MOLEKULARNA BIOTEHNOLOGIJA

UČNI NAČRT PREDMETA/COURSE SYLLABUS

Predmet:	Molekularna biotehnologija
Course title:	MOLECULAR BIOTECHNOLOGY
Članica nosilka/UL Member:	UL FKKT

Študijski programi in stopnja	Študijska smer	Letnik	Semestri	Izbirnost
Biokemija, druga stopnja, magistrski	Ni členitve (študijski program)	1. letnik, 2. letnik		izbirni

Univerzitetna koda predmeta/University course code:	0100722
Koda učne enote na članici/UL Member course code:	BI2I18

Predavanja /Lectures	Seminar /Seminar	Vaje /Tutorials	Klinične vaje /Clinical tutorials	Druge oblike študija /Other forms of study	Samostojno delo /Individual student work	ECTS
30	30	15 LV			75	5

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	Prerequisites:
Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	The course has to be assigned to the student.

Vsebina:	Content (Syllabus outline):
Predavanja: 1. Uvod. Biotehnologija in molekularna biotehnologija. 2. Molekularna biotehnologija in okolje: mikrobni biosenzorji, bioremediacija/fitoremediacija. 3. Molekularna biotehnologija in hrana: določanje GS sestavin in določanje sestave živil z analizo DNA. 4. Molekularna biotehnologija za pripravo terapevtikov: interferoni, rastni hormon, dejavnik tumorske nekroze, inzulin, interlevkini,… 5. Molekularna biotehnologija za pripravo encimov (nukleaze, lipaze). 6. Molekularna biotehnologija za pripravo diagnostičnih in terapevtskih protiteles.	Lectures: 1. Introduction. Biotechnology and molecular biotechnology. 2. Molecular biotechnology and environment: microbial biosensors, bioremediation/phytoremediation. 3. Molecular biotechnology and food: determining genetically modified ingredients and composition based on DNA analysis. 4. Molecular biotechnology for preparation of therapeutics: interferons, growth hormone, tumour necrosis factor, insulin, interleukins… 5. Molecular biotechnology for enzyme production (nucleases, lipases). 6. Molecular biotechnology for preparation of diagnostic and therapeutic antibodies.

7. Molekularna biotehnologija za pripravo cepiv: herpes, papilomavirus, kolera; DNA-cepiva (karies), vektorska cepiva, bakterije kot dostavni sistemi za antigene. 8. Molekularna biotehnologija za sintezo tržno zanimivih produktov: male biološke molekule, antibiotiki, biopolimeri. 9. Molekularna biotehnologija in uporaba biomase: proizvodnja fruktoze, alkoholov, mikrobna pretvorba celuloze in lignina. 10. Molekularna biotehnologija: metabolično inženirstvo. 11. Molekularna biotehnologija in novi viri energije. 12. Molekularna biotehnologija in gensko spremenjene rastline in živali. 13. Družbeni vidiki sodobne biotehnologije: varnost, okoljska tveganja, ekonomski vidiki in družbena sprejemljivost. 14. Rekombinantne bakterije v agronomiji Seminarji: Primeri razvoja novih sistemov za proizvodnjo reagentov, terapevtikov, uporaba v zdravstvu, alternativni viri energije ipd. iz tekoče znanstvene periodike. Laboratorijske vaje: 1. Določanje vrstne sestave mešanega mesa 2. Določanje vsebnosti GS rastlin v živilu 3. Načini transformacije cianobakterij	7. Molecular biotechnology for preparation of vaccines: herpes, papilomavirus, cholera; DNA vaccines (caries), vector vaccines, bacteria as antigen delivery systems. 8. Molecular biotechnology for synthesis of commercial products: small biological molecules, antibiotics, biopolymers. 9. Molecular biotechnology and biomass utilization: production of fructose, alcohols, microbial conversion of cellulose and lignin. 10. Molecular biotechnology: metabolic engineering. 11. Molecular biotechnology and new energy sources. 12. Molecular biotechnology and genetically engineered plants and animals. 13. Open public issues of modern biotechnology: safety, environmental risks, economical issues and public acceptance. 14. Recombinant bacteria in agriculture Seminars: Examples of novel systems for production of reagents, therapeutics, medical uses, alternative energy sources etc. from current scientific literature. Laboratory work: 1. Determination of species composition in mixed meet samples 2. Determination of presence of genetically modified plants in food samples 3. Techniques for transformation of cyanobacteria

Temeljna literatura in viri/Readings:

- B.R. Glick, J.J. Pasternak in C.L. Patten: Molecular Biotechnology: Principles and applications of recombinant DNA. 4. izdaja. Washington: ASM Press, 2009 (40 %, večino preostalega učbenika uporabijo študenti pri predmetu Tehnologija DNA v 1. letniku magistrskega študija).
- B.R. Glick, J.J. Pasternak and C.L. Patten: Molecular Biotechnology: Principles and applications of recombinant DNA. 4. izdaja. Washington: ASM Press, 2009 (40%; most of the remaining textbook is recommended for the introductory DNA Technology course in the 1st year Master's programme).

Cilji in kompetence:	**Objectives and competences:**
Študentje morajo poznati aplikativne vidike genskega inženirstva. Ob predhodnem poznavanju DNA-tehnologije bodo sposobni razumeti načine priprave gensko spremenjenih organizmov in umestiti njihovo uporabnost v širši kontekst ved o življenju in sodobnih tehnologij.	Students have to know applicative aspects of genetic engineering. With prior knowledge of DNA technology they will be able to understand how genetically engineered organisms are prepared and to put their value into the context of life sciences and modern technologies.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje Znanje: Postopki priprave rekombinantnih cepiv. Uporabnost gensko spremenjenih organizmov in produktov na različnih področjih (okoljske tehnologije, medicina,	Knowledge and Comprehension Knowledge: Procedures needed to prepare recombinant vaccines. Usefulness of genetically engineered organisms and products in different areas (environmental

reagenti). Princip metaboličnega inženirstva in uporaba za pripravo tržno zanimivih produktov. Razumevanje: Povezovanje posameznih tehnik v postopke v molekularni biotehnologiji. Identifikacija problema – zastavitev cilja – zasnova eksperimentov – preverjanje ciljev – prenos v prakso. Uporaba Analiza živil na osnovi DNA. Povzemanje vsebine znanstvenih člankov, utrjevanje terminologije in predstavljanje zahtevnih strokovnih vsebin. Spremljanje dnevnih novic s področja biotehnologije. Refleksija Širina spektra biotehnoloških aplikacij. Biološka zdravila pridobivamo z gensko tehnologijo. Prenos temeljnih znanj v tehnologijo. Prenosljive spretnosti Urejanje spletnih strani v okolju Wikimedia. Predstavljanje strokovnih vsebin in argumentirano razpravljanje o temah s področja biotehnologije.	technologies, medicine, reagents). Principle of metabolic engineering and its use for development of commercial products. Understanding: Combining techniques into procedures in molecular biotechnology. Problem identification – goal setting – design of experiments – testing outcomes – transfer into practice. Application DNA-based food analysis. Abstracting contents of scientific articles, terminology practice and presenting advanced professional contents. Following daily news in the field of biotechnology. Analysis Broadness of biotech applications. Biopharmaceuticals are produced using gene technology. Transfer for fundamental knowledge into technology. Skill-transference Ability Editing Web pages in Wikimedia environment. Presenting professional contents and argumented discussions on biotech topics.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, tri laboratorijske vaje, individualno delo pri pripravi seminarja (možnost konzultacij), predstavitve seminarjev.	Lectures, three laboratory experiments, individual seminar preparation (consultations possible), seminar presentation.

Načini ocenjevanja:	**Delež/Weight**	**Assessment:**
Pisni izpit. Seminarska naloga. Opravljene vaje so pogoj za pristop k izpitu.		Written and oral examination. Seminar presentation. Access to examination only with completed laboratory practicals.

Reference nosilca/Lecturer's references:

- ŠKRLJ, Nives, DREVENŠEK, Gorazd, HUDOKLIN, Samo, ROMIH, Rok, ČURIN-ŠERBEC, Vladka, **DOLINAR, Marko**. Recombinant single-chain antibody with the trojan peptide penetratin positioned in the linker region enables cargo transfer across the blood-brain barrier. Appl. biochem. biotechnol., 2013, vol. 169, no. 1, str. 159-169, ilustr., doi: 10.1007/s12010-012-9962-7. [COBISS.SI-ID 30399193]
- ŠKRLJ, Nives, ERČULJ, Nina, **DOLINAR, Marko**. A versatile bacterial expression vector based on the synthetic biology plasmid pSB1. Protein expr. purif., 2009, vol. 64, no. 2, str. 198-204, doi: 10.1016/j.pep.2008.10.019. [COBISS.SI-ID 30190085]
- VASILJEVA, Olga, **DOLINAR, Marko**, ROZMAN PUNGERČAR, Jerica, TURK, Vito, TURK, Boris. Recombinant human procathepsin S is capable of autocatalytic processing at neutral pH in the presence of glycosaminoglycans. *FEBS lett.*. [Print ed.], 2005, vol. 579, str. 1285-1290. [COBISS.SI-ID 18842407]