UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	TEHNOLOGIJA DNA
Course Title:	DNA TECHNOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
MAG Biokemija, 2. stopnja	**/**	**1.**	**1.**
USP Biochemistry, 2nd Cycle	**/**	**1st**	**1st**

Vrsta predmeta / Course Type: obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code: BI211

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
45	**/**	**15 SV + 15 LV**	**/**	**/**	**75**	**5**

Nosilec predmeta / Lecturer: izr. prof. dr. Marko Dolinar / Dr. Marko Dolinar, Associate Professor

Jeziki / Languages:

Predavanja / Lectures:	**Slovenski / Slovenian**
Vaje / Tutorial:	**Slovenski / Slovenian**

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):
1.Uvod. Primerjava DNA-tehnologije in sorodnih ved: metode in cilji. 2. Mutageneza. 3. Izražanje na površini. 4. Dvohibridni sistemi. 5. Rekombinantne bakterije v agronomiji. 6. Gensko spremenjene rastline. 7. Gensko spremenjena hrana. 8. DNA v forenzičnih analizah. 9. Analize DNA v diagnostiki. 10.Analize DNA v sistematiki in arheologiji. 11. Transgenske živali. Tehnologija izbijanja genov. Utišanje genov z RNAi. 12. Pluripotentne celice: priprava in uporaba. 13. Kloniranje sesalcev.	1.Introduction. Comparison of DNA-technology and related disciplines: methods and goals. 2. Mutagenesis. 3. Surface display. 4. Two-hybrid systems. 5. Recombinant bacteria in agronomy. 6. Genetically modified plants. 7. Genetically modified food. 8. DNA in forensic analyses. 9. DNA analyses in diagnostics. 10. DNA analyses in biological systematics and archaeology. 11. Transgenic animals. Knock-out technology. Gene silencing with RNAi. 12. Pluripotent cells: preparation and

14. Določanje genomskih zaporedij in analize razlik v genomih. 15. Genomike. 16. Rekombinantna DNA v medicini. Gensko zdravljenje. Vaje – laboratorijski del: 1. Mutageneza 2. PCR na osnovi kolonije. 3. Hitra izolacija genomske DNA, pomnoževanje polimorfnih regij in njihova analiza. Vaje - seminarski del: 1. Primeri vektorjev v tehnologiji DNA. 2. Obravnava izbranih raziskovalnih člankov s področja tehnologije DNA.	applications. 13. Cloning of mammals. 14. Determining genome sequences and analysis of intergenomic heterogeneity. 15. Genomics. 16. Recombinant DNA in medicine. Gene therapy. Laboratory practicals: 1. Mutagenesis. 2. Colony PCR. 3. Quick genomic DNA isolation, amplification of polymorphic regions and their analysis. Tutorial: 1. Examples of vectors in DNA technology. 2. Discussions on selected current research articles from the field of DNA technology.

Temeljna literatura in viri / Readings:

- Glick & Pasternak: Molecular Biotechnology: Principles and Applications of Recombinant DNA. Washington: ASM Press, 2003.

Cilji in kompetence:	**Objectives and Competences:**
Vsak študent mora biti po opravljenem izpitu sposoben razumeti tehnično zapletene postopke dela z DNA v molekularni biotehnologiji, pa tudi pri forenzičnih, biomedicinskih in drugih analizah. Znati mora izbrati ustrezne metode na osnovi DNA za reševanje konkretnih problemov v molekularni biologiji. Razen tega bo poznal načine uvedbe mutacij, interakcijske metode, ki temeljijo na DNA, postopek priprave transgenskih organizmov in mehanizme utišanja genov.	Students will understand technically advanced procedures involving DNA in molecular biotechnology, as well as in forensic, biomedical and other analyses. They will be able to choose adequate DNA-based methods for solving practical problems in molecular biology. Also, they will know procedures for introduction of mutations, DNA-based interaction methods, procedures for preparation of transgenic organisms and mechanisms of gene silencing.

Predvideni študijski rezultati:	**Intended Learning Outcomes:**
<u>Znanje in razumevanje</u> Znanje: Zahtevne tehnike na osnovi DNA za genomske analize in raziskave interakcij med proteini. Metode za uvedbo mutacij v DNA. Primeri uporabe DNA-tehnologije v agronomiji,	<u>Knowledge and Comprehension</u> Knowledge: Advanced DNA-based techniques for genomic analyses and investigations of interactions between proteins. Methods for introduction of mutations into DNA. Examples of DNA

medicini, forenziki in drugod. Tehnologija interferenčne DNA in njena uporaba. Načini genskega zdravljenja. Razumevanje: delovanje dvohibridnih sistemov, priprava, selekcija in analiza transgenskih rastlin in živali. Možnosti za uvedbo različnih tipov mutacij v DNA. Mehanizem utišanja genov. Stopnje dela pri jedrnem prenosu. Razločevanje med posameznimi tipi genomik.	technology applications in agriculture, medicine, forensics and elsewhere. Gene silencing technology and its applications. Modes of gene therapy. Comprehension: Functioning of two-hybrid systems, development, selection and analysis of transgenic plants and animals. Various approaches in DNA mutagenesis. Gene silencing mechanism. Nuclear transfer: procedure stages. Differentiating between various types of genomics.
<u>Uporaba</u> Mutageneza in PCR na osnovi kolonij. Izolacija genomske DNA za forenzične analize in analiza polimorfnih regij.	<u>Application</u> Mutagenesis, followed by colony PCR. Isolation of genomic DNA for forensic analyses and analysis of polymorphic regions.
<u>Refleksija</u> Izbor ustreznih analiznih metod glede na končni cilj raziskave. Povezovanje dela z DNA z analizo proteinov. Funkcijska genomika kot proteomika? Gensko spremenjena hrana: vplivi na zdravje? Terapevtsko in reproduktivno kloniranje. Meje detekcije DNA v sledovih – uporaba v forenziki. Ali bo mogoče vsako dedno bolezen odkriti še preden se razvije? Smisel testiranja okvarjenih genov povezanih z neozdravljivimi boleznimi. Majhne razlike v genomih – velike razlike v fenotipih.	<u>Analysis</u> Selecting the most appropriate analytical method based on the final goal of research. Combining work with DNA with protein analysis. Functional genomics as a part of proteomics? Genetically modified food: possible health effects. DNA detection limits in forensic traces. Will we be able to detect all hereditary diseases before their outbreak? Does it make sense to test for gene dysfunction linked to untreatable diseases? Small differences in genomes result in major differences in phenotypes.
<u>Prenosljive spretnosti</u> Razumevanje raziskovalnih člankov, priprava in predstavitev seminarja, slovenska strokovna terminologija.	<u>Skill-transference Ability</u> Understanding research articles, seminar preparation and presentation, professional terminology in Slovenian language.

Metode poučevanja in učenja:	**Learning and Teaching Methods:**
Predavanja, laboratorijska vaja, individualno delo pri pripravi seminarja. Spletna gradiva za določena poglavja.	Lectures, laboratory practical courses, individual work for preparing seminars. Web sources for some topics.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni in ustni izpit ter seminarska naloga. Opravljene vaje so pogoj za pristop k		Written and oral examination. Seminary presentation. Access to examination only with

izpitu.		completed laboratory practicals.

Reference nosilca / Lecturer's references:

- ŠKRLJ, Nives, VRANAC, Tanja, POPOVIĆ, Mara, ČURIN-ŠERBEC, Vladka, **DOLINAR, Marko**. Specific binding of the pathogenic prion isoform: development and characterization of a humanized single-chain variable antibody fragment. PloS one, ISSN 1932-6203, 2011, vol. 6, no. 1, art. no. e15783 (9 str.). http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0015783, doi: 10.1371/journal.pone.0015783. [COBISS.SI-ID 34754053]
- ŠKRLJ, Nives, ČURIN-ŠERBEC, Vladka, **DOLINAR, Marko**. Single-chain Fv antibody fragments retain binding properties of the monoclonal antibody raised against peptide P1 of the human prion protein. Applied biochemistry and biotechnology, ISSN 0273-2289, 2010, issue 6, vol. 160, str. 1808-1821. http://www.springerlink.com/content/n72368781x356488/fulltext.pdf, doi: 10.1007/s12010-009-8699-4. [COBISS.SI-ID 30601477]
- KOPITAR, Gregor, **DOLINAR, Marko**, ŠTRUKELJ, Borut, PUNGERČAR, Jože, TURK, Vito. Folding and activation of human procathepsin S from inclusion bodies produced in Escherichia coli. European journal of biochemistry, ISSN 0014-2956, 1996, vol. 236, str. 558-562. [COBISS.SI-ID 22129]