



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Izbrana poglavja iz sodobnih molekularno-bioloških analiz
Course title:	Selected Topics in Modern Molecular Biology Analyses

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Doktorski študij Ekološke znanosti, 3. stopnja		1. ali 2.; 1st or 2nd	1.- 4.; 1st-4th
Doctoral Study Ecological Sciences, 3rd degree			

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
10	10		10		150	6

Nosilec predmeta / Lecturer:

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

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

Osnovna znanja iz molekularne biologije na ravni drugostopenjskega programa.

Prerequisites:

Knowledge of basic molecular biology at master level.

Vsebina:

Obravnavana bodo izbrana poglavja iz naslednjih sklopov:

- podvojevanje DNA in rekombinacije,
- molekularni mehanizmi izražanja genov,
- spremembe genetskega materiala,
- kromosomi,
- osnovne molekularno-biološke metode,
- genetske analize genoma,
- evolucija genomov,
- genetika bakterij in njihovih virusov,
- genomi kloroplastov in mitohondrijska DNA,
- molekularni pristopi k študiju biodiverzitete, filogenije, populacijske genetike in ekologije
- evolucija in filogenija
- baze podatkov in osnove bioinformatike pri analizi molekularno-bioloških podatkov.

Content (Syllabus outline):

Selected topics in the following issues will be discussed:

- DNA replication and recombination,
- molecular mechanisms of gene expression,
- modifications of genetic material,
- chromosomes,
- basic molecular genetic methods,
- genetic analyses of the genomes,
- evolution of genomes,
- genetics of bacteria and their viruses,
- chloroplast genomes, mitochondrial DNA,
- molecular approaches in biodiversity and phylogenetic studies, population genetics and ecology,
- evolution and phylogenetics,
- databases and fundamentals of bioinformatics in the analyses of molecular biology data.

Temeljna literatura in viri / Readings:

- Lodish H, Berk A, Kaiser CA, Monty Krieger s sod. 2012. Molecular Cell Biology. New York: WH Freeman and Company.
- Conner, JK in Hartl DL 2004. A primer of ecological genetics. Sinauer Associates, Inc. Publishers Sunderland, Massachusetts.
- Hartwell L, Hood L, Goldberg M, Reynolds A, Silver L 2010. Genetics: From genes to genomes. McGraw-Hill, Boston.
- Nei M in Kumar S. 2000. Molecular Evolution and Phylogenetics. Oxford University Press, Inc., New York.
- Ausubel MF, Brent R, Kingston RE s sod. 2011. Current Protocols in Molecular Biology. John Wiley & Sons, Inc.

Cilji in kompetence:

- Podrobno razložiti spoznanja o genetskih dogajanjih v celici na molekularnem nivoju.
- Podrobno razložiti metode analize genov, genomov in proučevanja izražanja genov znotraj kompleksnih biotskih sistemov ter razpravljati o novih tehnologijah, kot so genomika in informacijske vede, ki omogočajo izčrpno analizo celotnih sklopov genov in njihovega izražanja v organizmu.
- Podrobno razložiti molekulske mehanizme, ki so omogočili razvoj različnih biotskih sistemov.
- Omogočiti poglobljeno razumevanje molekularno-bioloških tehnik in analiz, ki se uporabljajo v klasičnih bioloških disciplinah in pojasniti vlogo molekularne biologije v moderni biologiji, vključno z njenimi vplivi na področjih biodiverzitete, filogenije, populacijske genetike in ekologije.

Objectives and competences:

- To give an advanced review of genetic events in the cell at the molecular level.
- Explain in detail tools for analyzing genes, genomes and gene expression within complex biotic systems and to discuss the new technologies such as genomics and the information science that allow a comprehensive analysis of the entire gene set and its expression in an organism.
- Explain in detail molecular mechanism which enabled the evolution of biotic systems.
- To enable advanced understanding of molecular biology techniques and analyses, used in classical biological disciplines, and to give information about the role of molecular biology within modern biology, including its impact on the fields of biodiversity, phylogenetics, population genetics and ecology.

Predvideni študijski rezultati:**Znanje in razumevanje:**

- Študenti dobijo izčrpen pregled nad področjem molekularne genetike do molekularne biologije postgenomske ere in nad vplivi razvoja sodobnih molekularno-bioloških analiz na klasične biološke discipline kot so biodiverziteta, filogenija, populacijske genetika in ekologija.
- Podrobno obvladajo številna sodobna molekularno-biološka in bioinformatična orodja.

Prenesljive/ključne spretnosti in drugi atributi:

- Praktično znanje iz številnih tehnik in metod molekularne biologije

Intended learning outcomes:**Knowledge and understanding:**

- Students get a comprehensive overview on the field of molecular genetics, molecular biology of post genomic era with the impact of modern molecular biology analyses on classical biology disciplines such as biodiversity, phylogenetics, phylogeography, population genetics and ecology.
- They are able to use advanced numerous molecular biology- and bioinformatics tools.

Transferable/Key Skills and other attributes:

- Practical knowledge of various techniques and methods in molecular biology

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Seminarsko delo

Learning and teaching methods:

- Lectures
- Laboratory exercises
- Seminar work

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

•Seminarska naloga	40 %	•Seminar essay
•Pisni izpit	60 %	•Written exam

Reference nosilca / Lecturer's references:

Trček J., Lipoglavšek L., Avguštin G. 2016. 16S rRNA *in situ* hybridisation followed by flow cytometry for rapid identification of acetic acid bacteria involved in submerged industrial vinegar production. Food Technol. Biotechnol. 54 (1), 108-112.

Trček J., Mira N.P., Jarboe L.R. 2015. Adaptation and tolerance of bacteria against acetic acid. Appl. Microbiol. Biotechnol. 99, 6215-6229.

Trček J. in Matsushita K. 2013. A unique enzyme of acetic acid bacteria, PQQ-dependent alcohol dehydrogenase is also present in *Frateuria aurantia*. Appl. Microbiol. Biotechnol. 97, 7369-7376.