Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Izbrane metode v biokemiji in molekularni biologiji
Course title:	Selected Methods in Biochemistry and Molecular Biology

Študijski program in stopnja Study programme and level	**Študijska smer Study field**	**Letnik Academic year**	**Semester Semester**
Univerzitetni študijski program: Ekologija z naravovarstvom, 1. stopnja		**2. ali 3.**	**3. ali 4. ali 5. ali 6.**
Undergraduate university programme: Ecology with Nature Conservation, 1st level		**2nd or 3rd**	**3rd or 4th or 5th or 6th**

Vrsta predmeta / Course type	Izbirni/Elective
Univerzitetna koda predmeta / University course code:	**B085**

Predavanja Lectures	**Seminar Seminar**	**Sem. vaje Tutorial**	**Lab. vaje Laboratory work**	**Teren. vaje Field work**	**Samost. delo Individ. work**	**ECTS**
15			**30**		**135**	**6**

Nosilec predmeta / Lecturer:	Marjanca STARČIČ ERJAVEC

Jeziki / Languages:	**Predavanja / Lectures:**	**Slovenski/Slovene**
	Vaje / Tutorial:	**Slovenski/Slovene**

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Jih ni.	No.

Vsebina:

Predavanja:

- Osnovna orodja v biokemiji in molekularni biologiji;
- Izolacija nukleinskih kislin in njihova analiza;
- Encimi v biokemiji in molekularni biologiji;
- Vnos genetskih informacij v organizme;
- PCR in LAMP;
- Kloniranje in gensko spremenjeni organizmi;
- Genomske in genske knjižnice;
- Hibridizacija;
- Sekvenciranje;
- Osnove bioinformatike.

Vaje:

- Izolacija plazmidne in kromosomske DNA;
- Analiza izolirane DNA;
- Kloniranje DNA;
- Elektroporacija;
- PCR;
- Bioinformatika.

Content (Syllabus outline):

Lectures:

- Basic tools in biochemistry and molecular biology;
- Isolation of nucleic acids and their analysis;
- Enzymes in biochemistry and molecular biology;
- Introduction of genetic information into organisms;
- PCR in LAMP;
- Cloning and genetically modified organisms;
- Genomic and gene libraries;
- Hybridization;
- Sequencing;
- Basics of bioinformatics.

Tutorial:

- Isolation of plasmid and chromosomal DNA;
- Analysis of isolated DNA;
- DNA cloning;
- Electroporation;
- PCR;
- Bioinformatics.

Temeljni literatura in viri / Readings:

- Nelson, D. L., Cox, M. M. (2005). *Lehninger principles of biochemistry* (4. izdaja, str. XXV, 1119 , 91). W. H. Freeman.
- Anderluh, G., Bavdek, A., Sepčić, K. (2009). *Praktikum iz biokemije: za študente prvostopenjskega bolonjskega programa Biologija* (str. 75). Študentska založba.
- Herzog-Velikonja, B., Gruden, K. (2000). *Praktikum iz molekularne biologije, Teoretični del* (str. 104). Študentska založba.

Cilji in kompetence:

Namen predmeta je podati principe poglavitnih molekularno-bioloških metod. Velik poudarek je na praktičnemu laboratorijskemu delu. Študenti bodo seznanjeni z naslednjimi tehnikami:

- Izolacija RNA in DNA iz različnih vrst celic;

Objectives and competences:

The aim of the subject is to give background information of the main molecular biology methods . A great emphasis is on practical laboratory work. Students will develop skills in using the following techniques:

- RNA and DNA isolation from various cell types;

- Čiščenje nukleinskih kislin;
- Kvantifikacija nukleinskih kislin;
- Separacija RNA in DNA na agaroznih gelih;
- Separacija proteinov na poliakrilamidnih gelih;
- Encimske modifikacije;
- Kloniranje DNA in priprava DNA knjižnic;
- Transformacija DNA v različne celične sisteme;
- Hibridizacija RNA in DNA;
- Selekcija pozitivnih klonov;
- Hibridizacija po Northernu;
- Hibridizacija po Southernu;
- Verižna reakcija s polimerazo (PCR);
- Sekvenciranje DNA;
- Bioinformatika.

- Nucleic acid purification;
- Nucleic acid quantification;
- Separation of RNA and DNA on agarose gels;
- Separation of proteins on polyacrylamide gels;
- Enzyme modifications;
- DNA cloning and DNA library construction;
- Transformation of DNA in different cell systems;
- Hybridization of RNA and DNA;
- Screening of positive clones;
- Northern blot;
- Southern blot;
- Polymerase chain reaction (PCR);
- DNA sequencing;
- Bioinformatics.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Študenti spoznajo možnosti in načine uporabe molekularno bioloških tehnik pri študiju biodiverzitete, filogenije, filogeografije, populacijske genetike in ekologije;
- Študenti spoznajo in razumejo principe številnih molekularno bioloških metod;
- Študenti pridobijo sposobnost kritičnega ovrednotenja uporabe spoznanih metod v praksi;
- Študenti dobro obvladajo laboratorijsko delo z različnimi aparaturami ter ravnanje z zdravju škodljivimi kemikalijami.

Intended learning outcomes:

Knowledge and understanding:

- Students gain knowledge of the possibilities and ways of applications of molecular biology techniques in biodiversity, phylogenetic, phylogeography, population genetic and ecology studies;
- Students learn and understand the principles of numerous molecular biology methods;
- Students gain the ability to critically evaluate the practical application of the methods they've learned;
- Students are proficient in laboratory work with various equipment and handling hazardous chemicals.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Laboratorijske vaje	• Lectures • Laboratory practicals

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Kolokvij • Pisni izpit	**50** **50**	• Midterm exam • Written exam

Reference nosilca / Lecturer's references:

1. DENEKE, Wolde, EGUALE, Tadesse, MEDHIN, Girmay, HAILE, Aklilu Feleke, ALEMAYEHU, Haile, MIHRET, Adane, PIRŠ, Mateja, STRAŠEK SMRDEL, Katja, AVBERŠEK, Jana, KUŠAR, Darja, CERAR KIŠEK, Tjaša, JANKO, Tea, STEYER, Andrej, **STARČIČ ERJAVEC, Marjanca**. Diarrheagenic *Escherichia coli* in stool specimens collected from patients attending primary healthcare facilities in Ethiopia: whole-genome sequencing-based molecular characterization. *International journal of molecular sciences*. 2024, vol. 25, issue 19, [article no.] 10251, str. 1-19.
2. KUZNETSOVA, Marina V., POSPELOVA, Julia S., MASLENNIKOVA, Irina L., **STARČIČ ERJAVEC, Marjanca**. Dual-species biofilms: biomass, viable cell ratio/cross-species interactions, conjugative transfer. *International journal of molecular sciences*. 2023, vol. 24, issue 19, [article no.] 14497, str. 1-14.
3. KOVAČ, Urša, ŽUŽEK, Zala, RASPOR DALL'OLIO, Lucija, POHAR, Katka, IHAN, Alojz, MOŠKON, Miha, ROZMAN, Damjana, **STARČIČ ERJAVEC, Marjanca**. *Escherichia coli* affects expression of circadian clock genes in human hepatoma cells. *Microorganisms*. 2021, vol. 9, iss. 4, str. 1-14.
4. TRUDEN, Sara, ŽOLNIR-DOVČ, Marija, SODJA, Eva, **STARČIČ ERJAVEC, Marjanca**. Nationwide analysis of *Mycobacterium chimaera* and *Mycobacterium intracellulare* isolates : frequency, clinical importance, and molecular and phenotypic resistance profiles. *Infection, genetics and evolution : journal of molecular epidemiology and evolutionary genetics in infectious diseases*. Aug. 2020, vol. 82, article 104311, str. 1-6
5. KUZNETSOVA, Marina V., GIZATULLINA, Julia, NESTEROVA, Larisa Jur'evna, **STARČIČ ERJAVEC, Marjanca**. *Escherichia coli* isolated from cases of colibacillosis in Russian poultry farms (Perm Krai) : sensitivity to antibiotics and bacteriocins. *Microorganisms*. May 2020, vol. 8, iss. 5, str. 1-11