Univerza v Mariboru
University of Maribor

Fakulteta za naravoslovje in matematiko / Faculty of Natural Sciences and Mathematics

OPIS PREDMETA / SUBJECT SPECIFICATION	
Predmet:	**Izbrana poglavja iz sodobnih molekularnobioloških analiz**
Subject Title:	**Selected Topics in Modern Molecular Biology Analyses**

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Doktorski študij Ekološke znanosti / Doctoral Study Ecological Sciences		Izbirni 1 ali 2 ali 3	**2 ali 3 ali 4 ali 5**

Univerzitetna koda predmeta / University subject code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Lab. work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
5			5		140	**5**

Nosilec predmeta / Lecturer: Bojana MOZETIČ FRANCKY

Jeziki / Languages:	**Predavanja / Lecture:**	slovenski / Slovenian
	Vaje / Tutorial:	slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Poznavanje sodobnih molekularnobioloških analiz na ravni drugostopenjskega programa	Knowledge of modern molecular biology analyses at master level

Vsebina:	**Contents (Syllabus outline):**
Obravnavana so izbrana poglavja iz naslednjih sklopov. Principi klasične genetike Molekularna biologija podvojevanja DNK in rekombinacija Molekularna biologija ekspresije genov Molekularni mehanizmi regulacije genov Spremembe genetskega materiala Kromosomi Osnovne molekularno-biološke metode Projekt humanega genoma Genetske analize in rekonstrukcija genomov Evolucija genomov Genetska kontrola razvoja večceličnih organizmov Molekularna genetika celičnega cikla in rak Genetika bakterij in njihovih virusov Genomi kloroplastov, mitohondrijska DNA in ekstranuklearno dedovanje Populacijska genetika Molekularni pristopi pri študiju biodiverzitete, filogenije, filogeografije, populacijske genetike in ekologije Evolucija in filogenija Baze podatkov in osnove bioinformatike pri analizi molekularnobioloških podatkov Aktualni problemi, socialne, etične in pravne dileme, najnovejša spoznanja in perspektive v molekularni biologiji	Selected topics in the following chapters are discussed. Principles of classical genetics Molecular biology of DNA replication and recombination Molecular biology of gene expression Molecular mechanisms of gene regulation Modifications of genetic material Chromosomes Basic molecular genetic methods Human genome project Genetic analyses and the reconstruction of the genomes The evolution of genomes Genetic control of development in multicellular organisms Molecular genetics of the cell cycle and cancers Genetics of bacteria and their viruses Chloroplast genomes, mitochondrial DNA and extra nuclear inheritance Introduction to population and evolutionary genetics Molecular approaches in biodiversity and phylogenetic studies, phylogeography, population genetics and ecology Evolution and phylogenetics Databases and fundamentals of bioinformatics in the analyses of molecular biology data Actual problems, social, ethical and legal dilemmas, recent knowledge and perspectives in molecular

	genetics

Temeljni študijski viri / Textbooks:

- Avise, J. C., 2004: Molecular markers, Natural History, and Evolution, Second Edition.2004. Sinauer Associates, Inc. Publishers Sunderland, Massachusetts.
- Conner, J. K., D. L. A Hartl, 2000: A primer of ecological genetics. Sinauer Associates, Inc. Publishers Sunderland, Massachusetts.
- Hartwell, L. H., l. Hood, M. L. Goldberg, A. E. Reynolds, L. M. Silver, R. C. Veres, 2004 : Genetics. From genes to genomes. McGraw-Hill, Boston.
- Lewin, B. 2004: Genes VII. Pearson Prentice Hall, Upper Saddle River.
- Nei, M., S. Kumar, 2000: Molecular Evolution and Phylogenetics. Oxford University Press, Inc., New York.
- Sambrook, J , D. W. Russell, 2001: Molecular cloning – a laboratory manual.Cold Spring Harbor Laboratory press, Cold Spring Harbor. New York.
- Informacije z interneta in drugih virov / informations from the internet and other sources

Cilji:	**Objectives:**
• Podrobno razložiti spoznanja o genetskih dogajanjih v celici na molekularnem nivoju in povezati principe Mendlove genetike z bazičnimi molekularnimi mehanizmi • Podrobno razložiti metode analize genov, genomov in proučevanju ekspresije 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 koncept genetske enotnosti živih bitij in podati sintezo informacij iz različnih organizmov v splošnem modelu, ki lahko razloži številne biotske sisteme • Podrobno razložiti molekularne mehanizme, ki so omogočili razvoj različnih biotskih sistemov, oziroma organizmov • Omogočiti poglobljeno razumevanje molekularno-bioloških tehnik in analiz, ki jih uporabljajo v klasičnih bioloških disciplinah, in pojasniti vlogo molekularne biologije v moderni biologiji, vključno z njenimi vplivi na področjih biodiverzitete, filogenije, filogeografije, populacijske genetike in ekologije	• To give an advanced review of genetic events in the cell at the molecular level and relate Mendelian genetics with fundamental molecular mechanisms • 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 the concept of genetic unity of living beings and the synthesis of information from different organisms into coherent models that explain many biotic systems • Explain in detail molecular mechanism which enabled the evolution of biotic systems, or whole organisms, respectively • To enable advanced understanding of molecular biology techniques and analyses, used in classical biologicaldisciplines, and to give information about the role of molecular biology within modern biology, including its impact on the fields of biodiversity, phylogenetics, phylogeography, population genetics and ecology
Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje:	Knowledge and Understanding:
• Študenti dobijo izčrpen pregled nad celotnim področjem, od klasične in molekularne genetike do molekularne biologije postgenomske ere in nad vplivi razvoja sodobnih molekularnobioloških analiz na klasične biološke discipline kot so biodiverziteta, filogenija, filogeografija, populacijske genetika in ekologija • Podrobno prepoznavajo in uporabijo specifične koncepte in principe • Podrobno obvladajo številna sodobna molekularno-biološka in bioinformatska orodja • Sposobni so poglobljeno povezovati znanja klasične Mendlove genetike, bazičnih molekularnih mehanizmov, genomike in informacijskih ved ter klasične biologije	• Students get a comprehensive overview of the field of classical and 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 recognize in detail and apply specific concepts and principles • They are able to use advancely numerous molecular biology- and bioinformatics tools • They are able to integrate advancely the knowledge of classical Mendelian genetics with fundamental molecular mechanisms, genomics and information science
Prenesljive/ključne spretnosti in drugi atributi:	Transferable/Key Skills and other attributes:
• Izbrana teoretična znanja znanja ter praktično obvladovanje številnih tehnik in metod • Sposobnost vrhunske aplikacije različnih konceptov in tehnik, ki so pomembni tudi za druga področja, kot so sistematika, evolucija, ekologija, razmnoževanje živali in rastlin, naravovarstvo in upravljanje z divjimi živalmi, humana genetika in antropologija • Podrobno obvladovanje moderne genetike, uporabne na teh področjih • Kritična presoja moralnih in etičnih problemov, povezanih z znanstvenim napredkom na genetskem področju	• Selected knowledge, including practice in laboratory work • Top-level ability of application of different concepts and techniques important for other fields such as systematics, evolution, ecology, animal and plant breeding, nature conservation and wildlife management, human genetics and anthropology • Advanced knowledge of modern genetics applicable in these fields • Critical appreciation of the moral and ethical problems related to scientific advances in genetics

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Laboratorijske vaje • Seminar in diskusije • Individualno delo s študenti	• Lectures • Laboratory excersises • Seminar and discussions • Individual work with students

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Kolokvij • Seminarska naloga • Pisni ali ustni izpit	30 % 30 % 40 %	• Partial exam • Seminar essay • Written or oral exam

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Materialni pogoji za izvedbo predmeta :	***Material conditions for subject realization***
• *Multimedijska predavalnica* • *Molekularno biološki laboratorij* • *Možnost uporabe računalnikov in dostopa do interneta*	• *Lecture hall for multimedia presentations* • *Molecular biology laboratory* • *Availability of computers and access to internet*

Obveznosti študentov:	***Students' commitments:***
(pisni, ustni izpit, naloge, projekti)	*(written, oral examination, coursework, projects):*
• Kolokvij • Seminarska naloga • Pisni ali ustni izpit	• Partial exam • Seminar essay • Written or oral exam