



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

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| 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.; | 1.- 4.; |
| Doctoral Study Ecological Sciences, 3rd degree | | 1st or 2nd | 1st-4th |

Vrsta predmeta / Course type: Izbirni/Elective

Univerzitetna koda predmeta / University course code:

| Predavanja Lectures | Seminar Seminar | Vaje Tutorial | Klinične vaje work | Druge oblike študija | Samost. delo Individ. work | ECTS |
|------------------------|--------------------|------------------|-----------------------|-------------------------|----------------------------------|------|
| 10 | 10 | 10 | | | 150 | 6 |

Nosilec predmeta / Lecturer: Janja TRČEK

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

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. 2016. Molecular Cell Biology. 6. izdaja, WH Freeman, 1280 str.
- Conner, JK in Hartl DL 2004. A primer of ecological genetics. Sinauer Associates, Inc. Publishers Sunderland, Massachusetts, 304 str.
- Hartwell L, Hood L, Goldberg M, Reynolds A, Silver L 2017. Genetics: From genes to genomes. 8. izdaja, McGraw-Hill Education, 848 str.
- Nei M in Kumar S. 2000. Molecular Evolution and Phylogenetics. Oxford University Press, 333 str.
- 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.

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.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Seminarsko delo

Learning and teaching methods:

- Lectures
- Laboratory exercises
- Seminar work

Načini ocenjevanja:

- Seminarska naloga
- Pisni izpit

Delež (v %) /

Weight (in %)

Assessment:

- Seminar essay
- Written exam

Reference nosilca / Lecturer's references:

Škraban J., Cleenwerck I., Vandamme P., Fanedl L., **Trček J.** 2018. Genome sequences and description of novel exopolysaccharides producing species *Komagataeibacter pomaceti* sp. nov. and reclassification of *Komagataeibacter kombuchae* (Dutta and Gachhui 2007) Yamada et al., 2013 as a later heterotypic synonym of *Komagataeibacter hansenii* (Gosselé et al. 1983) Yamada et al., 2013. Syst. Appl. Microbiol. 41 (6), 581-592.

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.