreactors application in bioprocess development and intensification. Biotechnology in chemical, pharmaceutical and food industry, in medicine, agriculture and environment protection. Industrial biotechnology. Selected examples of industrial bioprocesses: production of beer, organic and amino acids, antibiotics, vitamins, biofuels, biopharmaceuticals. Bioprocesses with microorganisms, plant and animal cells. Bioprocess-based lignocellulose biomass valorization. Bioplastics.

Biogoriva. Etika in umetna inteligenca v biotehnologiji.	Biofuels. Ethics and artificial intelligence in biotechnology.
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Temeljna literatura in viri/Readings:

<ul style="list-style-type: none"> - Ratledge C., Kristiansen B., Basic Biotechnology, Cambridge Press, (2001), 342 str. - Enfors S-O., Häggström L., Bioprocess technology, KTH Press (1996), 356 str. - Žnidaršič Plazl, P., Podgornik, H. Vaje iz biotehnologije. 2. izd. Ljubljana: Fakulteta za kemijo in kemijsko tehnologijo, 2011. 96 str., ilustr. ISBN 978-961-6756-23-5. - Tekoča znanstvena periodika.
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Cilji in kompetence:

<p>Cilj predmeta je spoznavanje študentov z interdisciplinarnostjo in zakonitostimi biotehnologije in vloge, mikrobiologije, biokemije in biokemijskega inženirstva v biotehnologiji. Predmet se povezuje s kemijskim inženirstvom, fizikalno kemijo, industrijsko mikrobiologijo, rastlinsko in animalno biotehnologijo.</p> <p>Študentje si pri predmetu pridobijo naslednje specifične kompetence:</p> <ul style="list-style-type: none"> - sposobnost razumevanja vloge in možnosti aplikaciji inženirskih znanj v biotehnologiji - sposobnost povezovanja inženirskih znanj z znanji mikrobiologije, biokemije, genetike in genskega inženiringa - sposobnost razumevanja delovanja in vloge in mikroorganizmov v biotehnoloških procesih - sposobnost razumevanja strukture delovanja biotehnološkega procesa od laboratorijskih raziskav do industrijskega postopka - Sposobnost razumevanja vloge pripravljanih procesov, produkcijskih in zaključnih procesov v biotehnologiji 	<h3>Objectives and competences:</h3> <p>The aim of this course is to introduce students the interdisciplinary and legality of biotechnology in the sence of its applications, microbiology, biochemistry and biochemical engineering. The focus of the study is to learn how to use engineering technology skills and application in laboratory and industrial practice. The course is linked to chemical engineering, physical chemistry, industrial microbiology, plant and animal biotechnology</p> <ul style="list-style-type: none"> - Capability and insight in the strategy and the role of bioreactor design according to the type of microorganism or tissue culture, type of bioprocess and the mode of operation. - Capability and interlinking of bioreactor operation and techniques with chemical and biochemical engineering principles – mass and heat transport processes, fluid dynamics, process rheology and the modes of operation. - Capability of understading the influence of microbial physiology to the bioreactor design and the modes of operation and their influence to the bioprocess development and design. - Capability of understading of pilot and larged scale bioreactors operation.
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Predvideni študijski rezultati:

<p>Znanje in razumevanje Študentje spoznajo strukturo in interdisciplinarnost področja biotehnologije. Pridobijo osnovna znanja mikrobiologije in mikrobne fiziologije, potrebna za razumevanje poročja in spoznajo pomen in vlogo inženirstva v biotehnoloških postopkih.</p> <p>Uporaba Študent uporabi znanja in razumevanja o mehanizmih in vlogi mikroorganizmov v biosintezi različnih produktov visokotonažne, rekombinantne in fine biotehnologije, ki jih v praksi nadgradi z inženirskimi znanji.</p> <p>Refleksija Študentje so sposobni samostojno sklepati, definirati problem, kritičnega ovrednotenja skladnosti med teoretičnimi načeli in praktičnim ravnanjem,</p>	<h3>Intended learning outcomes:</h3> <p>Knowledge and Comprehension Students learn about the structure and interdisciplinary field of biotechnology. Acquire basic knowledge of microbiology and microbial physiology needed to understand the area and learn about the importance and role of engineering aspects in biotechnological processes.</p> <p>Application Student use of knowledge and understanding the mechanisms and the role of microorganisms in the biosynthesis of various bulk, recombinant and fine biotechnology products, that in practice upgrade with the engineering skills.</p> <p>Analysis Students are able to conclude independently, define a problem, to make a critical evaluation of conformity between theoretical principles and practical behavior,</p>
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<p>postavljati zaključke in reševati nekatere zanimive probleme v biotehnologiji.</p> <p>Prenosljive spretnosti</p> <p>Študentje pridobijo sposobnost identificiranja in reševanja tehnoloških problemov, sposobni so zbiranja in interpretacije podatkov, kritične analize in sinteze pridobljenih znanj v tehnoloških študijah, povezovanja znanj iz strokovne literature s prakso in prenosom pridobljenih znanj v sorodne tehnologije. Znanje v obliki predavanj, seminarjev in teoretičnih znanj in znanja iz znanstvene literature.</p>	<p>and to formulate independent conclusions and solve some actual biotechnology problems.</p> <p>Skill-transference Ability</p> <p>Students gain the ability to identify and solve technological problems, they are capable of collecting and interpreting data, critical analysis and synthesis of acquired knowledge in technological studies, integration of knowledge from the scientific literature with the practice and transmission of the acquired knowledge in related technologies. Knowledge in the form of lectures, seminars and theoretical skills and knowledge from the scientific literature.</p>
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Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja, seminarji in praktične vaje, strokovne ekskurzije v industriji.	Lectures, seminars, exercises

Načini ocenjevanja:	Delež/Weight	Assessment:
Pisni izpit	70,00 %	Written exam
Vaje	15,00 %	Laboratory practice
Seminar	15,00 %	Seminar

Reference nosilca/Lecturer's references:
<ul style="list-style-type: none"> - Wohlgemuth, R., Plazl, I., Žnidaršič Plazl, P., Gernaey, K.V., Woodley, J.M. Microscale technology and biocatalytic processes: opportunities and challenges for synthesis. Trends Biotechnol., 2015, 33: 302-314. - Cvjetko, M., Vorkapić-Furač, J., Žnidaršič Plazl, P. Isoamyl acetate synthesis in imidazolium-based ionic liquids using packed bed enzyme microreactor. Process Biochem., 2012, 47: 1344-1350. - Žnidaršič Plazl, P., Plazl, I. Microbioreactors. V: Moo-Young, M. (tr.). Comprehensive Biotechnology, 2nd Ed. Amsterdam [etc.]: Elsevier, 2011, str. 289-301